PROJECT MANUAL FOR
2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION
COLUMBIA COUNTY, WI

VOLUME I

November 2025
Project #00090019

Prepared By:

MSA Professional Services, Inc.
1230 South Boulevard
Baraboo, WI 53913

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2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION
COLUMBIA COUNTY, WI
Project #00090019
Seals Page



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PROJECT MANUAL FOR
2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION
COLUMBIA COUNTY, WI COUNTY

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ADVERTISEMENT FOR BIDS
2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION
COLUMBIA COUNTY, WI

WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION is requesting Bids for the construction of the following Project:

2025 WWTF UPGRADE
Project #00090019

The WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION will receive and accept bids ONLY through QuestCDN.com via the online electronic bid service (Quest vBid) for the construction of the 2025 WWTF Upgrade until 10:00 a.m., December 9, 2025. All bids will be downloaded and publicly read aloud during a virtual public bid opening that will be held at the day and time of the bid closing. All plan holders will receive information via Quest on how to join the virtual meeting prior to the bid opening.

The Project includes the following Work: Architectural, mechanical, and electrical modifications are to be undertaken at the Control Building (STR 05) and Chemical Building (STR 30). The existing dechlorination building is to be demolished (STR 85). New chemical dosing pumps and tanks are to be installed in STR 30. Structural and electrical modifications are to accompany the installation of a new UV disinfection system in the existing UV disinfection/effluent channel (STR 50). New rotary lobe sludge transfer pumps are to be installed to replace the existing progressive cavity pumps in the Digester Building (STR 60) and Sludge Dewatering Building (STR 70). The existing potable water hydropneumatic tank is to be replaced with a full acceptance bladder tank in STR 60. A new pelletizer system and all associated equipment and appurtenances are to be installed in the Sludge Dryer Building (STR 75). Widespread VFD replacement is also to be undertaken throughout the Facility.

The anticipated substantial completion date is August 27, 2027, and final completion date is October 27, 2027.

Obtaining the Bidding Documents

Information and Bidding Documents for the Project can be found at the following designated website: www.Quest cdn.com

Bidding Documents are available for download from Quest CDN at www.Quest cdn.com. You may download the digital plan documents for $45 by inputting Quest eBidDoc #9896582 on the website's Project Search page. Please contact QuestCDN at 952-233-1632 or contact by email at info@questcdn.com for assistance in free membership registration, downloading, and working with the digital project information. Prospective Bidders are urged to register with Quest CDN as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. Quest CDN requires the bidding documents to be downloaded from the site in order to submit a bid in the Vbid system. The designated website will be updated periodically with addenda, lists of registered plan holders, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through Quest CDN. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than Quest CDN.

Instructions to Bidders.

No proposal will be accepted unless accompanied by a certified check or bid bond equal to at least 5% of the amount bid, payable to the Owner as a guarantee that, if the bid is accepted, the bidder will execute and file the proper contract and bond within 15 days after the award of the contract. The certified check or bid bond will be returned to the bidder as soon as the contract is signed, and if after 15 days the bidder shall fail to do so, the certified check or bid bond shall be forfeited to the Owner as liquidated damages.

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No bidder may withdraw their bid within 60 days after the actual date of the opening thereof.

The minimum wages to be paid on the project shall be in accordance with the wage rate scale established by Federal Davis Bacon Wage Rates. Federal wage rates can be found at https://sam.gov/content/wage-determinations. Be aware that project Administrators, Bidders, and Contractors are required to use the latest federal wage rate available at the time of bid opening.

This project anticipates use of Wisconsin DNR Clean Water Fund Program funding. We encourage Disadvantaged Business Enterprises (DBEs), including Minority-owned Business Enterprises (MBEs), Women's Business Enterprises (WBEs), and Small Businesses in Rural Areas (SBRAs) to submit bid proposals. A municipality, in awarding prime contracts, and primary contractor, in awarding subcontracts, are required to make a good faith effort to achieve a combined minimum goal of 15% participation for MBE/WBE utilization in accordance with s.NR 162.09(3), s.NR 166.12(4), and s.NR 167.18(4) Wis. Admin. Code. If a subcontractor awards subcontracts, these requirements shall apply to the subcontractor.

The Contractor shall conform to the "Use of American Iron and Steel" provision of H.R. 3547 Consolidated Appropriations Act, 2014, section 436, including all iron and steel products used in the project. Bid Proposals may be denied if the requirements of this section are not met and waivers are required. EPA guidance for the use of American Iron and Steel (AIS) can be found at http://water.epa.gov/grants_funding/aisrequirement.cfm.

Owner reserves the right to waive any informalities or to reject any or all bids.

Published by the authority of the WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION.

CONSULTING ENGINEER:
MSA Professional Services, Inc.
1230 South Boulevard
Baraboo, WI 53913
Matt Rockweiler, PE
(608) 355-8846 | mrockweiler@msa-ps.com

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INSTRUCTIONS TO BIDDERS

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ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. Issuing Office - The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2 - BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.04 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as plan holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.

2.05 Electronic Documents

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version 2017 Standard/Pro or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer

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cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with its Bid (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:

A. Evidence of Bidder's authority to do business in the state where the Project is located.

B. Bidder's state or other contractor license number, if applicable.

C. Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, "Subcontractors, Suppliers, and Others."

D. No contractor or subcontractor may work on this project who is currently debarred either Federally or in the State of Wisconsin.

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4 - PRE-BID CONFERENCE

4.01 A pre-bid conference will be conducted for this Project on December 2, 2025 at 9 am. Pre bid conference is not mandatory to attend.

ARTICLE 5 - SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE, OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 Site and Other Areas

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions.

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1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:

   Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.

   Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.

   Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

   Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

B. Underground Facilities: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 Other Site-related Documents

A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:

1. 2022 WWTF Upgrade Record Drawings, Wisconsin Dells – Lake Delton Sewerage Commission, Dated May 23, 2024

2. Wastewater Treatment Facility (WWTF) Biosolids Dryer System Construction Record Drawings, Wisconsin Dells-Lake Delton Sewerage Commission, Dated July 2019

3. Wastewater Treatment Facility Upgrade Record Drawings, Wisconsin Dells - Lake Delton Sewerage Commission, Dated February 2007

4. 1999 Phosphorus Removal Upgrades Record Drawings, Wisconsin Dells – Lake Delton Sewerage Commission, Dated June 2000

Owner will make copies of these other Site-related documents available to any Bidder on request.

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B. Owner has not verified the contents of these other Site-related documents, and Bidder may not rely on the accuracy of any data or information in such documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the other Site-related documents.

C. The other Site-related documents are not part of the Contract Documents.

D. Bidders are encouraged to review the other Site-related documents, but Bidders will not be held accountable for any data or information in such documents. The requirement to review and take responsibility for documentary Site information is limited to information in (1) the Contract Documents and (2) the Technical Data.

5.04 Site Visit and Testing by Bidders

A. A Site visit is scheduled following the pre-bid conference. Maps to the Site will be available at the pre-Bid conference.

B. A Site visit is scheduled for December 2, 2025. Maps to the Site will be made available upon request.

C. Bidders visiting the Site are required to arrange their own transportation to the Site.

D. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the following Owner or Engineer contact for visiting the Site: Matthew Rockweiler, MSA Professional Services, Inc., (608) 355-8846/mrockweiler@msa-ps.com. Bidder must conduct the required Site visit during normal working hours.

E. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

F. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.

G. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

H. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 Owner's Safety Program

A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 Other Work at the Site

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A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6 - BIDDER'S REPRESENTATIONS

6.01 Express Representations and Certifications in Bid Form, Agreement

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

A. Matt Rockweiler, PE, (608) 355-8846 | mrockweiler@msa-ps.com

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.

7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5% or 10% of Bidder's maximum Bid price and in the form of a certified check, or an electronic Bid Bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

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8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

9.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10 - SUBSTITUTE AND "OR-EQUAL" ITEMS

10.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

10.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 11 - SUBCONTRACTORS, SUPPLIERS AND OTHERS

11.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work within 24-hours after Bid opening:

A. Subcontractors

1. Electrical

2. Process Mechanical

3. Plumbing/HVAC

4. Concrete

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5. Earthwork/Demolition

6. Architectural/Building

B. Suppliers

1. Rotary Lobe Sludge Transfer Pumps

2. UV Disinfection System

3. Chemical Storage Tank

4. Chemical Feed Pumps

5. Pelletizer System and All Associated Conveyance/Processing Systems

11.03 If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased *(or decreased)* by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

11.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

ARTICLE 12 - PREPARATION OF FORM

12.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid form shall be completed and submitted via QUEST vBID.

12.02 Bidder shall complete and submit required attachments as listed in the Bid Form.

12.03 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.

12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

12.05 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

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12.06 A Bid by an individual shall show the Bidder's name and official address.

12.07 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture shall be shown.

12.08 All names shall be printed in ink below the signatures.

12.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers and dates of which shall be filled in on the Bid Form.

12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

ARTICLE 13 - BASIS OF BID

13.01 Lump Sum

A. Bidders shall submit a Bid on a lump sum basis as set forth in the Bid Form.

13.02 Allowances

A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 14 - SUBMITTAL OF BID

14.01 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bid or Invitation to Bid, and shall be accompanied by the Bid security and other required documents. Bids will ONLY be received and accepted via the online electronic bid service through Quest CDN (www.QuestCDN.com). To access the electronic bid form, download the project documents and click the online bidding button at the top of the advertisement. If you need further assistance, please feel free to contact Quest CDN at (952) 233-1632.

14.02 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 15 - MODIFICATION AND WITHDRAWAL OF BID

15.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.

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15.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 16 - OPENING OF BIDS

16.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 17 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

17.01 All Bids will remain subject to acceptance for the period of time stated in the Bid form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 18 - EVALUATION OF BIDS AND AWARD OF CONTRACT

18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid which Owner determines to be in the best interest of the project.

18.05 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19 - BONDS AND INSURANCE

19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder

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delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20 - SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21 - SALES AND USE TAXES

21.01 Owner represents that it is a qualifying exempt entity under Section 77.54(9m), Wis. Stats. (as created by 2015 Wis. Act 126) with respect to exemption from Wisconsin sales and use tax of certain items that become part of eligible facilities owned by the qualifying exempt entity. The Bid shall account for such sales and use tax exemptions, to the extent applicable. The Contract will provide that the Contractor is not entitled to an increase in Contract Price if Contractor is not successful in obtaining an anticipated sales and use tax exemption, unless the reason for the inability to obtain the anticipated exemption is a formal determination by the State of Wisconsin that Owner is not a qualifying exempt entity.

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AVAILABLE PROJECT INFORMATION

LCP-A and MCC-A Shop Drawings

LCP-B and MCC-B Shop Drawings

LCP-C and MCC-C Shop Drawings

MCC-D Shop Drawings

Sludge Dryer Building H Shop Drawings

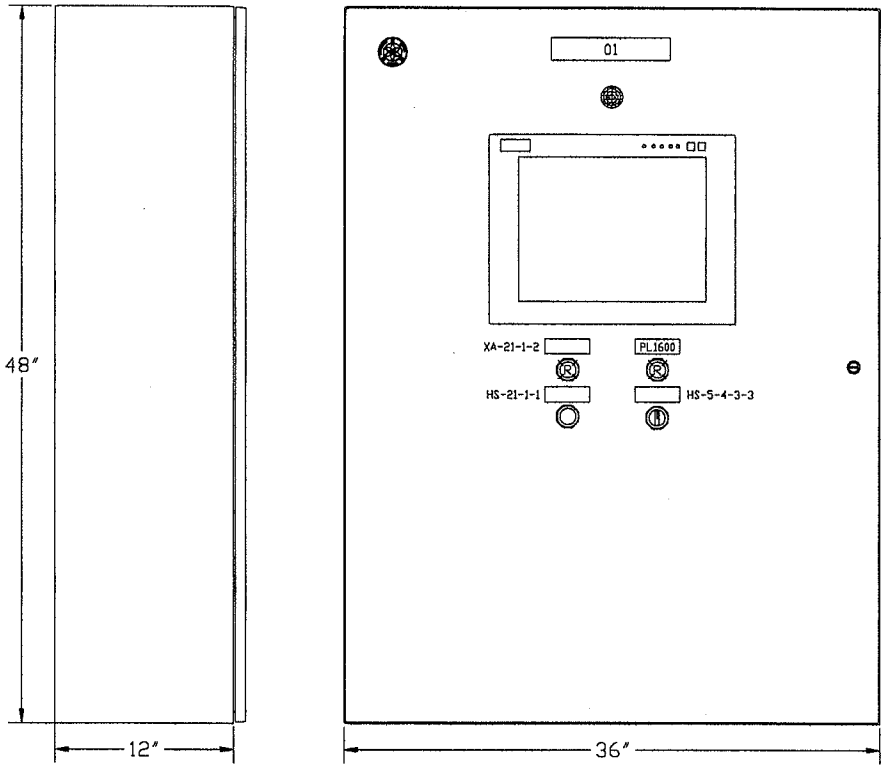
BCR Sludge Dryer Instrumentation Schedule Shop Drawings

Potable Water System Control Panel Shop Drawings

Server Rack Shop Drawings and Network Topology Notes

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NAMEPLATE SCHEDULE					
TAG	DESC1	DESC2	DESC3	SIZE	REMARKS
01	LCP-A			1.5x8	
HS-21-1-1	SILENCE			1x3	
HS-5-4-3-3	ON - OFF - AUTO			1x3	
PL1600	BACKUP MODE			1x3	
XA-21-1-2	PLC FAIL			1x3	

NAMEPLATES ARE WHITE WITH BLACK LETTERS

NOTES:

1. ENCLOSURE IS A NEMA TYPE 4,12 WALL-MOUNT HOFFMAN CSD483612 WITH INNER PANEL HOFFMAN CP4836. ENC201 EN HOFFMAN CP4836
2. FINISH IS ANSI 61 GRAY.
3. UL# BF-371415

ENC200 EN HOFFMAN CSD483612

SCALE

0 6" 12" 24"

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REVISION	
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13005 16th Ave. North
Plymouth, Minnesota 55441

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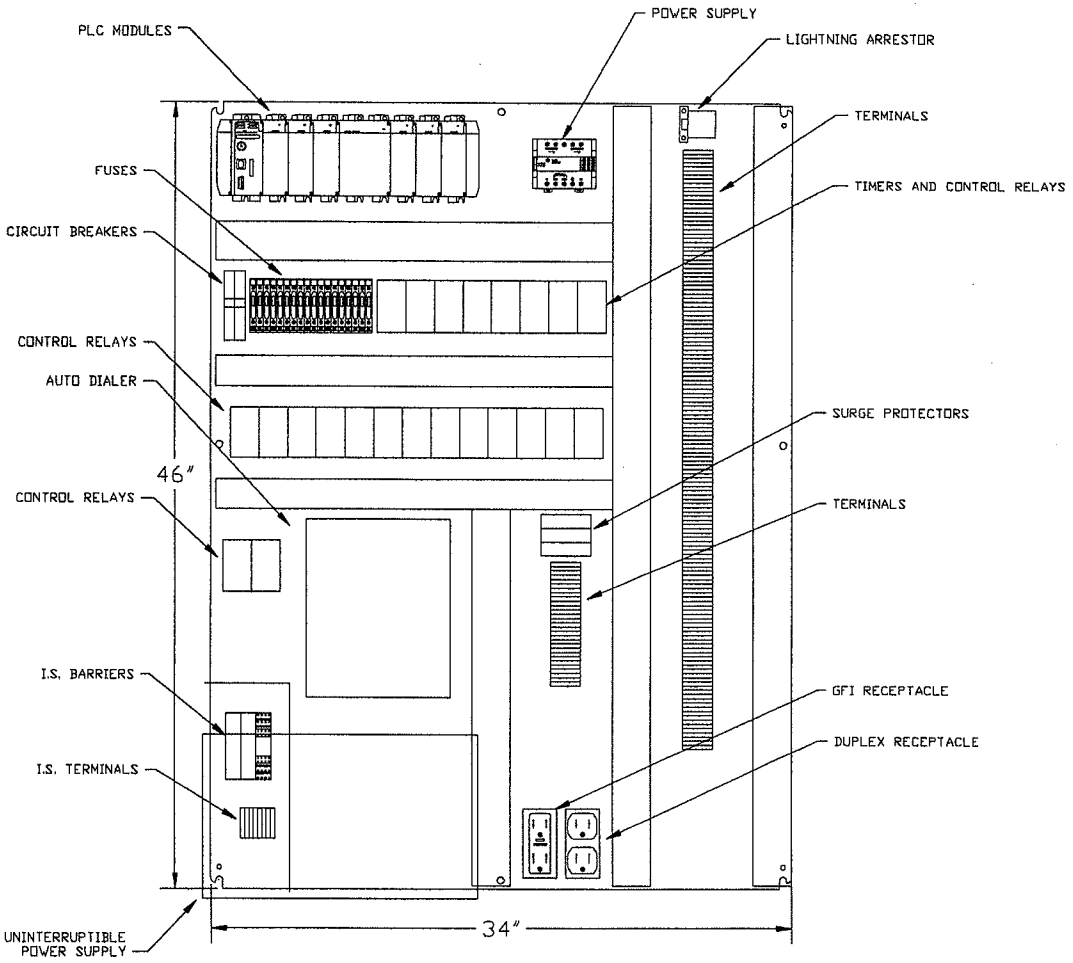
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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	2 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
ENCLOSURE DETAIL

PROJ. NO. 1520A

DWG. NO. 001



PANEL LAYOUT

SCALE

0 6" 12" 24"

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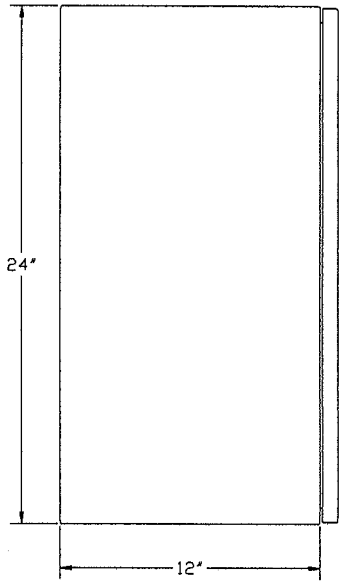
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ASSEM.	
SHEET	3 OF 60

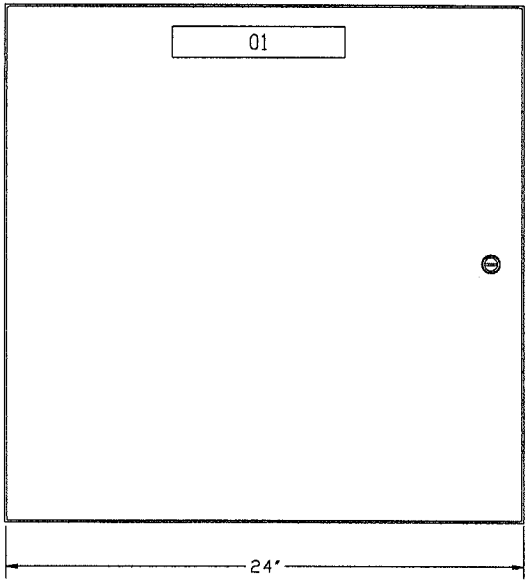
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

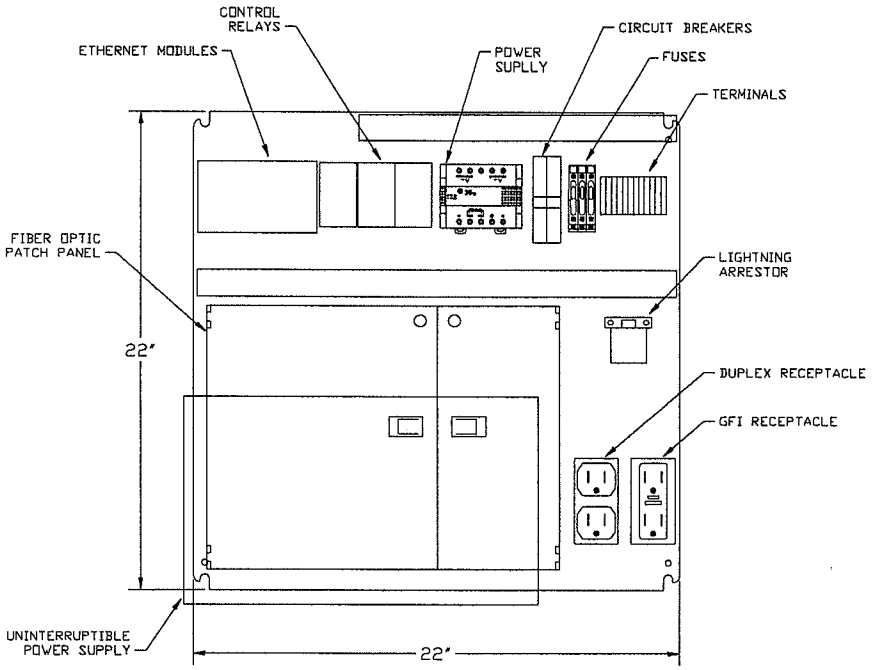
LCP-A
PANEL LAYOUT

PROJ. NO. 1520A

DWG. NO. 002







PANEL LAYOUT

NAMEPLATE SCHEDULE					
TAG	LINE 1	LINE 2	LINE 3	SIZE HxW	REMARKS
01	FIP-A			1.5x8	

NOTES:

1. ENCLOSURE IS A NEMA TYPE 4, 12 WALL-MOUNT HOFFMAN CONCEPT CSD242412 WITH INNER PANEL HOFFMAN CP2424.
2. FINISH IS ANSI 61 GRAY.
3. UL# BF-371418

SCALE

0 5' 10' 15'

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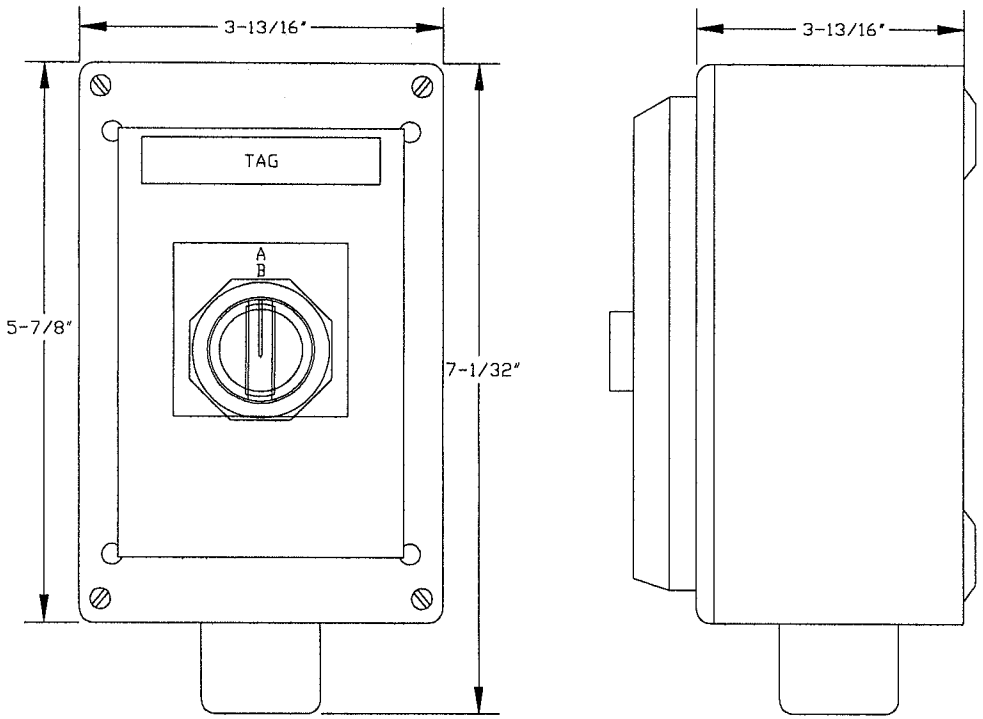
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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	4 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

FIP-A
FIBER OPTIC NETWORK INTERFACE PANEL
ENCLOSURE DETAIL

PROJ. NO. 1520A

DWG. NO. 003



NAMEPLATE SCHEDULE					
	NAMEPLATE			LEGEND PLATE	
TAG	LINE 1	LINE 2	LINE A	LINE B	LEGEND NO.
HS-4-1-1-1	GRIT CHAMBER DRIVE		OFF	HAND AUTO	800H-W551
HS-5-1-1-1	AERATION BLOWER NO.1		OFF	HAND AUTO	800H-W551
HS-5-1-2-1	AERATION BLOWER NO.2		OFF	HAND AUTO	800H-W551
HS-5-1-3-1	AERATION BLOWER NO.3		OFF	HAND AUTO	800H-W551
HS-5-3-1-1	AERATION BASIN	MIXER NO.1	OFF	HAND AUTO	800H-W551
HS-5-3-2-1	AERATION BASIN	MIXER NO.2	OFF	HAND AUTO	800H-W551
HS-6-1-1-1	AERATOR NO.1		OFF	HAND AUTO	800H-W551
HS-6-1-2-1	AERATOR NO.2		OFF	HAND AUTO	800H-W551
HS-6-1-3-1	AERATOR NO.3		OFF	HAND AUTO	800H-W551
HS-6-1-4-1	AERATOR NO.4		OFF	HAND AUTO	800H-W551
HS-6-1-5-1	AERATOR NO.5		OFF	HAND AUTO	800H-W551
HS-6-1-6-1	AERATOR NO.6		OFF	HAND AUTO	800H-W551
HS-6-1-7-1	AERATOR NO.7		OFF	HAND AUTO	800H-W551
HS-6-1-8-1	AERATOR NO.8		OFF	HAND AUTO	800H-W551
HS-19-2-1-1	WASHWATER WELL	PUMP NO. 1	OFF	HAND AUTO	800H-W551

NAMEPLATES ARE 1/2"Hx2"W WHITE WITH BLACK 1/8" LETTERS

NOTES:

1. ONE HOLE ENCLOSURE IS NEMA 4X FIBERGLASS ALLEN BRADLEY 800H-R3HA4RL.
2. FINISH IS ROSITE GLASS POLYESTER.
3. QUANTITY (15)

SCALE

0 1" 2" 4"

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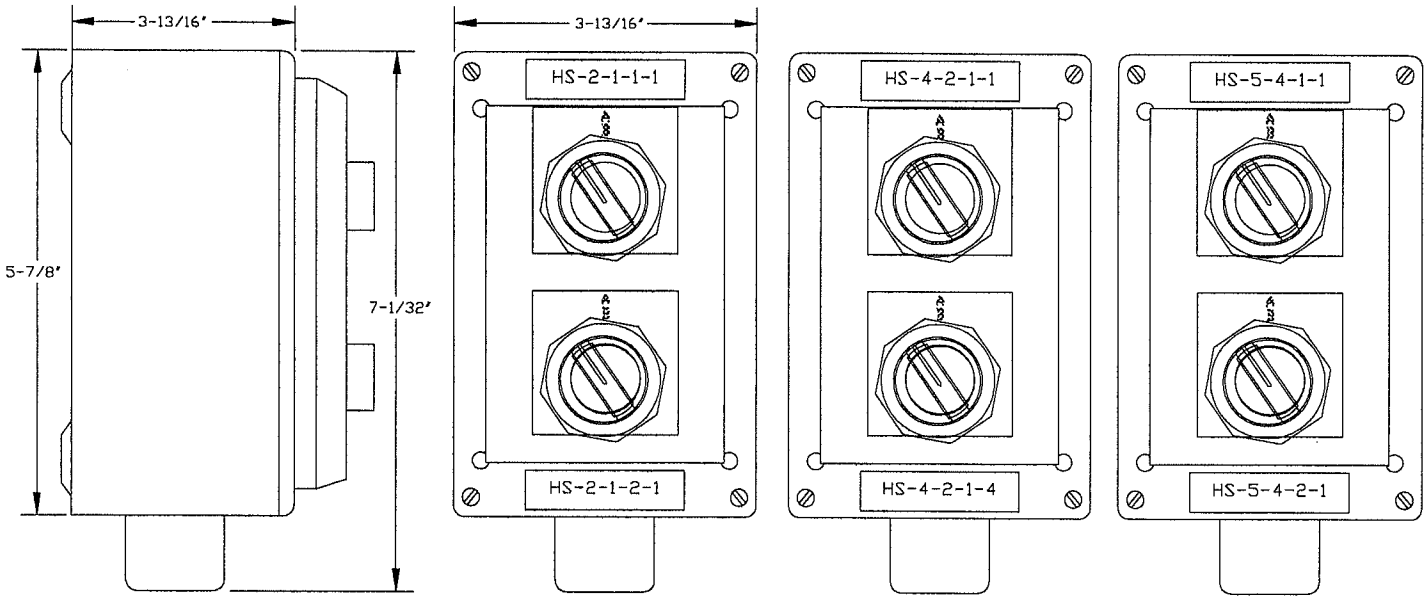
DATE	9/27/05
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ASSEM.	
SHEET	5 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LOCAL CONTROL STATIONS
SINGLE DEVICE STATIONS
ENCLOSURE DETAIL

PROJ. NO. 1520A

DWG. NO. 004A



NAMEPLATE SCHEDULE					
	NAMEPLATE			LEGEND PLATE	
TAG	LINE 1	LINE 2	LINE A	LINE B	LEGEND NO.
HS-2-1-1-1	SEPTAGE PUMP NO.1		OFF	HAND AUTO	800H-W551
HS-2-1-2-1	SEPTAGE PUMP NO.2		OFF	HAND AUTO	800H-W551
HS-4-2-1-1	GRIT PUMP		OFF	HAND AUTO	800H-W551
HS-4-2-1-4	GRIT FLUSHING VALVE		CLOSE	OPEN AUTO	800H-W500E
HS-5-4-1-1	FILTRATE	DRAIN PUMP NO.1	OFF	HAND AUTO	800H-W551
HS-5-4-2-1	FILTRATE	DRAIN PUMP NO.2	OFF	HAND AUTO	800H-W551

NAMEPLATES ARE 1/2"Hx2"W WHITE WITH BLACK 1/8" LETTERS

NOTES:

1. TWO HOLE ENCLOSURE IS NEMA 4X ALLEN BRADLEY 800H-2HZ4R.
2. FINISH IS ROSITE GLASS POLYESTER

SCALE

0 1" 2" 4"

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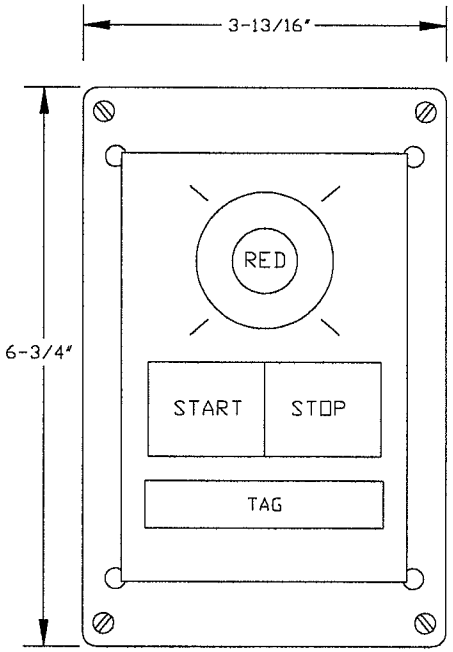
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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	6 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LOCAL CONTROL STATIONS
TWO DEVICE STATIONS
ENCLOSURE DETAIL

PROJ. NO. 1520A

DWG. NO. 004B



NAMEPLATE SCHEDULE			
TAG	LINE 1	LINE 2	SIZE
HS-EF-2-1	HVAC EF-2	MAU-1	5/8"X2-1/4"
HS-EF-2-2	HVAC EF-2	MAU-1	5/8"X2-1/4"

NAMEPLATES ARE 1/2"Hx2"W WHITE WITH BLACK 1/8" LETTERS

NOTES:

1. CONTROL STATION IS NEMA 7 ALLEN BRADLEY 800H-2HAD10R7.
2. QUANTITY (2)

SCALE

0 1" 2" 4"

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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	7 OF 60

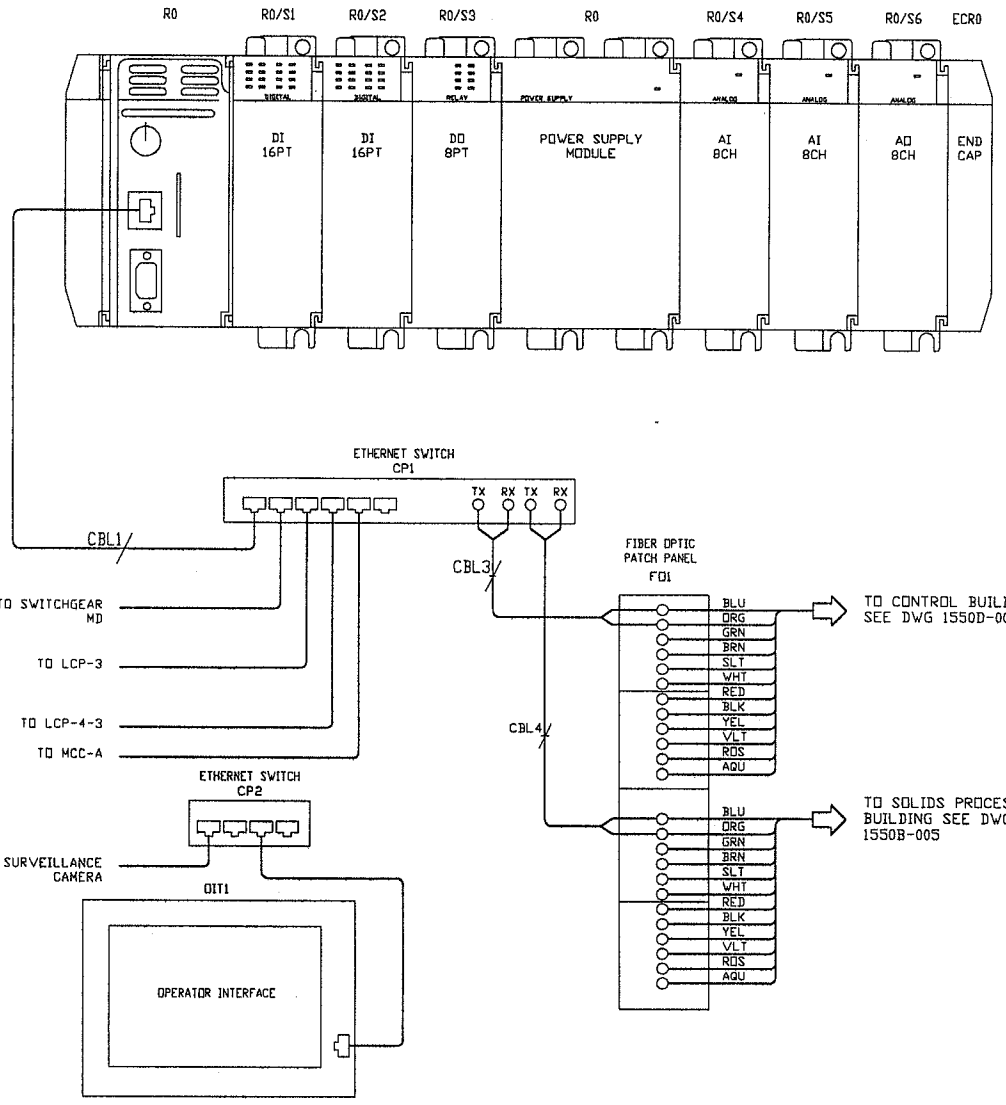
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LOCAL CONTROL STATIONS
START-STOP STATIONS
ENCLOSURE DETAIL

PROJ. NO. 1520A

DWG. NO. 004C

CONTROL LOGIX I/O SCHEDULE



QTY	TAGS	DESCRIPTION	MFG	CATALOG
1	R0	CPU, CPACT LGX 1.5MB MEM CPU CPACT LGX, 1.5MB MEMORY 120V AC	ALLEN BRADLEY	1769-L35E
2	R0/S1 R0/S2	PLC DIGITAL I/O MODULE 16 POINT INPUT - GENERAL PURPOSE 85-132V AC (INPUTS)	ALLEN BRADLEY	1769-IA16
1	R0/S3	PLC DIGITAL I/O MODULE 16 POINT RELAY CONTACT OUTPUT (N.O.) 1.5A @ 120V AC	ALLEN BRADLEY	1769-OW16
1	R0	COMPACTLOGIX POWER SUPPLY 120V AC	ALLEN BRADLEY	1769-PA4
2	R0/S4 R0/S5	PLC ANALOG I/O MODULE 8 ANALOG INPUTS (+/-10VDC; +/-20mA) 14 BIT RESOLUTION	ALLEN BRADLEY	1769-IF8
1	R0/S6	PLC ANALOG I/O MODULE 1769-OF8C 16 BIT RESOLUTION 8 4-20MA	ALLEN BRADLEY	1769-OF8C
1	ECR0	EXPANDABLE RACK RIGHT SIDE END CAP	ALLEN BRADLEY	1769-ECR
1	CBL1	ETHERNET CABLE CAT 5E ETHERNET CABLE CUT TO LENGTH	HUBBELL	PCX5EXX
2	CBL3 CBL4	FIBER OPTIC PATCH CABLE, SC-SC, MM 1 METER (1 PAIR) (2) FIBERS	PANDUIT	F6D3-3M1
1	CP1	INDUSTRIAL ETHERNET SWITCH (R) EX-ST PORTS (6) CAT 5E PORTS	N-TRON	[illegible]-SC-S
1	FO1	FIBER OPTIC PATCH PANEL OPTICOM	PANDUIT	FWME4
1	OIT1	OPERATOR INTERFACE TOUCHSCREEN 15" DISPLAY 120VAC DISPLAY	XYCOM	3715T
4	FO1	FIBER ADAPTER PANELS WITH 3 DUAL SC CONNECTORS	PANDUIT	FAP3WBUDSCZ
1	CP2	IDUSTRIAL ETHERNET SWITCH (4) CAT 53 PORTS	N-TRON	XXXXX

706FK

REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	8 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
PLC I/O SCHEDULE

PROJ. NO. 1520A

DWG. NO. 005

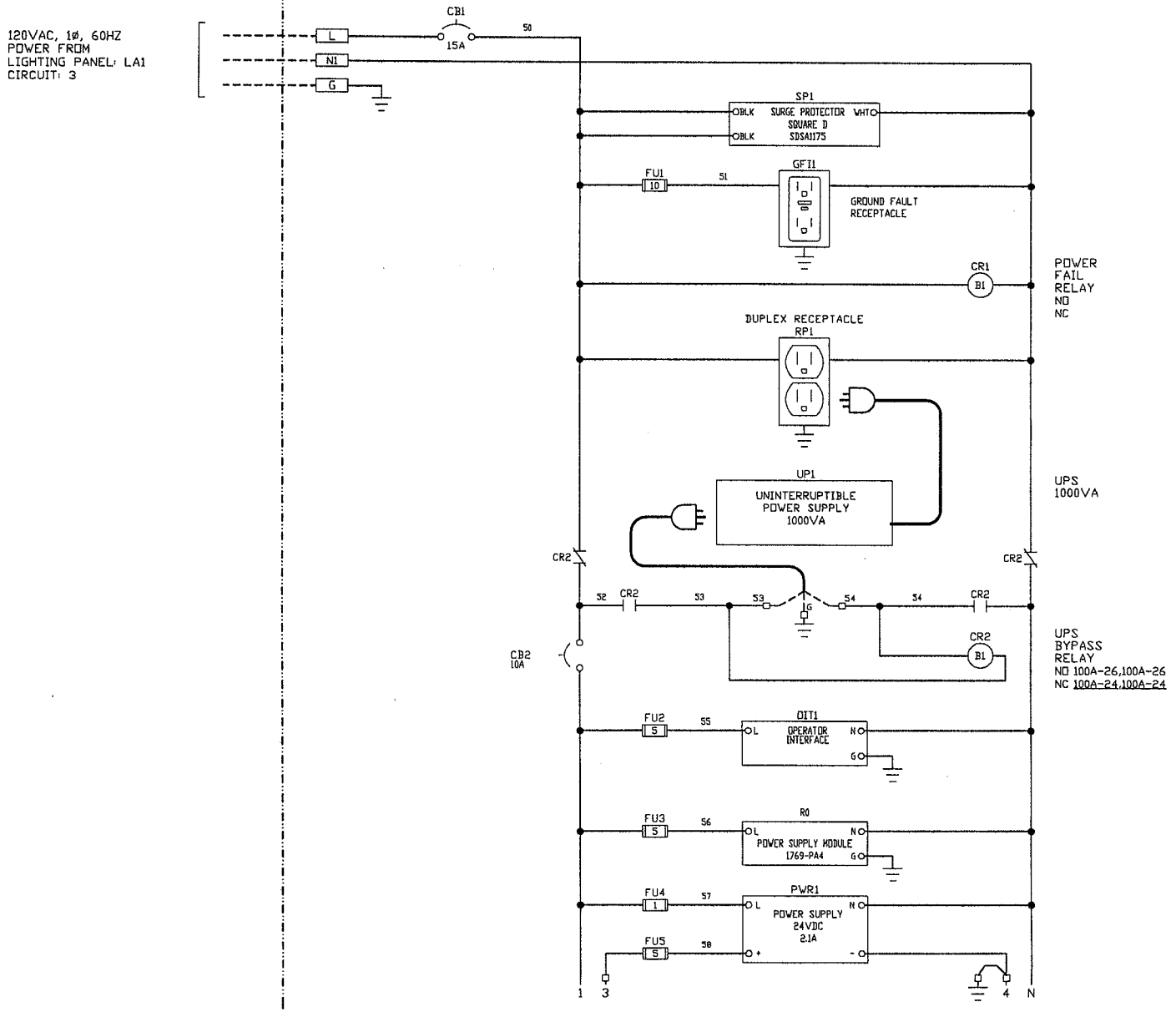
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DATE LAST EDITED: 11/16/2006

FIELD OR AS NOTED

LCP-A

120VAC, 1ø, 60HZ
POWER FROM
LIGHTING PANEL: LA1
CIRCUIT: 3



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	9 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
CONTROL POWER

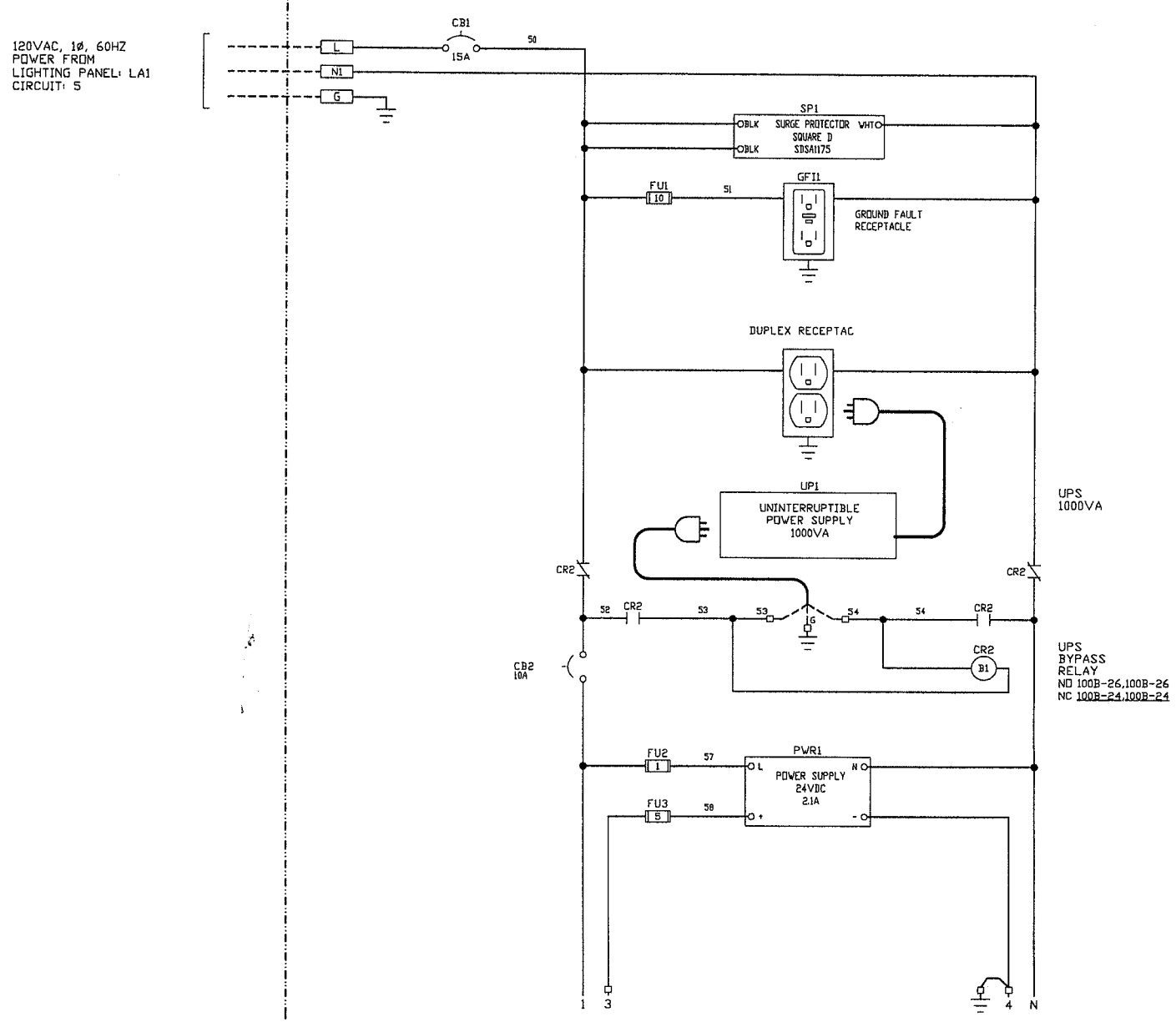
PROJ. NO. 1520A
DWG. NO. 100A

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DATE LAST EDITED: 11/16/2006

FIELD OR AS NOTED

FIP-A



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	10 OF 60

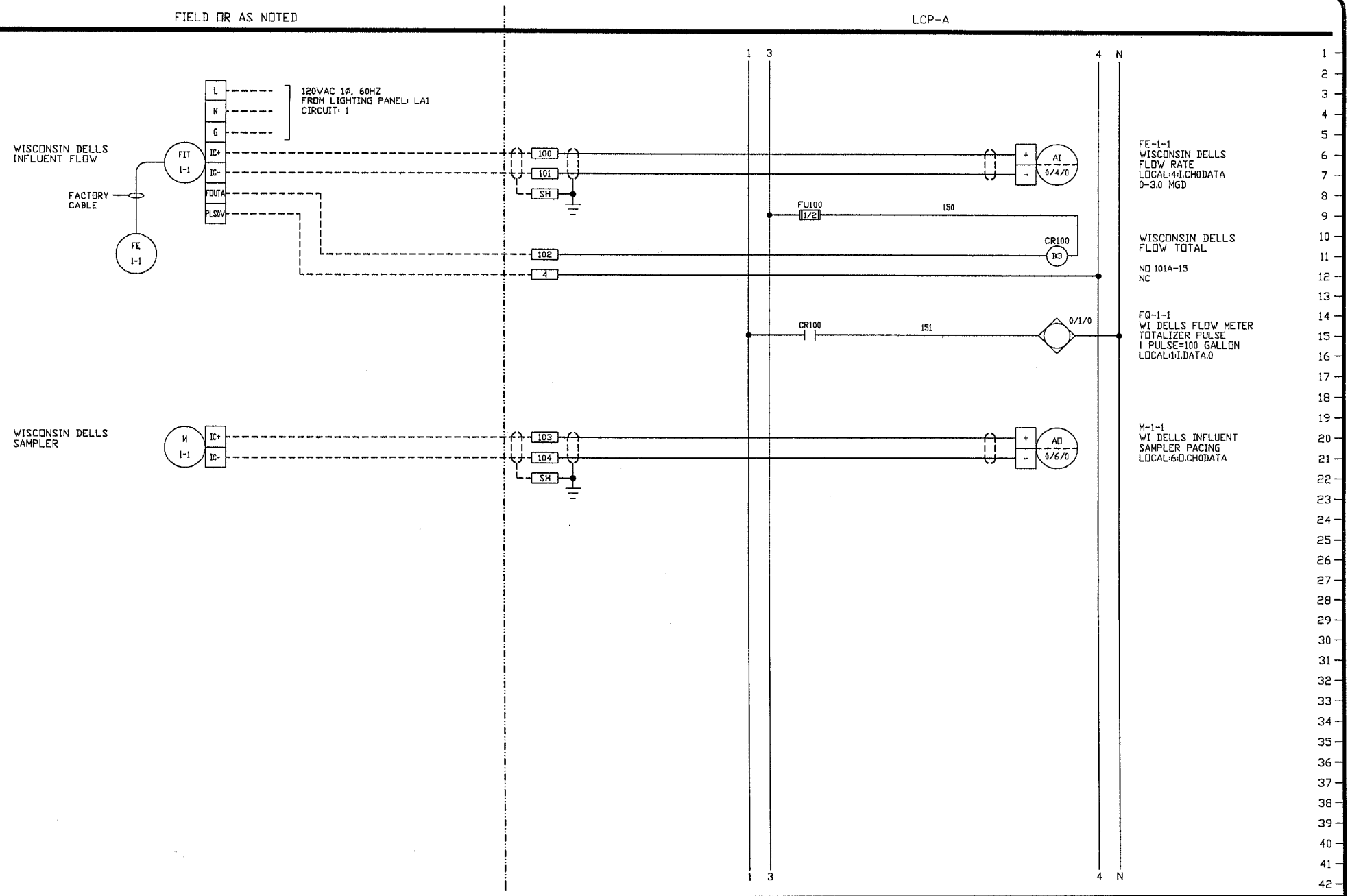
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

FIP-A
CONTROL POWER

PROJ. NO. 1520A1
DWG. NO. 100B

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DATE LAST EDITED: 11/16/2006



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

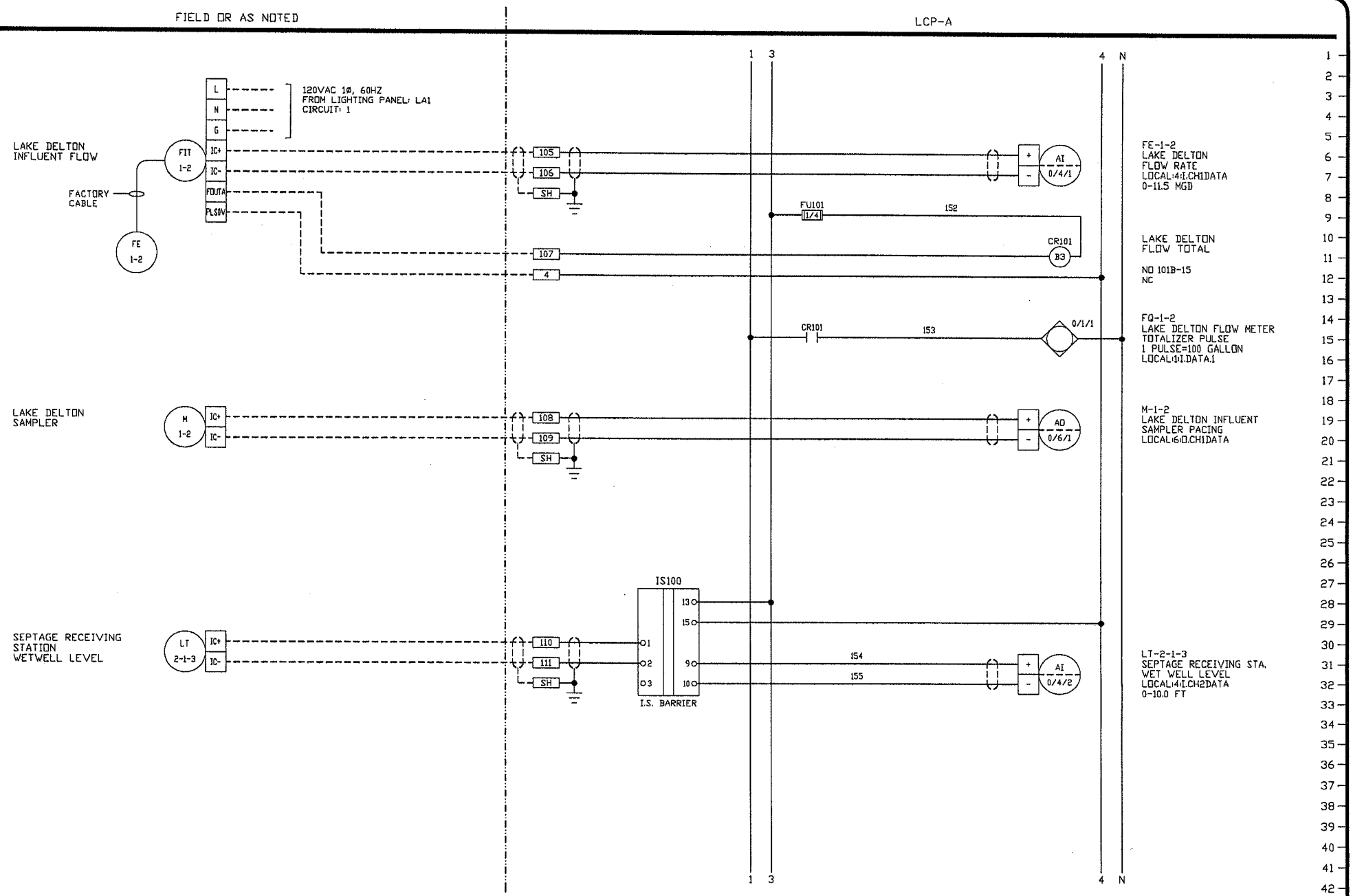
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	11 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
INFLUENT FLOW AND LEVEL METERING
PROJ. NO. 1520A
DWG. NO. 101A

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DATE LAST EDITED: 11/16/2006



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

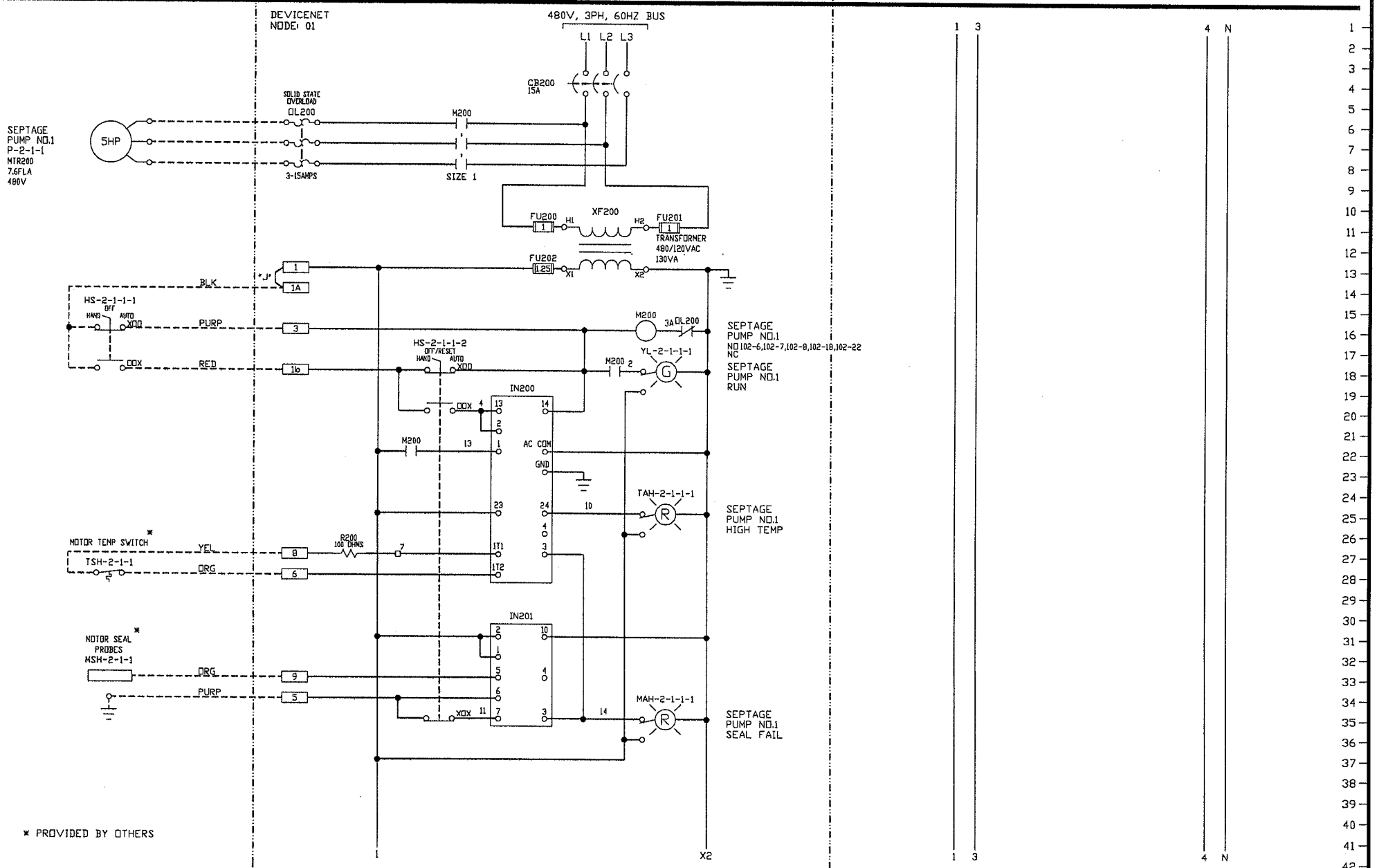
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	12 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
INFLUENT FLOW AND
LEVEL METERING
PROJ. NO. 1520A
DWG. NO. 101B

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REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

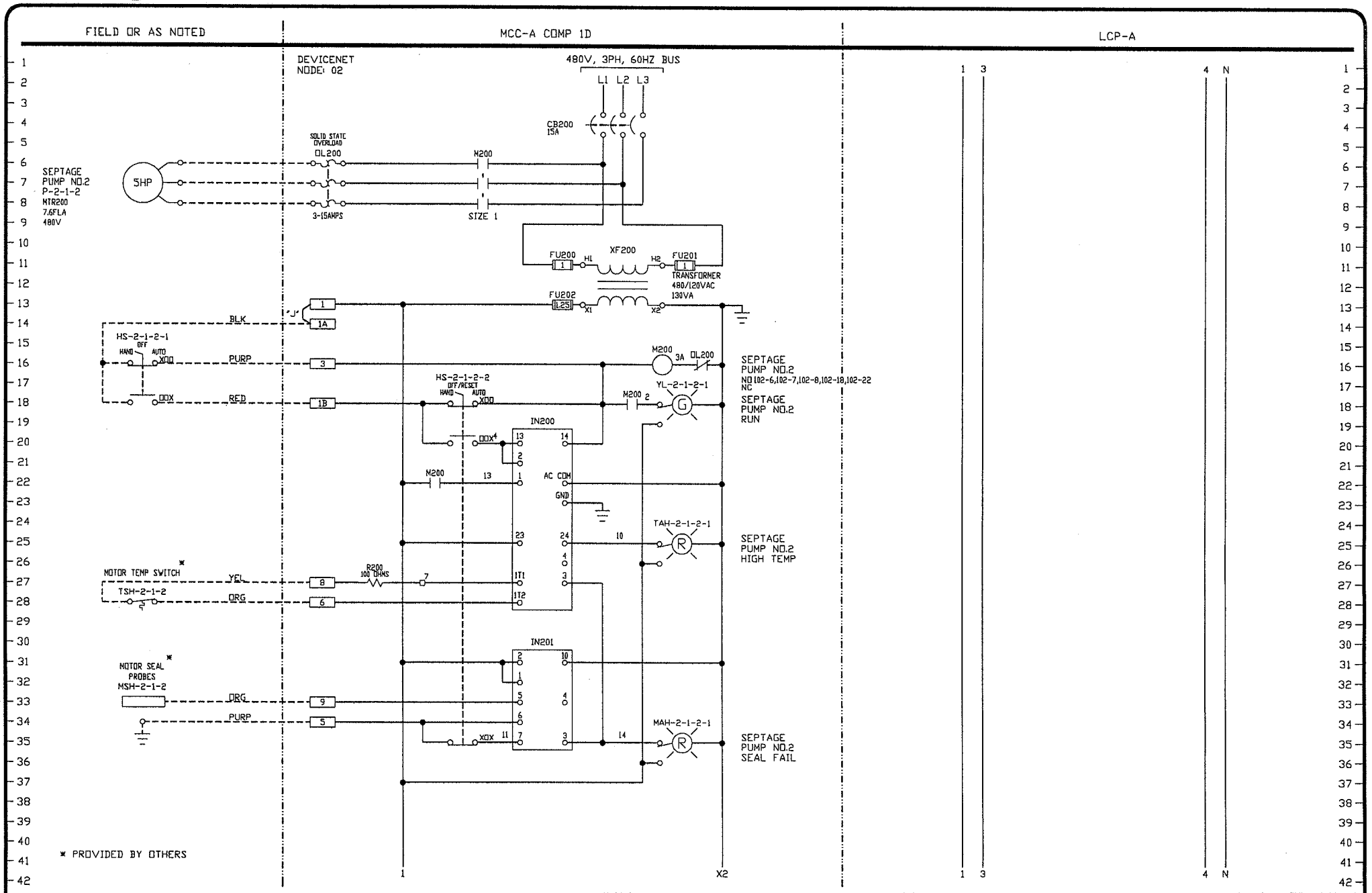
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	13 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
SEPTAGE PUMP NO.1
PROJ. NO. 1520A
DWG. NO. 102

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DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

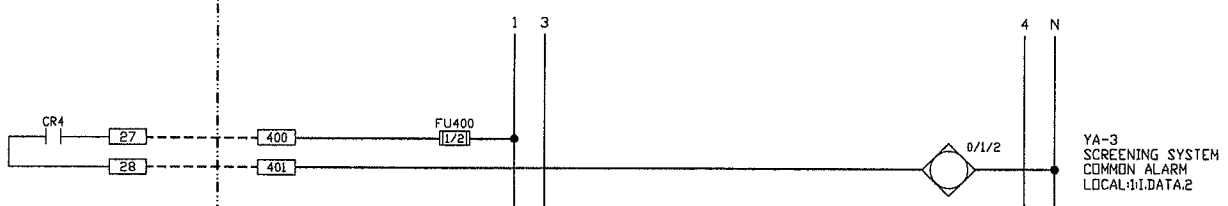
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	14 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
SEPTAGE PUMP NO.2
PROJ. NO. 1520A
DWG. NO. 103

LCP-3 *

LCP-A



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REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	15 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

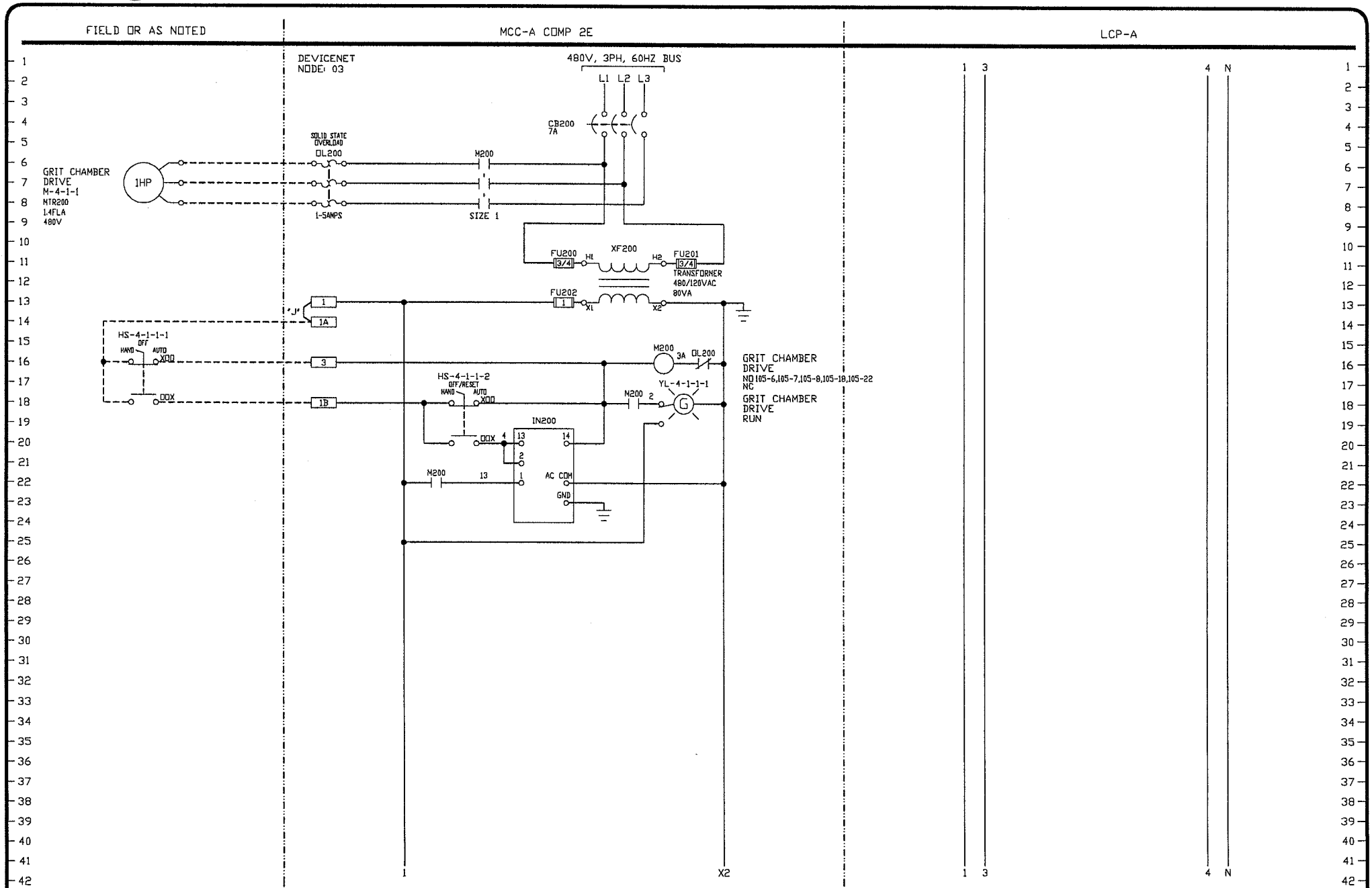
LCP-A
SCREENING SYSTEM

PROJ. NO. 1520A

DWG. NO. 104

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REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	16 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
GRIT CHAMBER DRIVE

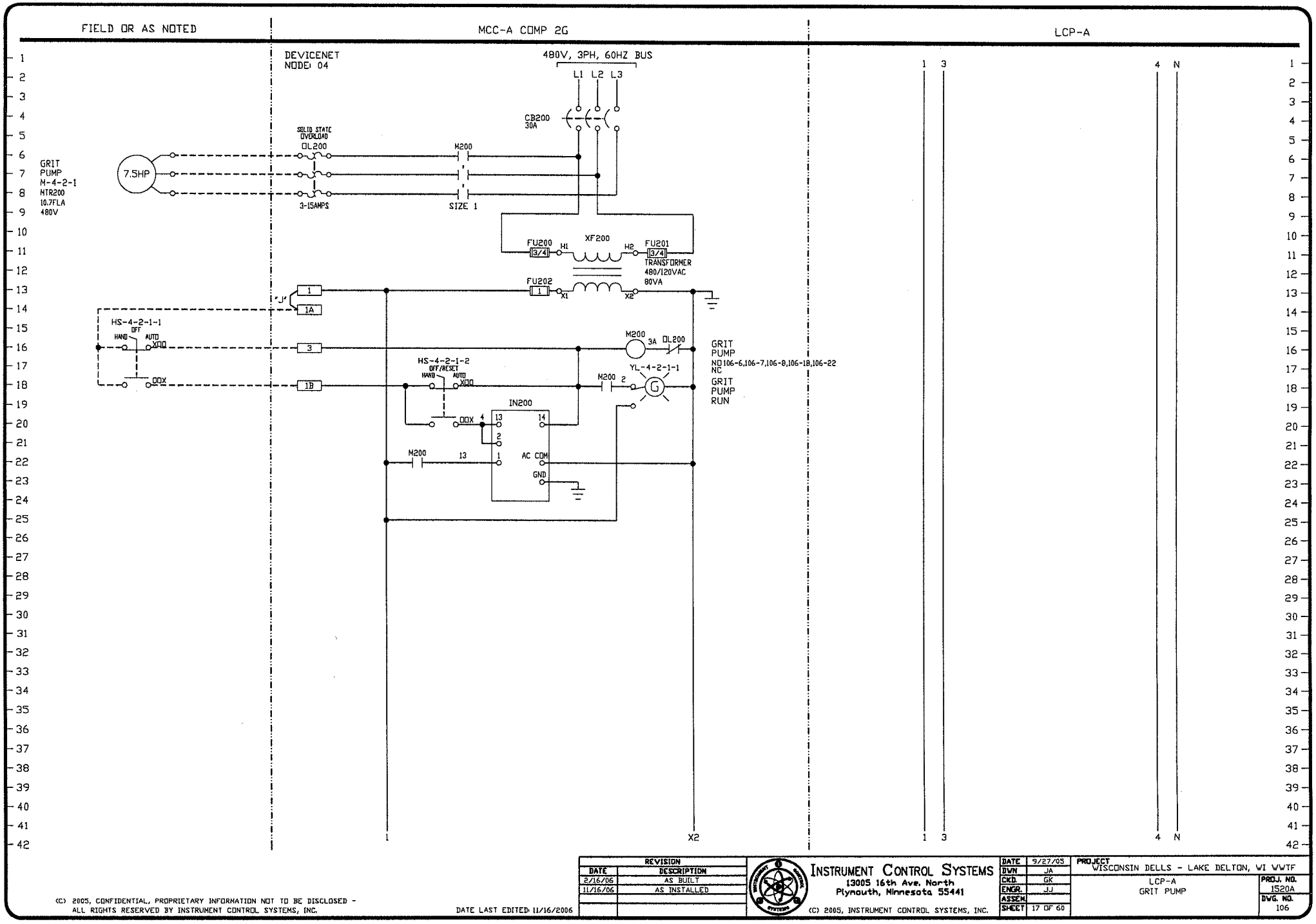
PROJ. NO. 1520A

DWG. NO. 105

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DATE LAST EDITED: 11/16/2006



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

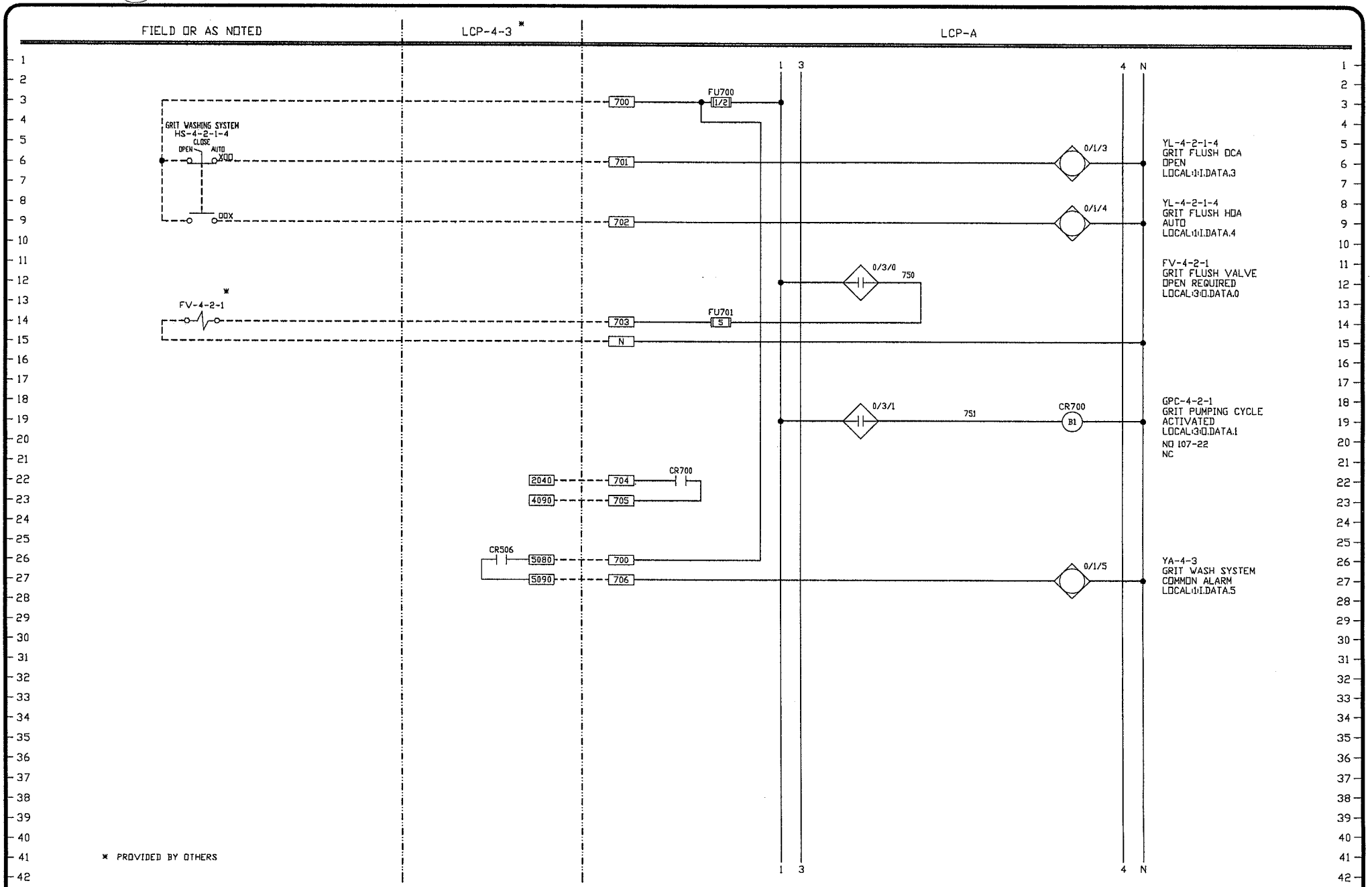
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	17 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
GRIT PUMP
PROJ. NO. 1520A
DWG. NO. 106

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REVISION	
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	18 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

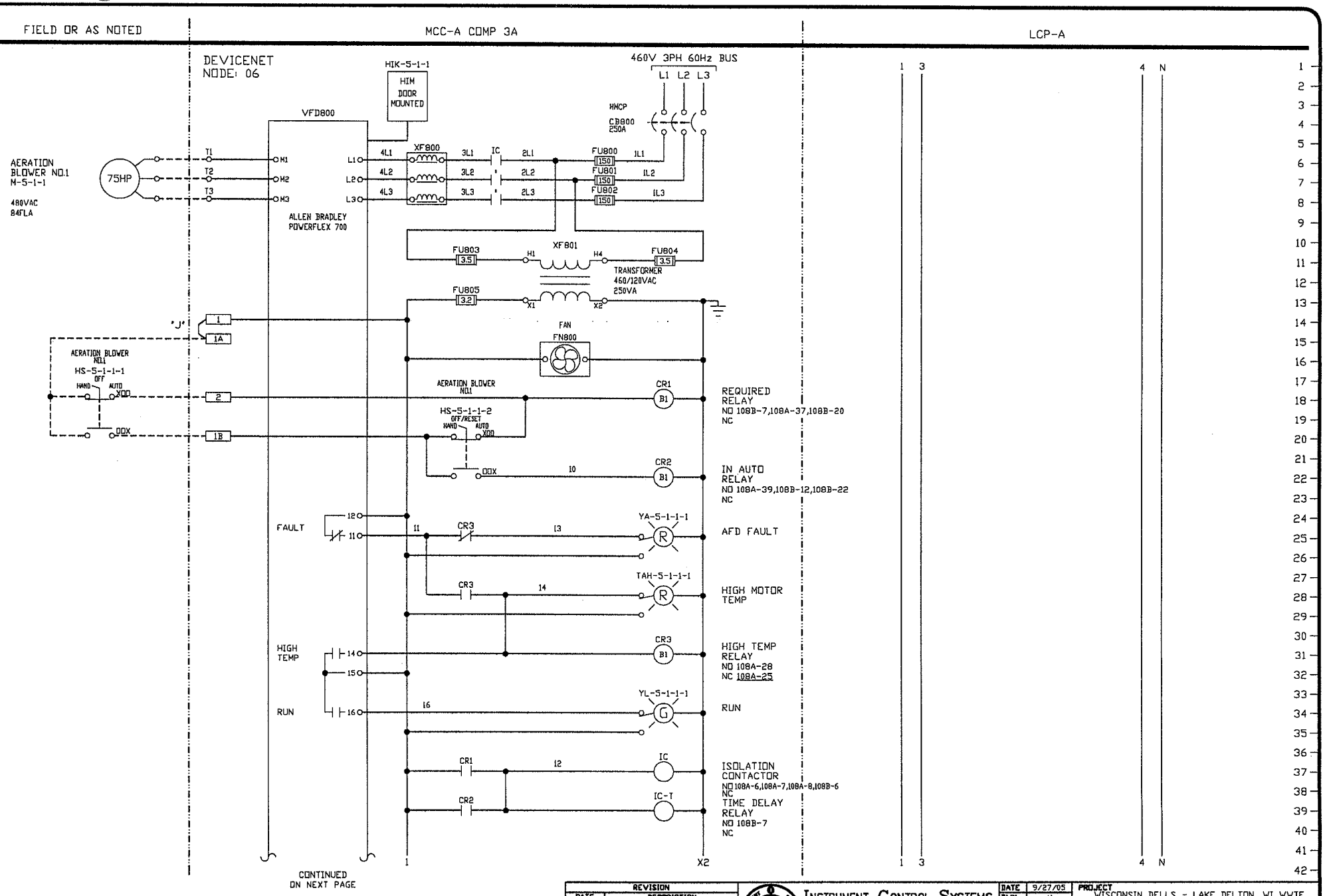
LCP-A
GRIT WASHING SYSTEM

PROJ. NO. 1520A
DWG. NO. 107

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DATE LAST EDITED: 11/16/2006

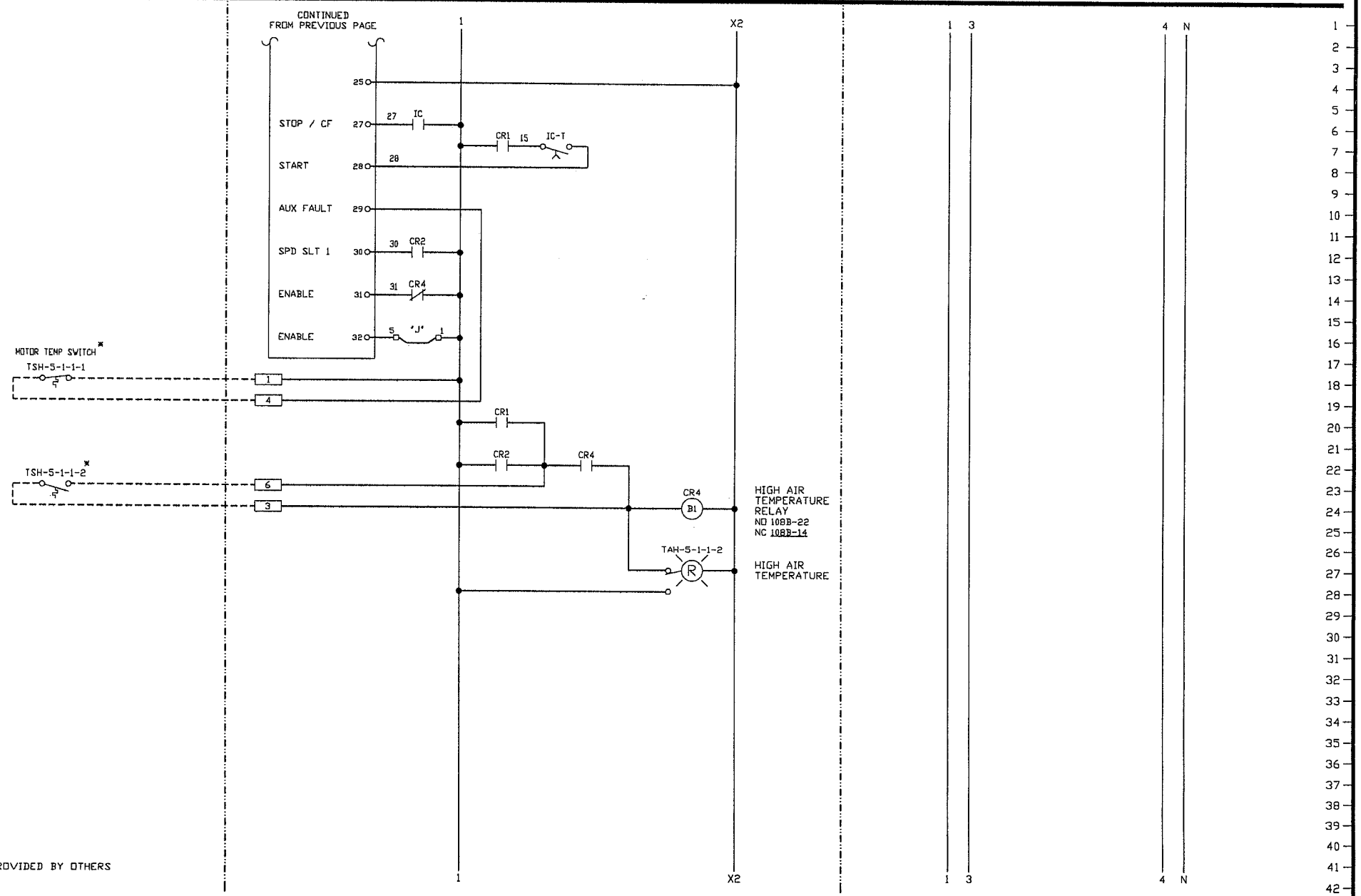
REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	19 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATION BLOWER NO.1
PROJ. NO. 1520A
DWG. NO. 108A



REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

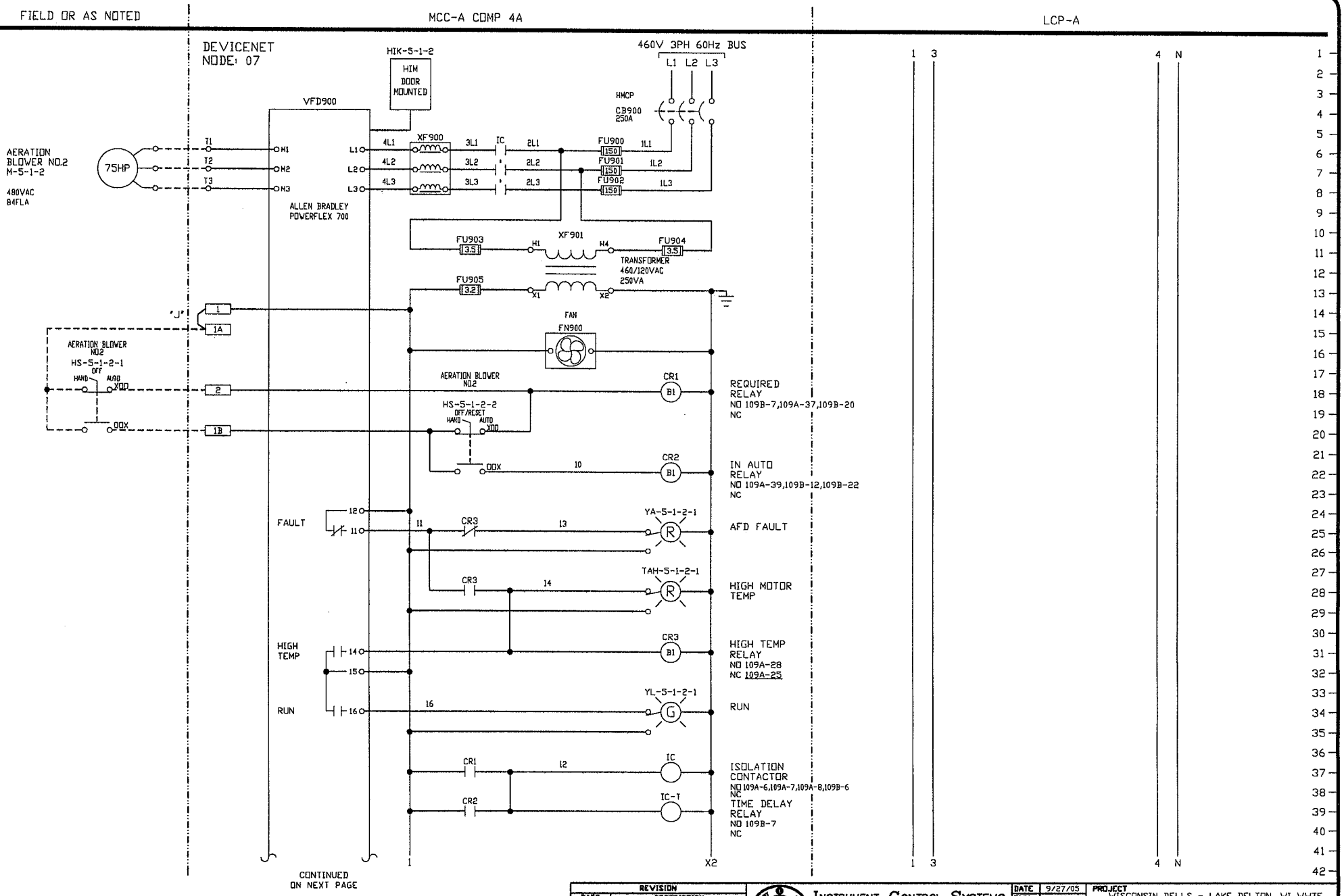
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	20 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATION BLOWER NO.1
PROJ. NO. 1520A
DWG. NO. 108B

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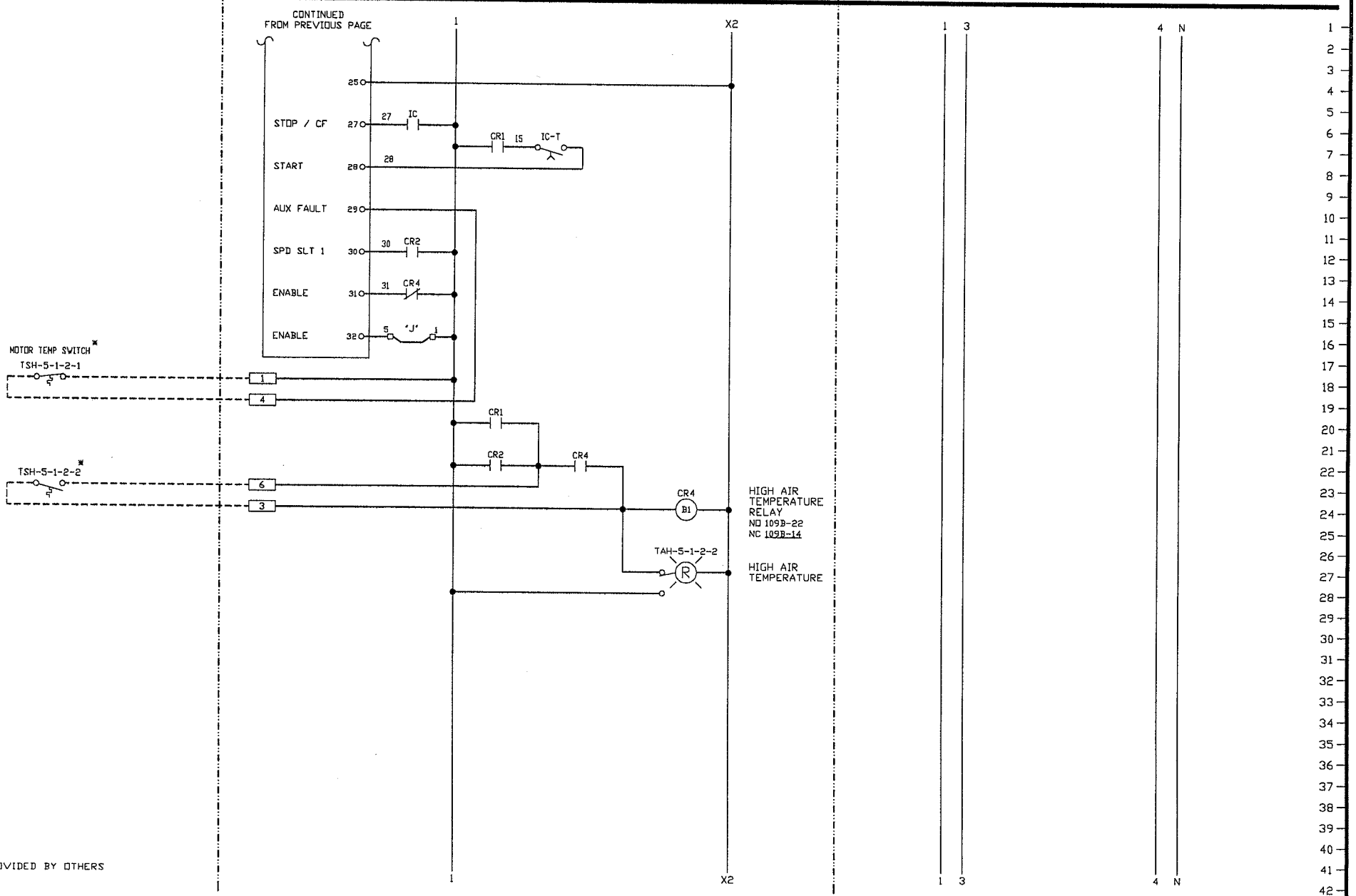
REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	21 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATION BLOWER NO.2
PROJ. NO. 1520A
DWG. NO. 109A



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

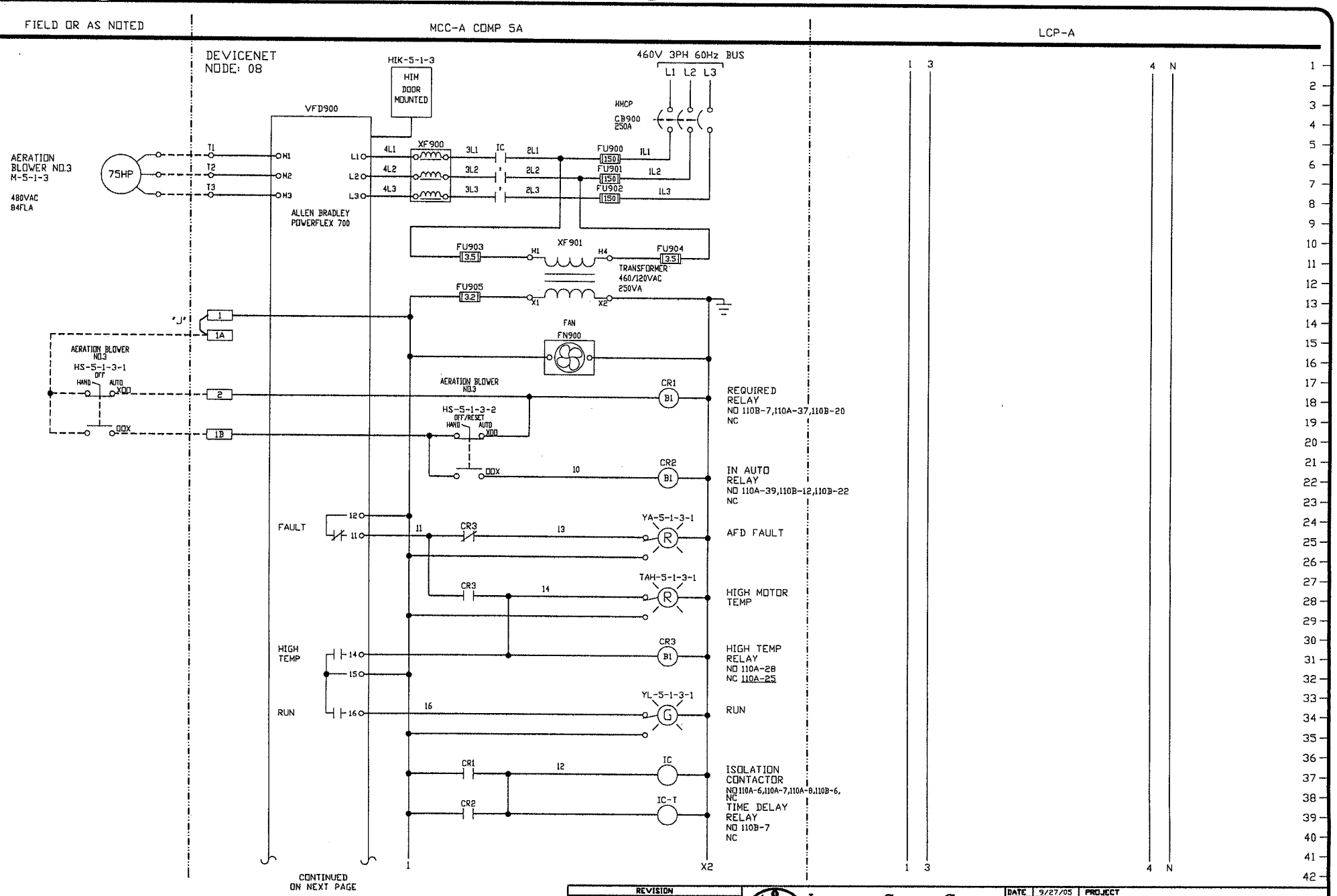
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	22 OF 60

PROJECT: WISCONSIN DELLS
LCP-A
AERATION BLOWER NO.2
PROJ. NO. 1520A
DWG. NO. 109B

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DATE LAST EDITED: 11/16/2006

REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

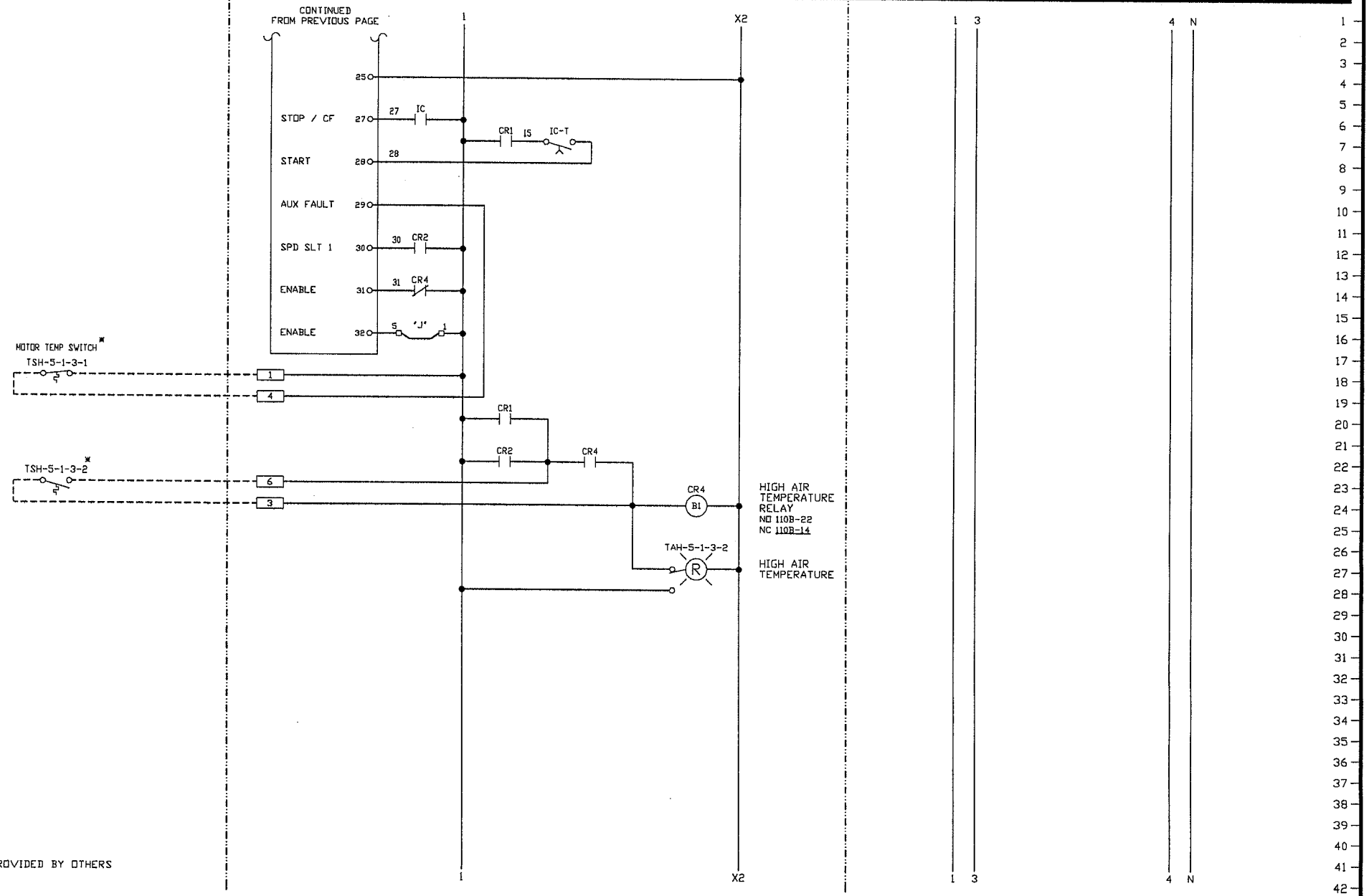
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	23 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATION BLOWER NO.3
PROJ. NO. 1520A
DWG. NO. 110A

FIELD OR AS NOTED | MCC-A COMP 5A | LCP-A



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REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

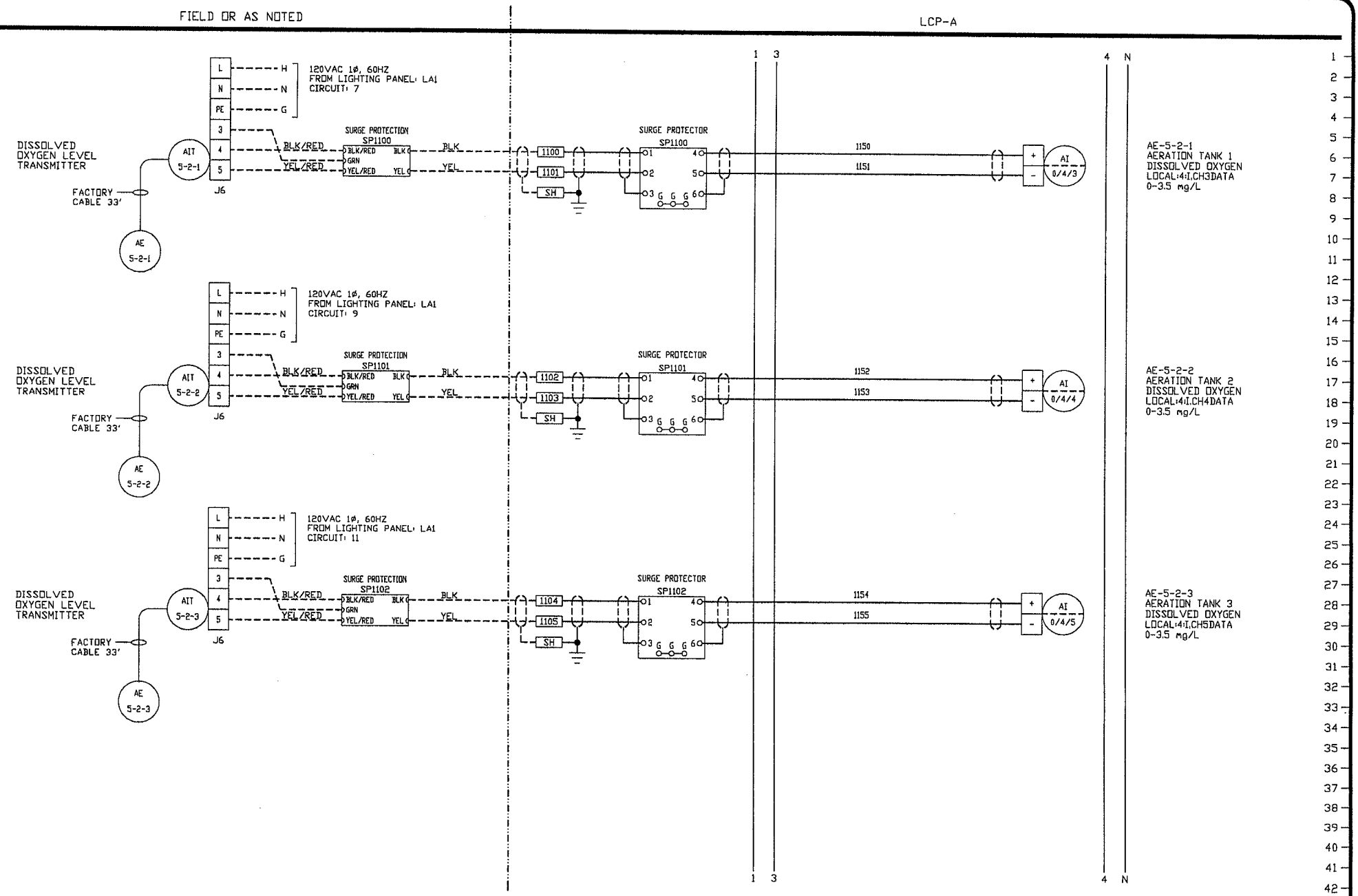
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	24 OF 60

PROJECT: WISCONSIN DELLS
LCP-A
AERATION BLOWER NO.3

PROJ. NO. 1520A
DWG. NO. 110B

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REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	25 OF 60

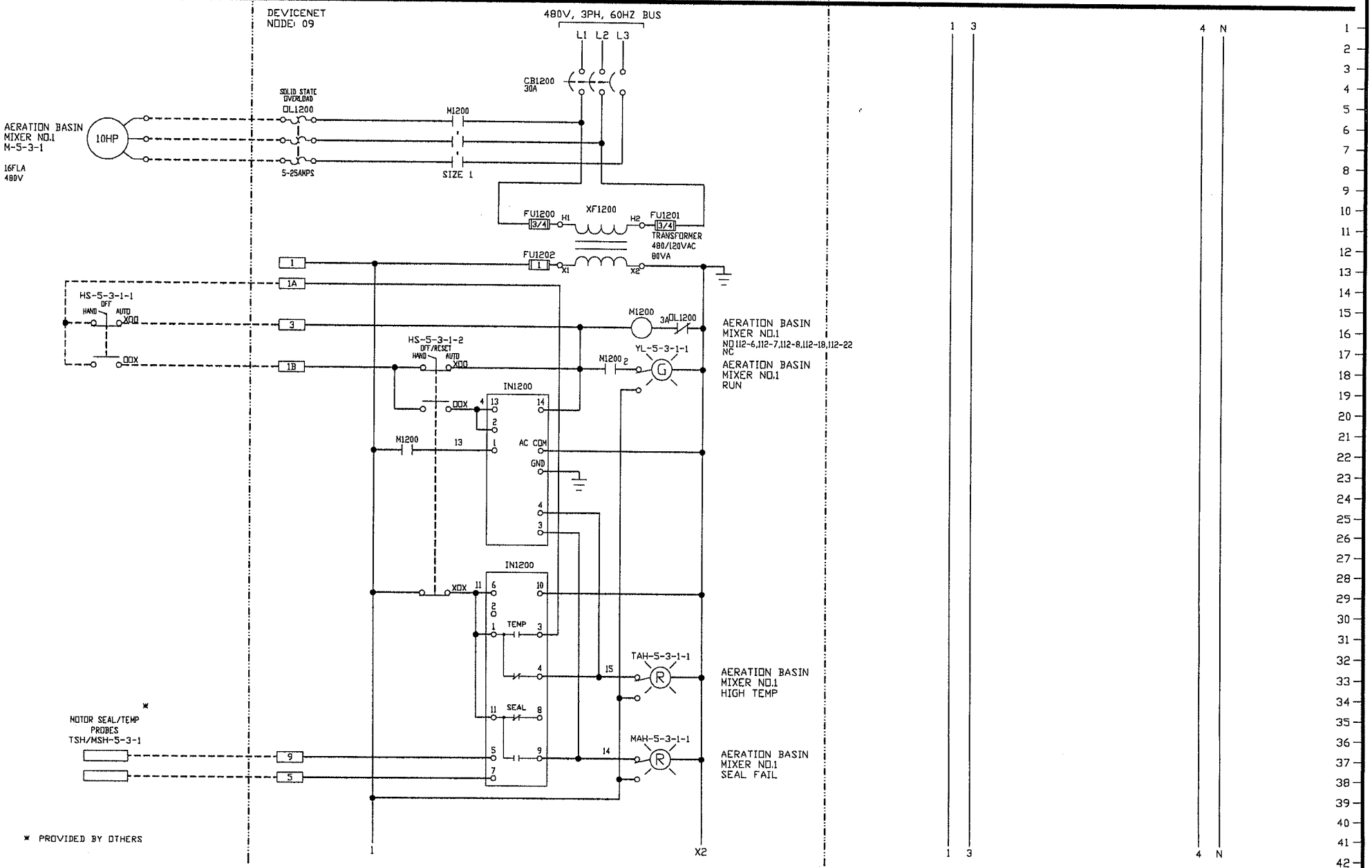
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
AERATION TANK
DISSOLVED OXYGEN

PROJ. NO. 1520A
DWG. NO. 111

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REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	26 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
AERATION BASIN MIXER NO.1

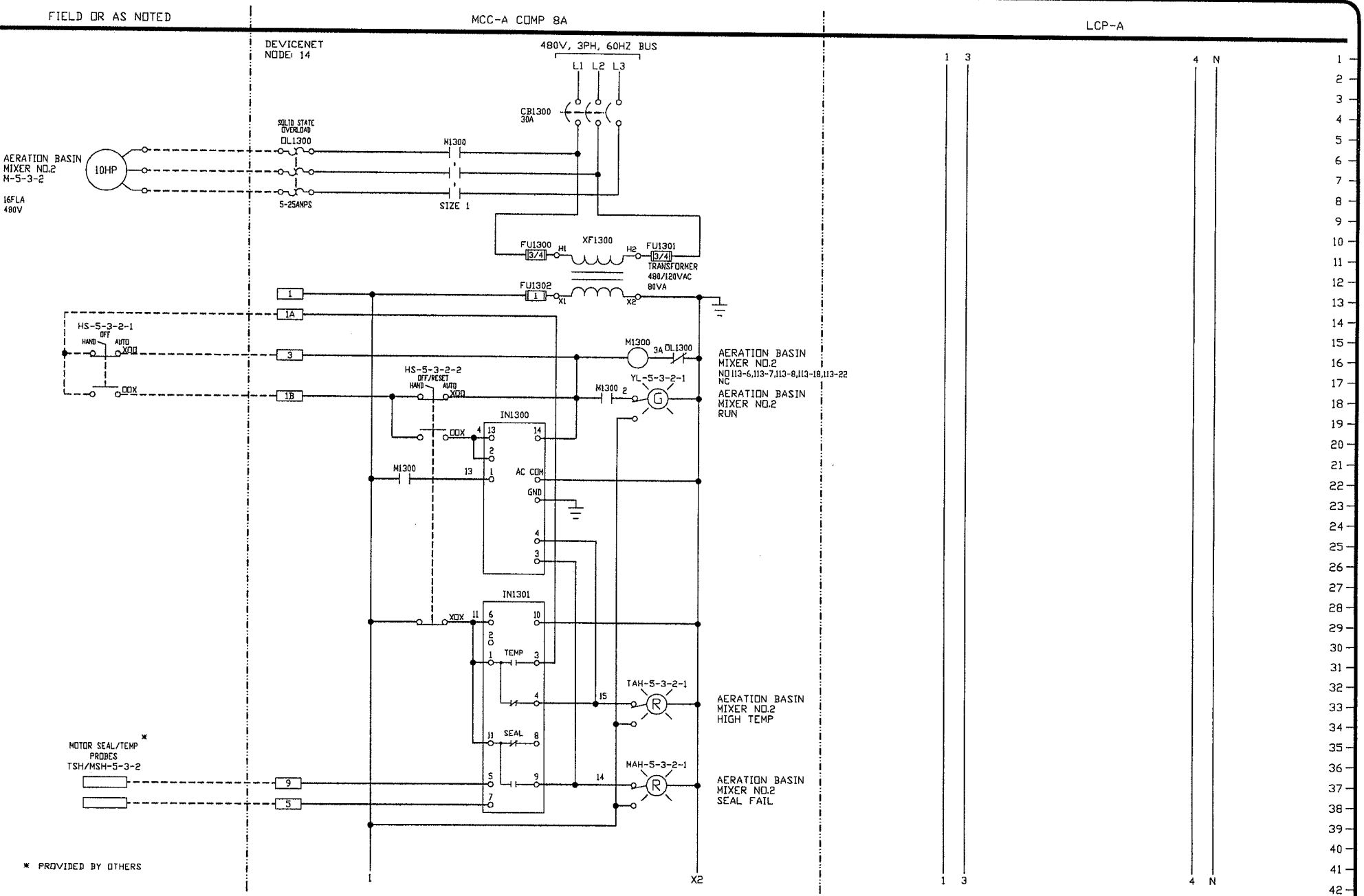
PROJ. NO. 1520A

DWG. NO. 112

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REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

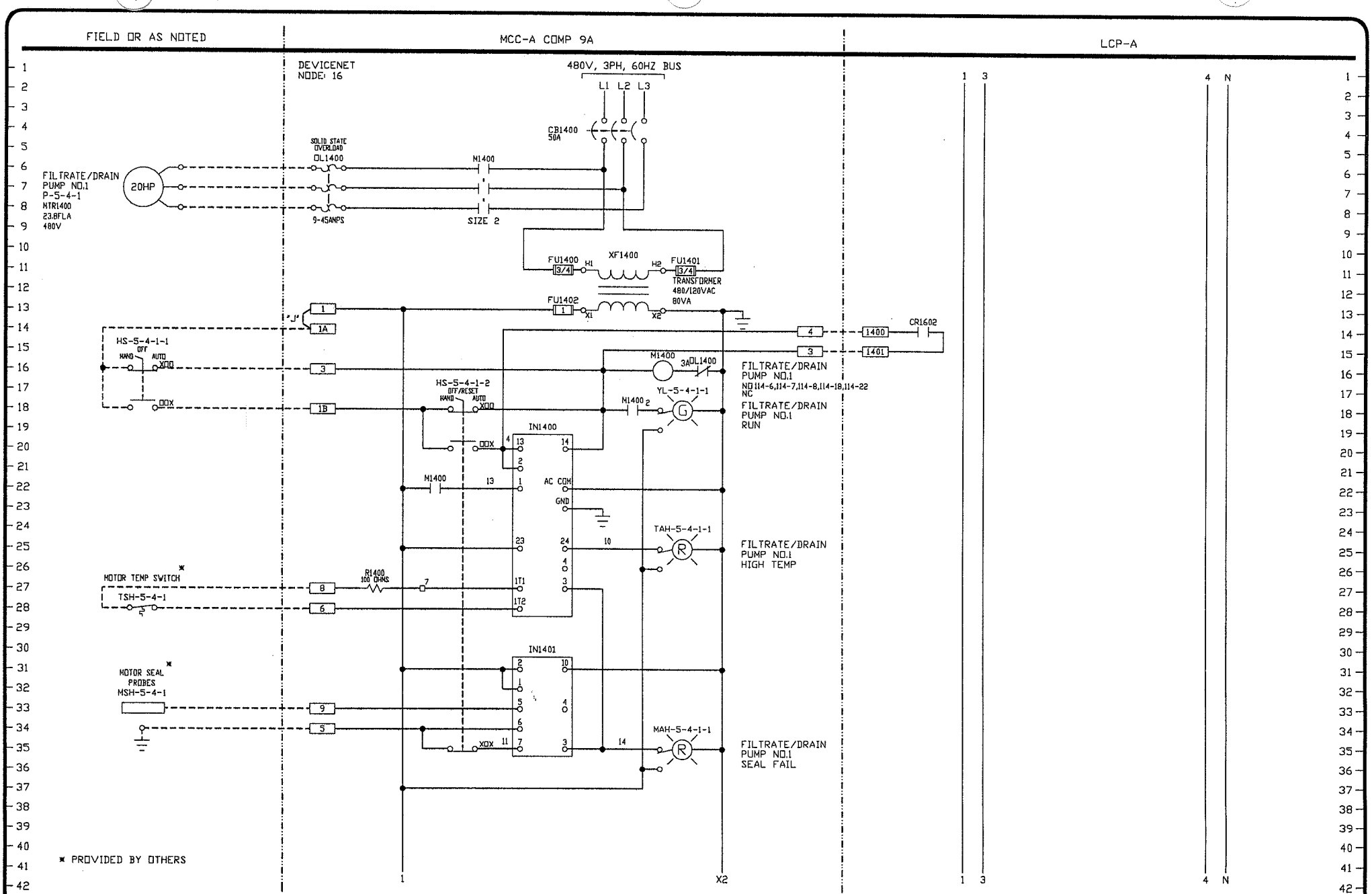
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	27 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATION BASIN MIXER NO.2
PROJ. NO. 1520A
DWG. NO. 113

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DATE LAST EDITED: 11/16/2006



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

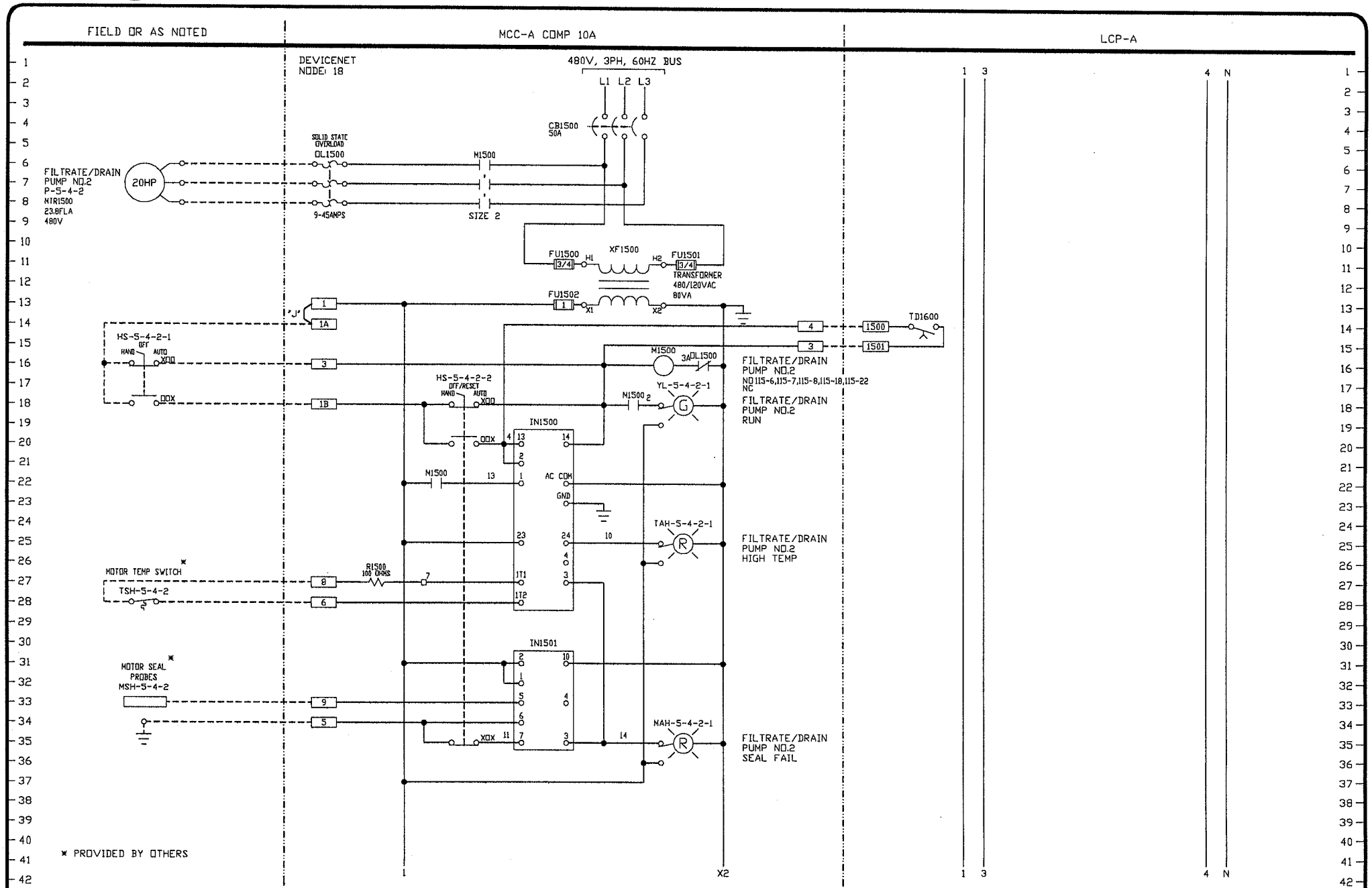
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	28 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
FILTRATE/DRAIN PUMP NO.1
PROJ. NO. 1520A
DWG. NO. 114

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DATE LAST EDITED: 11/16/2006



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

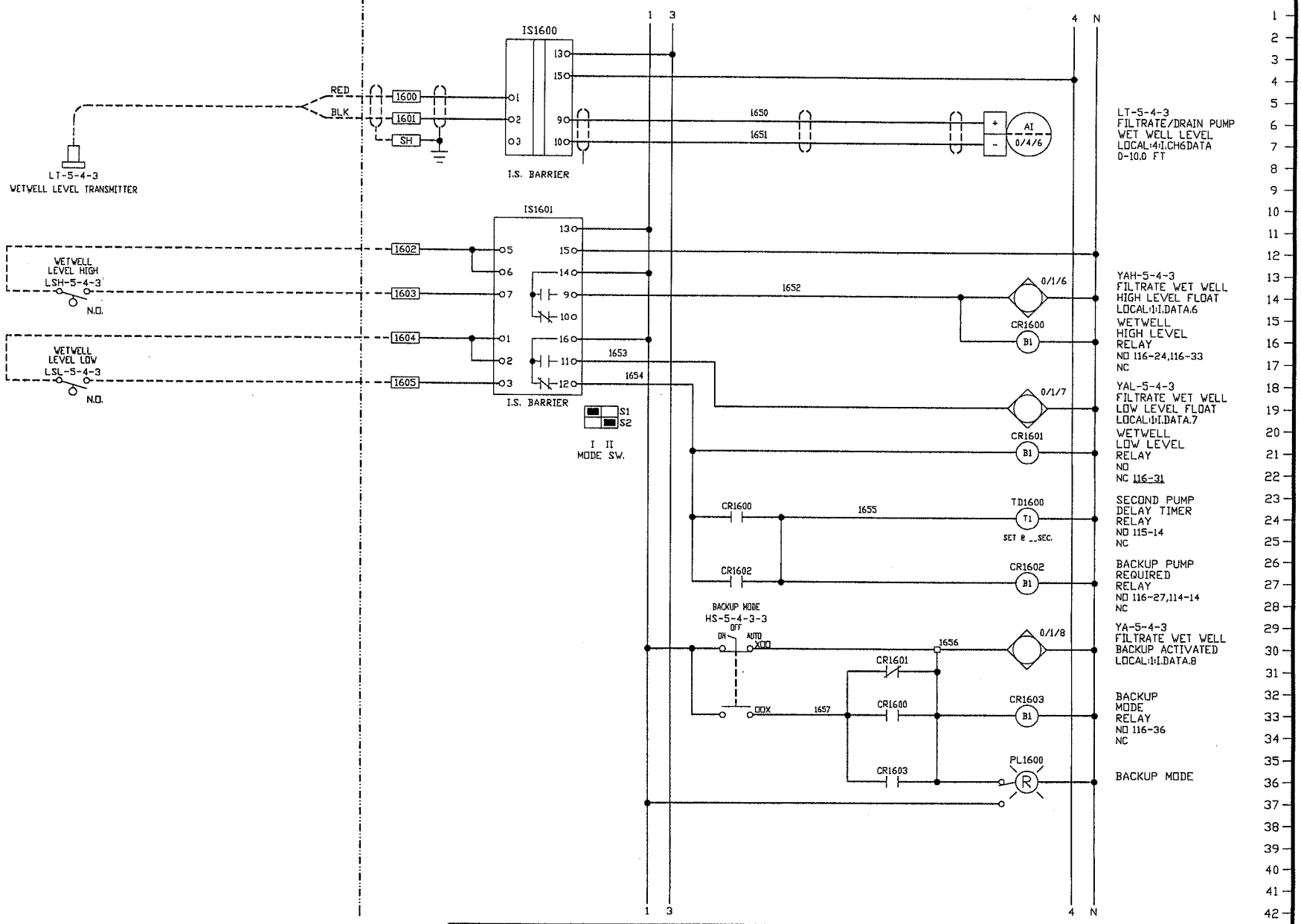
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	29 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
FILTRATE/DRAIN PUMP NO.2
PROJ. NO. 1520A
DWG. NO. 115

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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

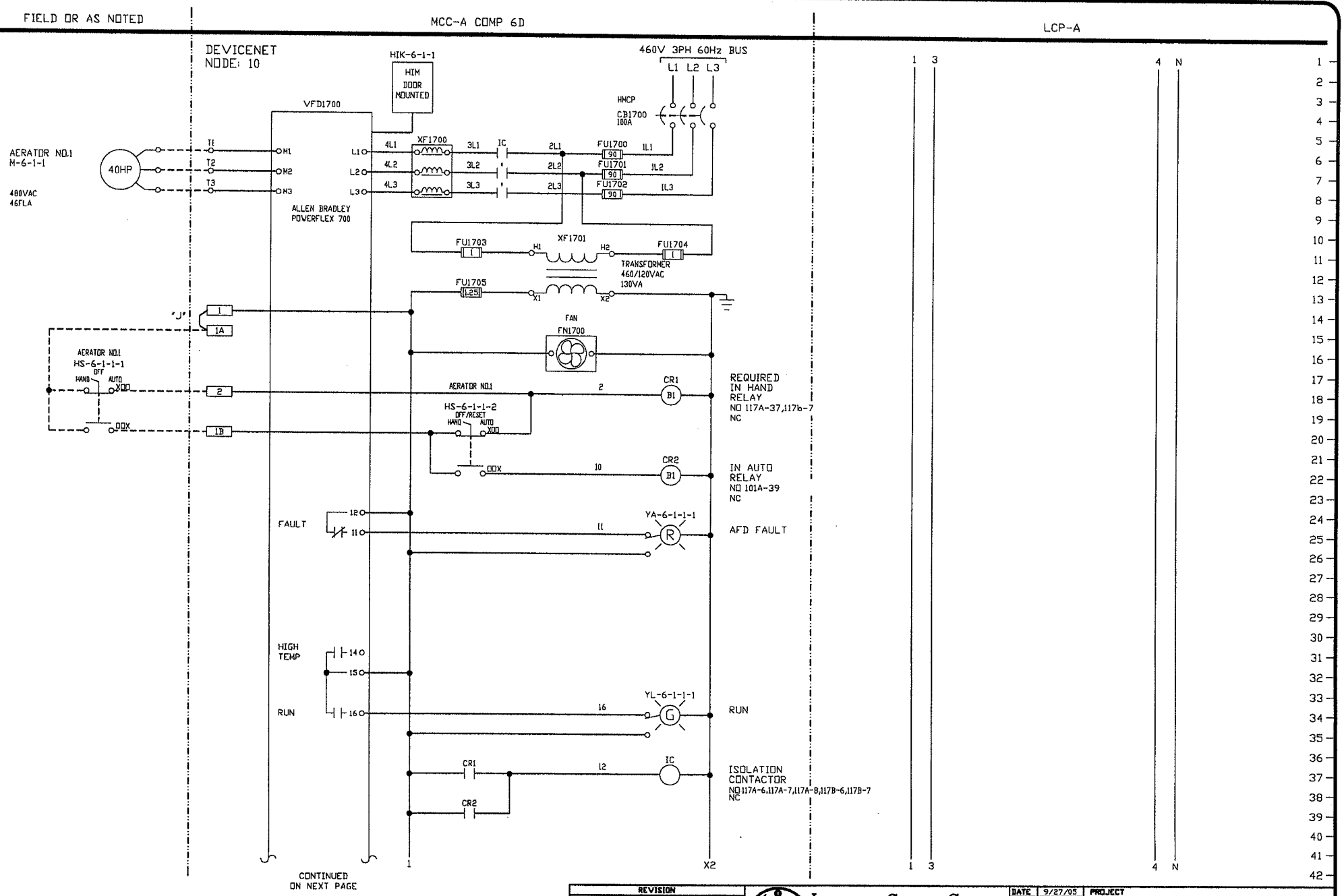
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	30 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
FILTRATE / DRAIN PUMP
STATION CONTROL
PROJ. NO. 1520A
DWG. NO. 116

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13005 16th Ave. North
Plymouth, Minnesota 55441

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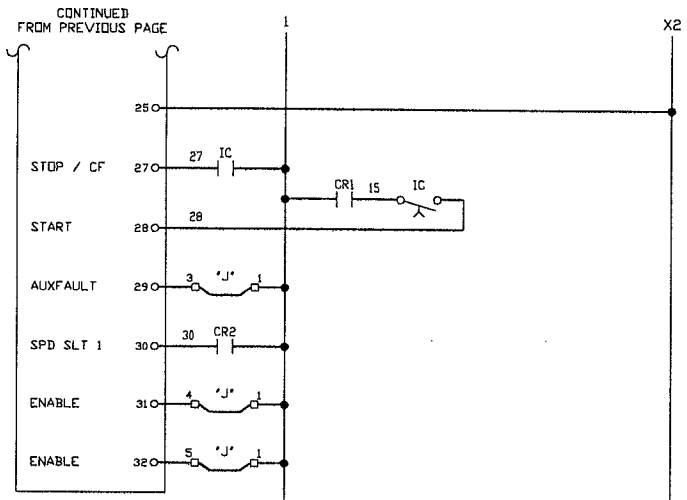
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CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	31 OF 60

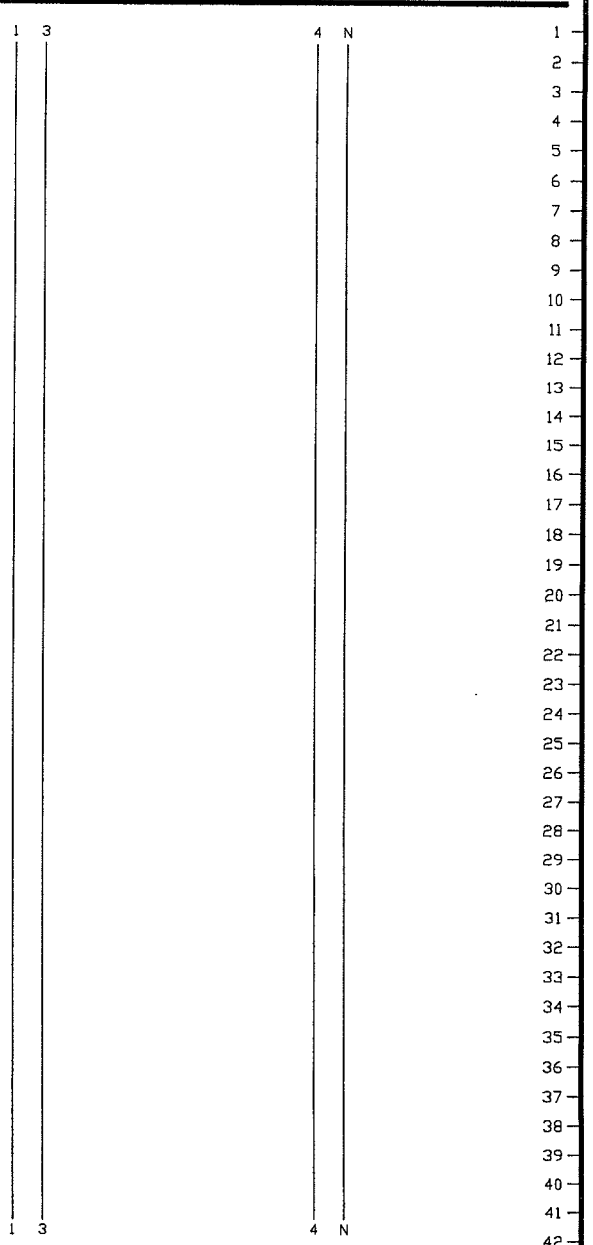
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO.1
PROJ. NO. 1520A
DWG. NO. 117A

FIELD OR AS NOTED

MCC-A COMP 6D

LCP-A





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DATE	DESCRIPTION
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

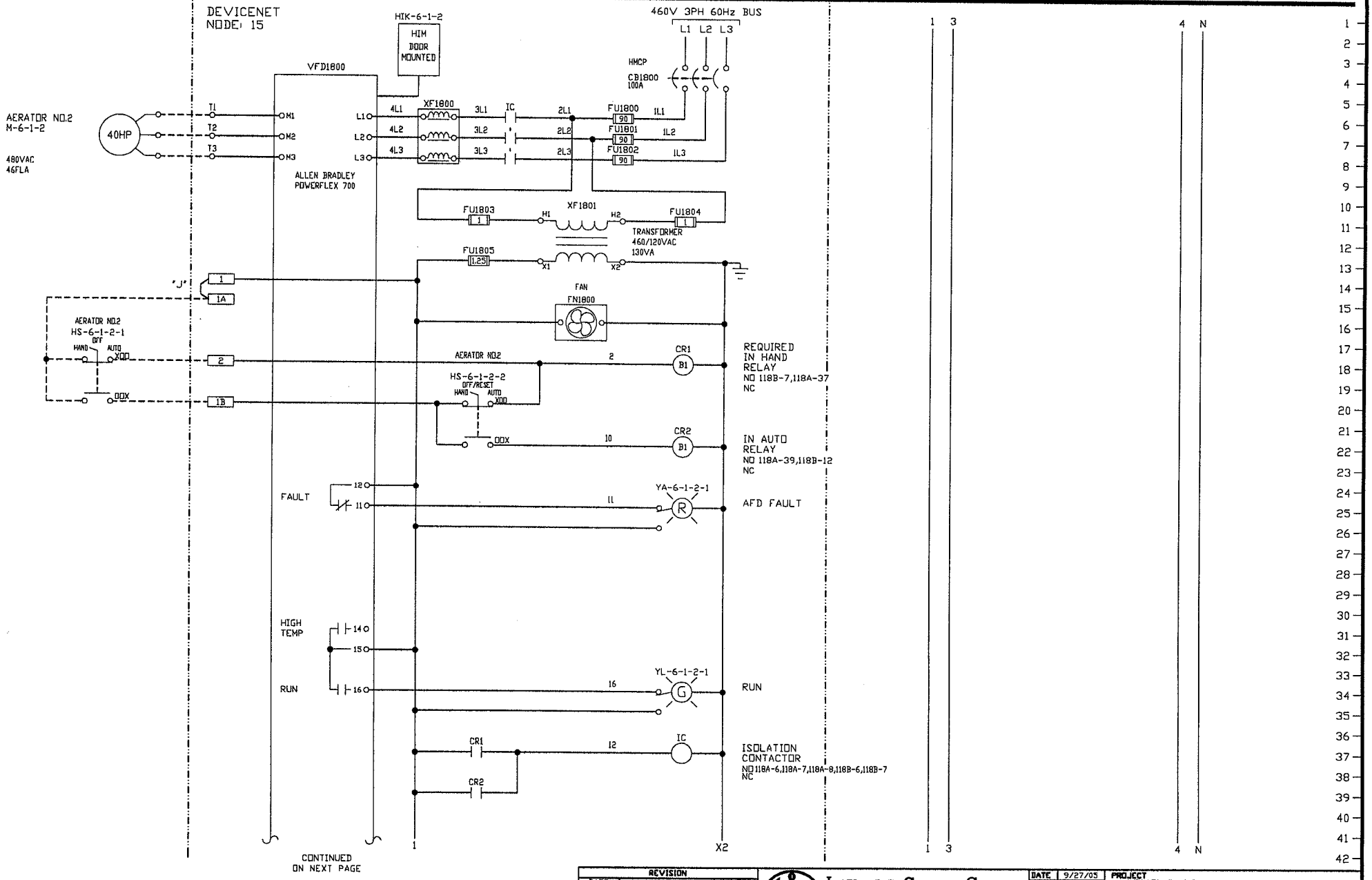
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	32 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO.1
PROJ. NO. 1520A
DWG. NO. 117B

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	33 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
AERATOR NO.2

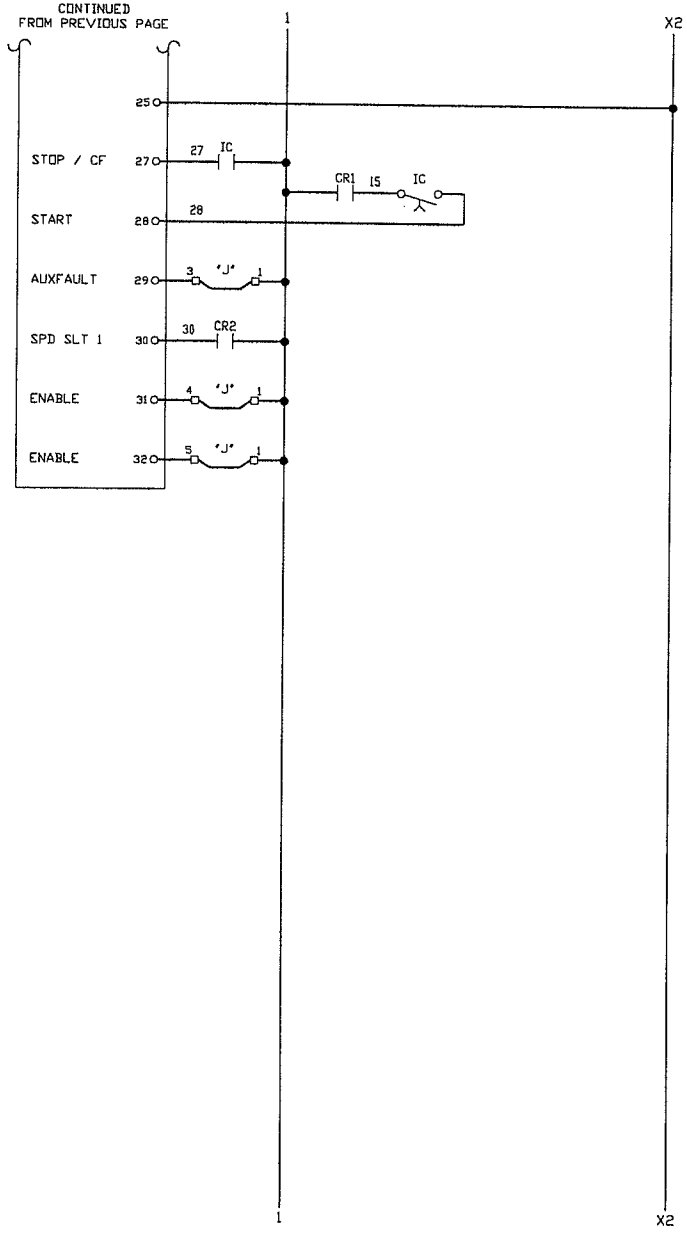
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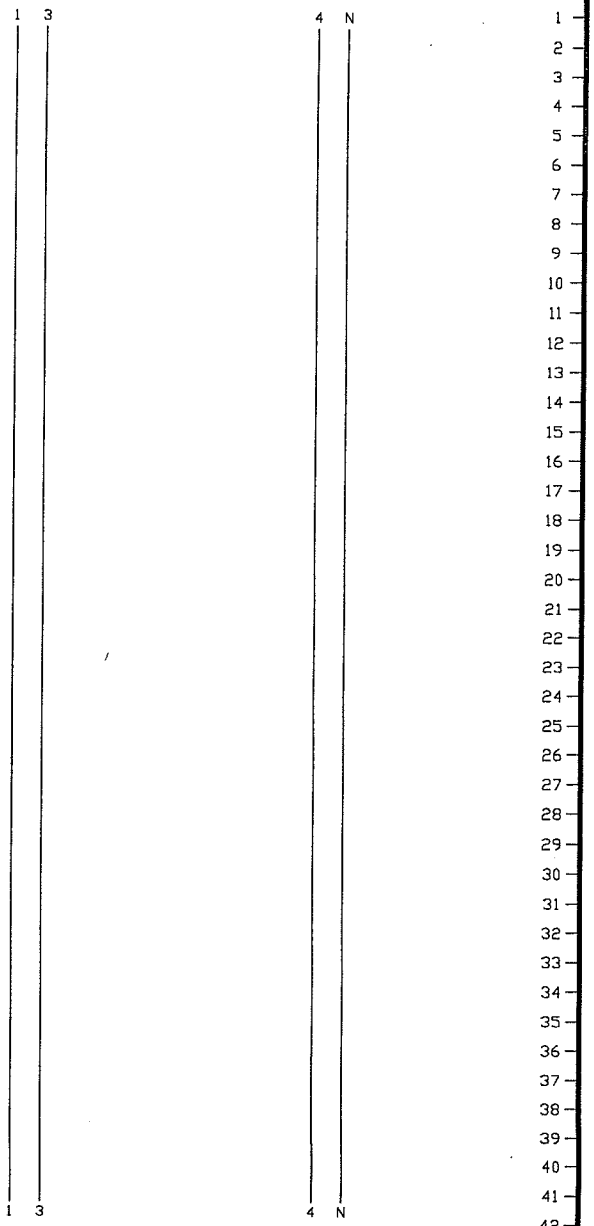
DWG. NO. 118A

FIELD OR AS NOTED

MCC-A COMP 8D

LCP-A





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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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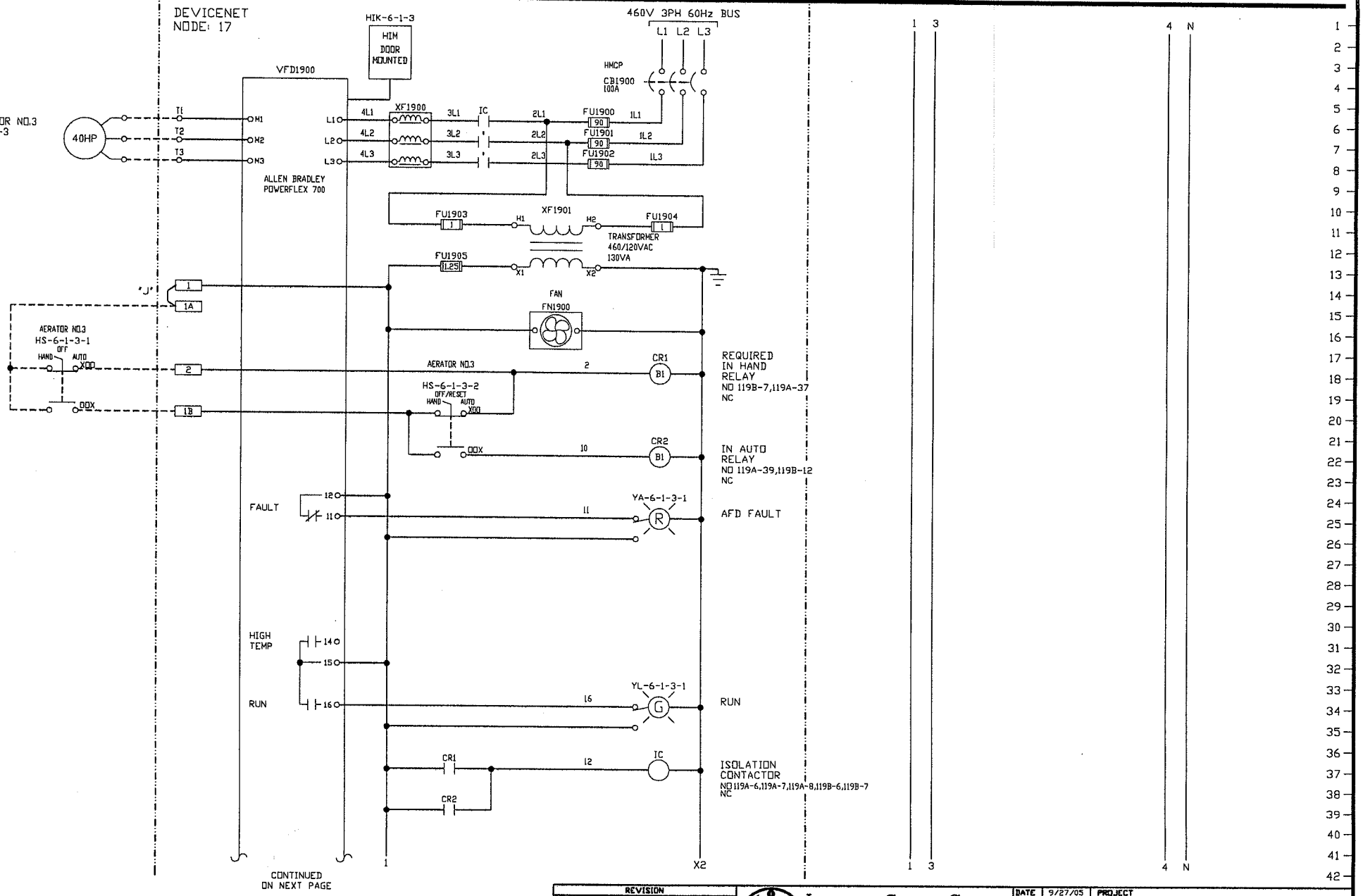
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	34 OF 60

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
AERATOR NO.2

PROJ. NO. 1520A

DWG. NO. 118B



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DATE	DESCRIPTION
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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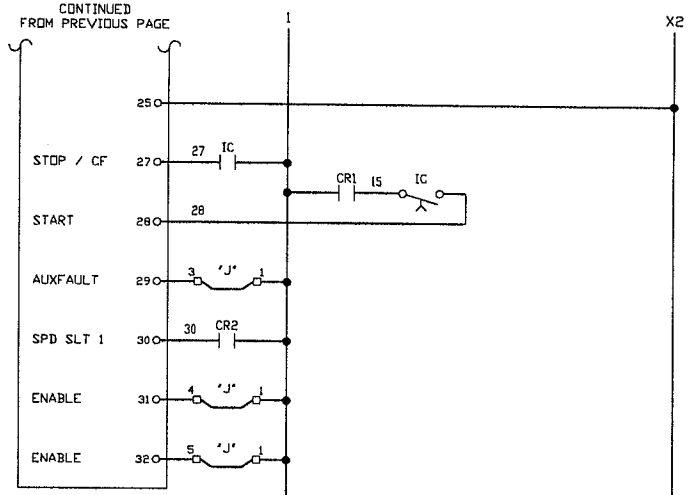
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CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	35 OF 60

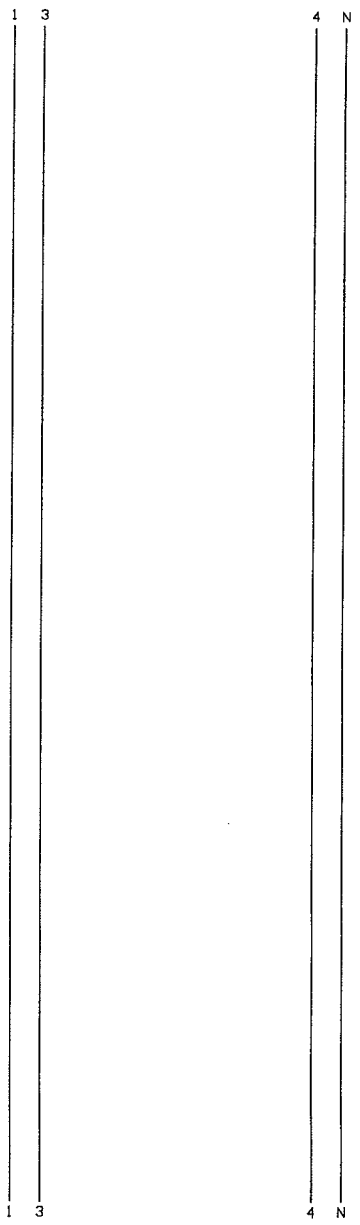
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO.3
PROJ. NO. 1520A
DWG. NO. 119A

FIELD OR AS NOTED

MCC-A COMP 9D

LCP-A





REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	36 OF 60

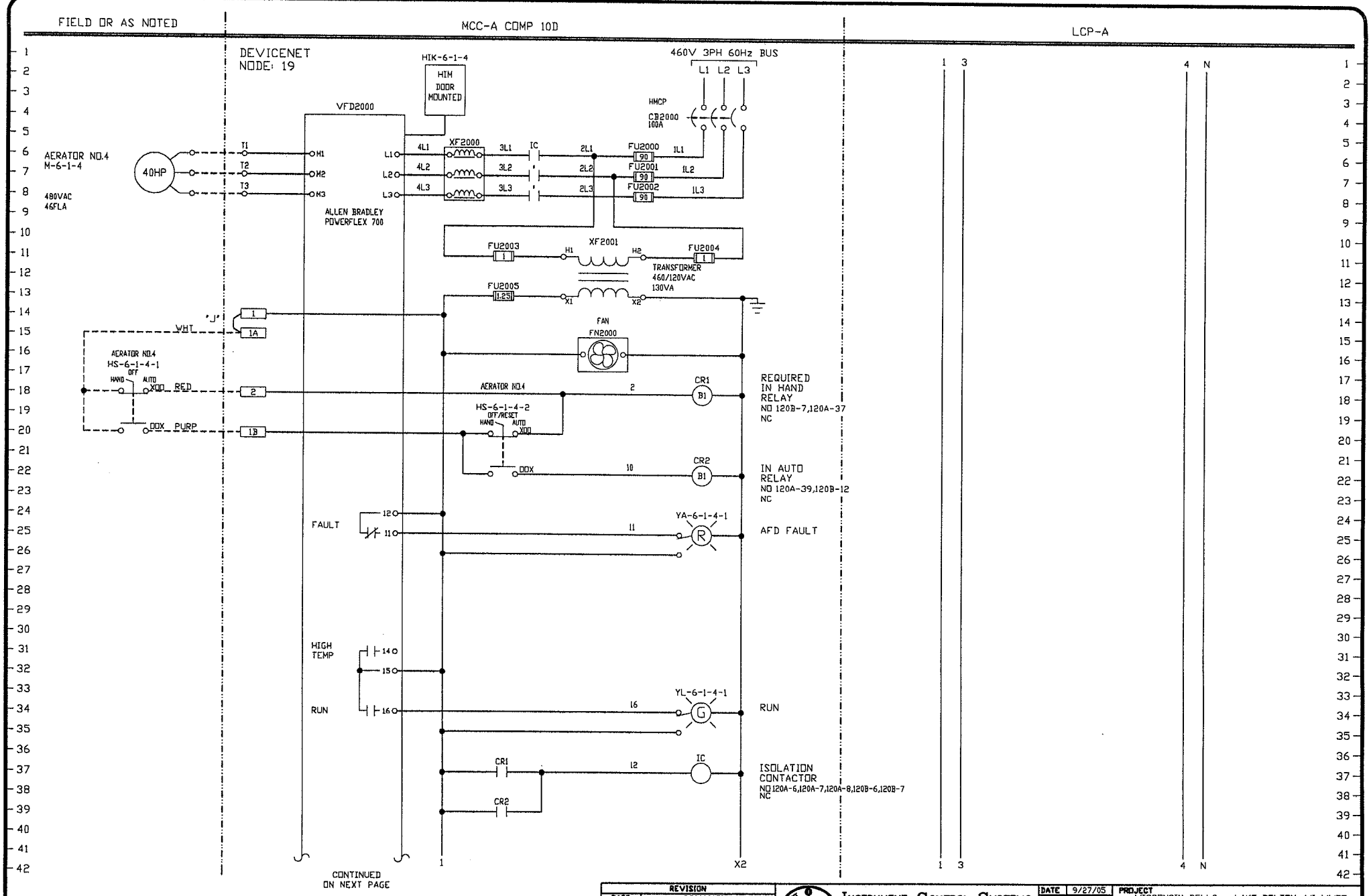
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO.3

PROJ. NO. 1520A
DWG. NO. 119B

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13005 16th Ave. North
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	37 OF 60

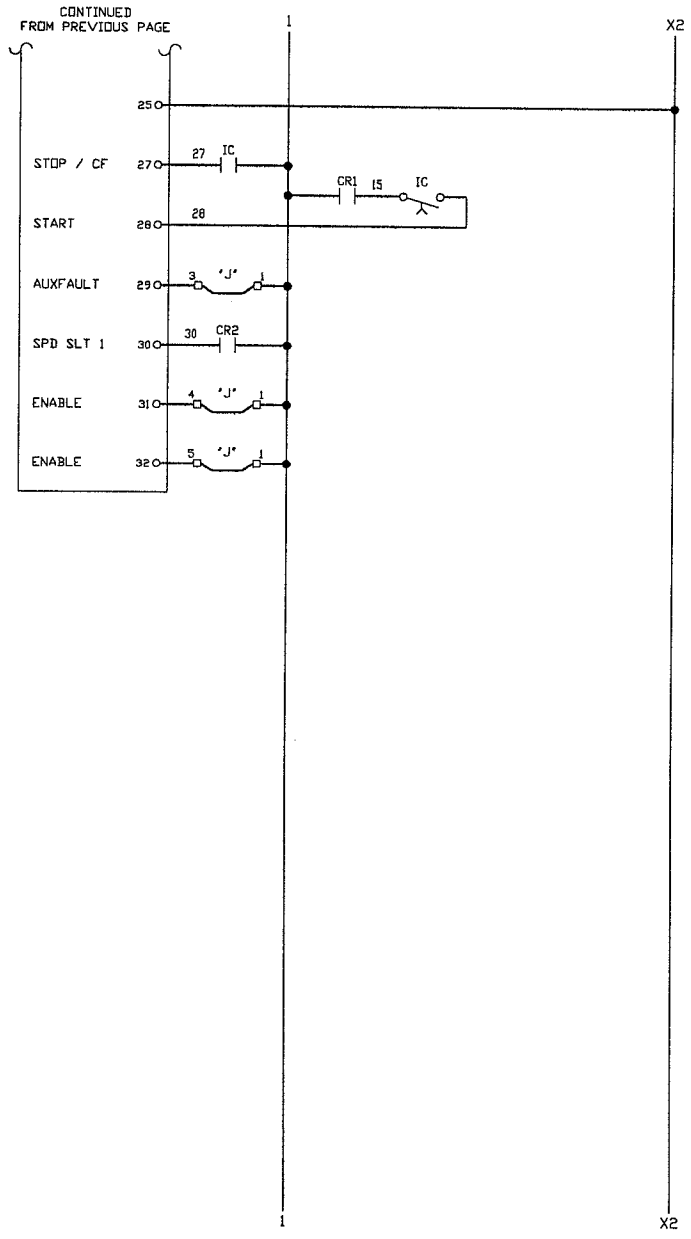
PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO.4

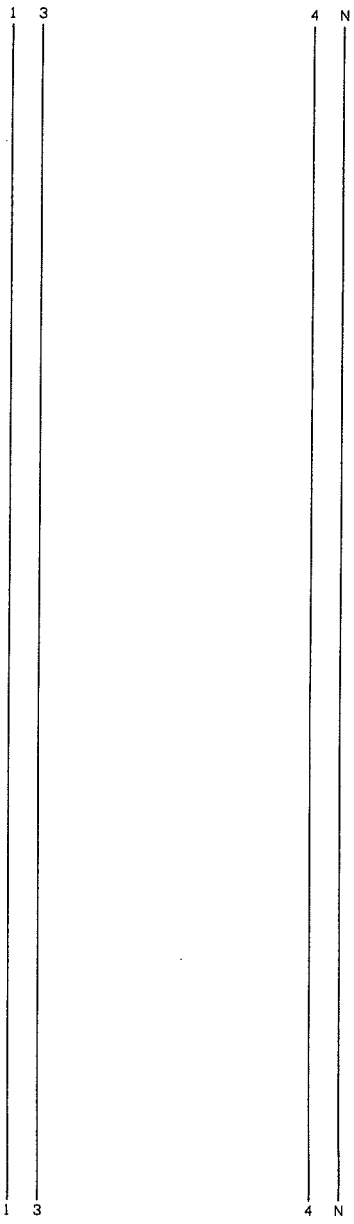
PROJ. NO.	DWG. NO.
1520A	120A

FIELD OR AS NOTED

MCC-A COMP 10D

LCP-A





REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

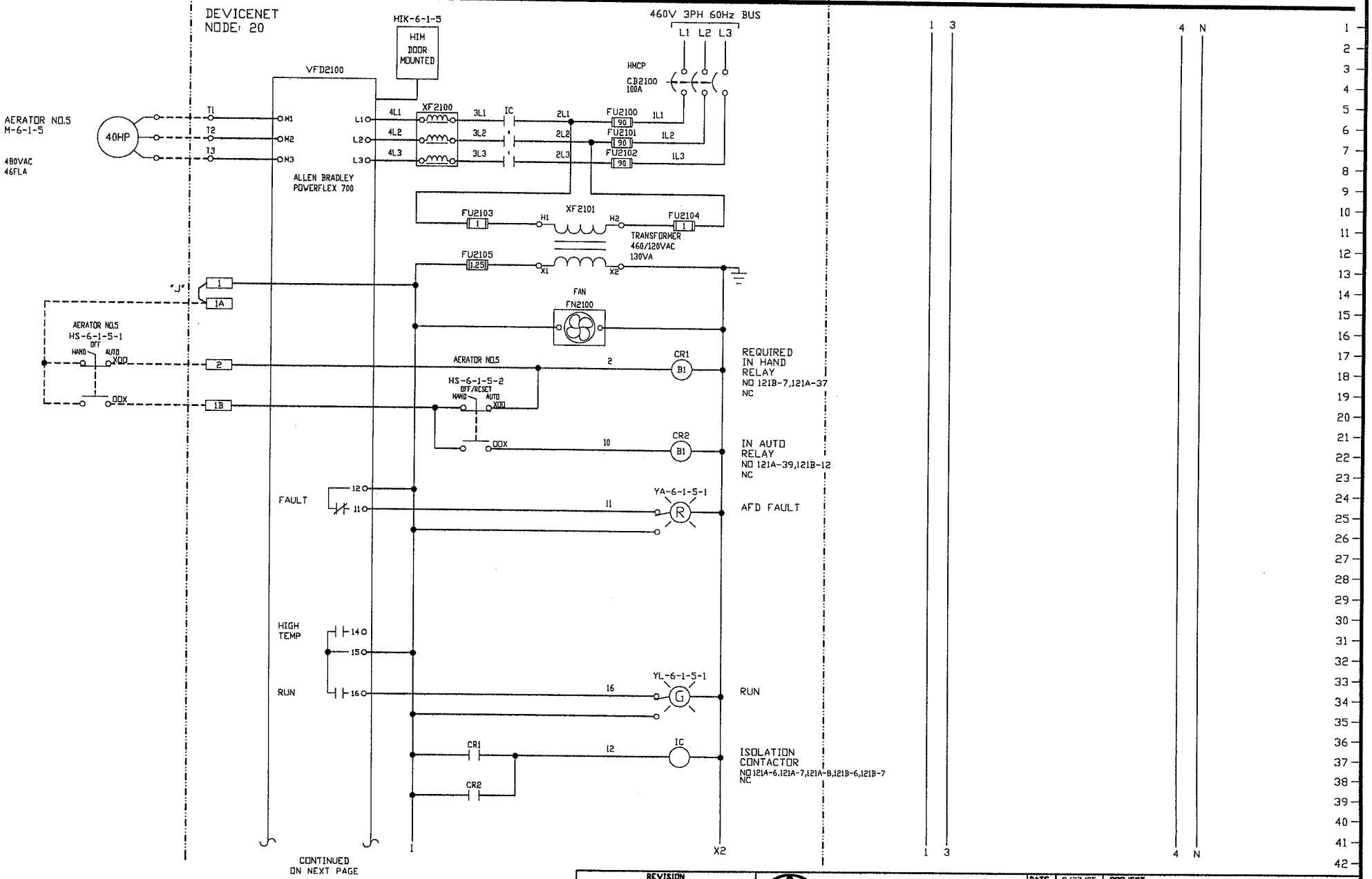
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	38 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO.4
PROJ. NO. 1520A
DWG. NO. 120B

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	39 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
AERATOR NO.5

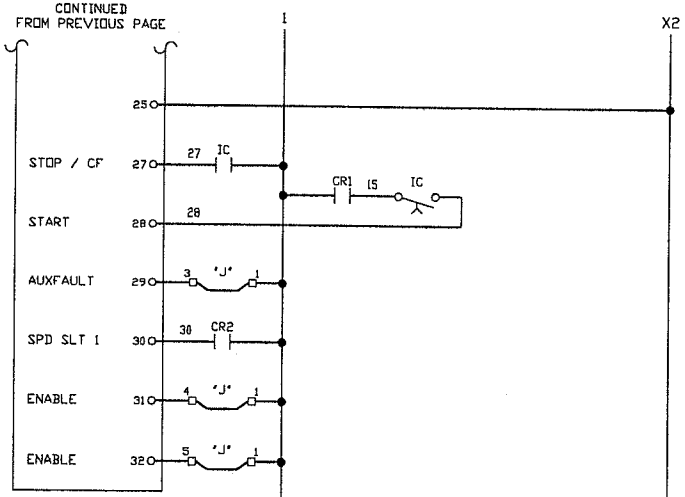
PROJ. NO. 1520A

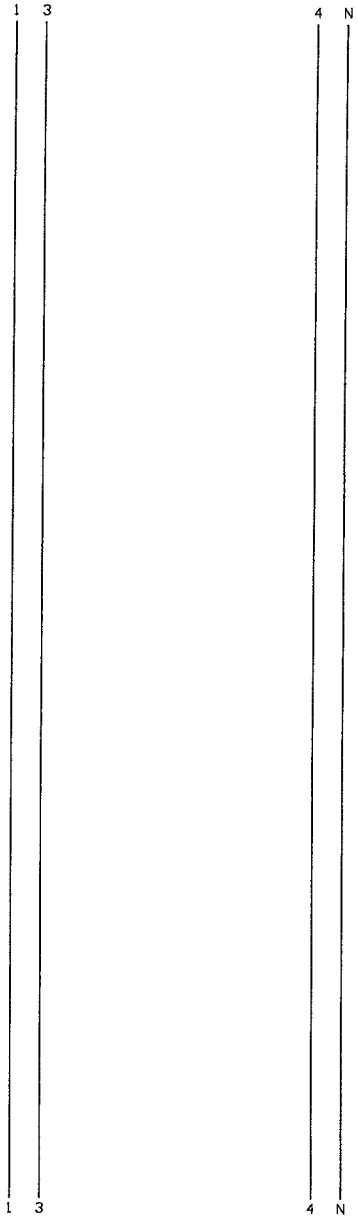
DWG. NO. 121A

FIELD OR AS NOTED

MCC-A COMP 11D

LCP-A





REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	40 OF 60

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

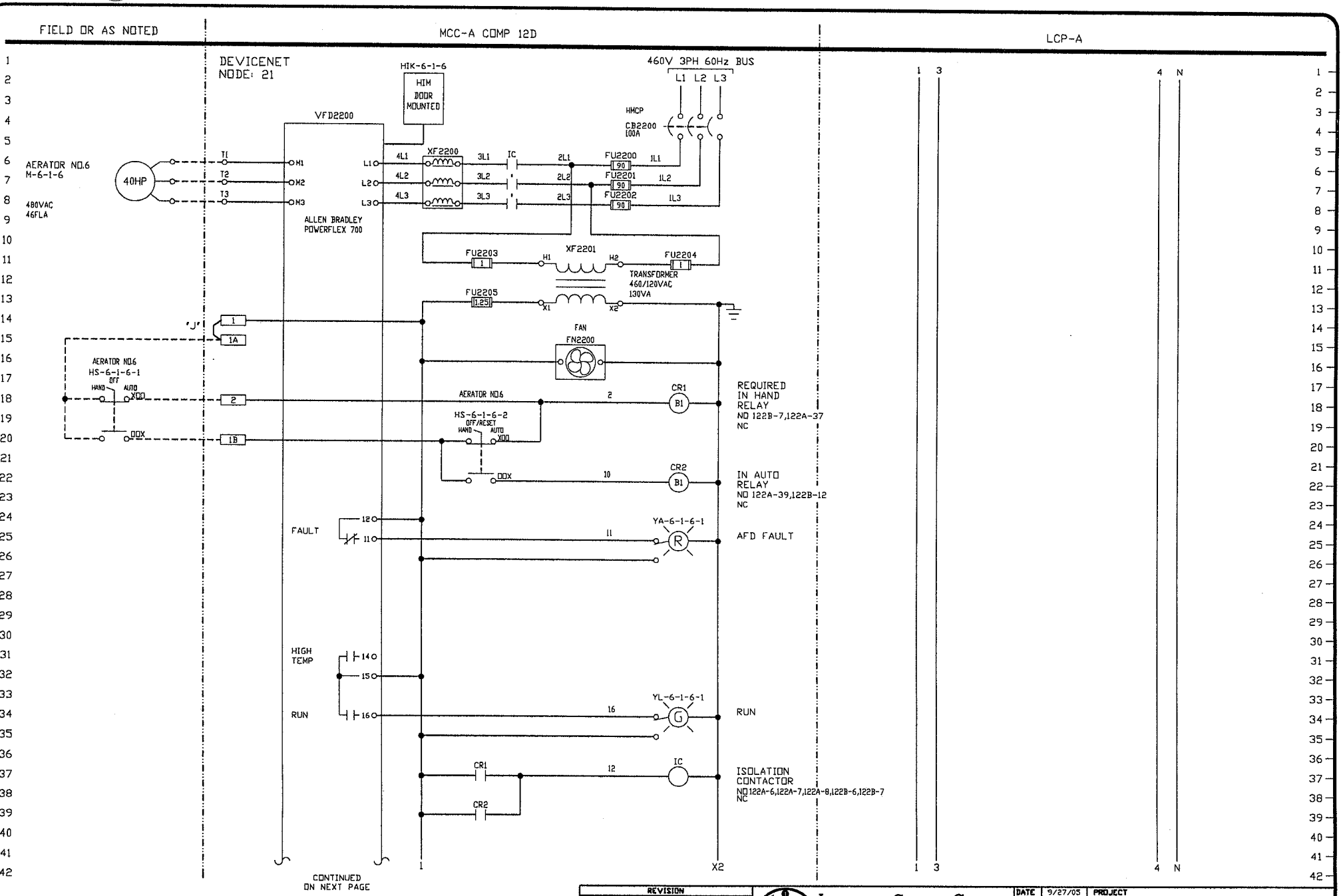
LCP-A
AERATOR NO.5

PROJ. NO. 1520A
DWG. NO. 121B

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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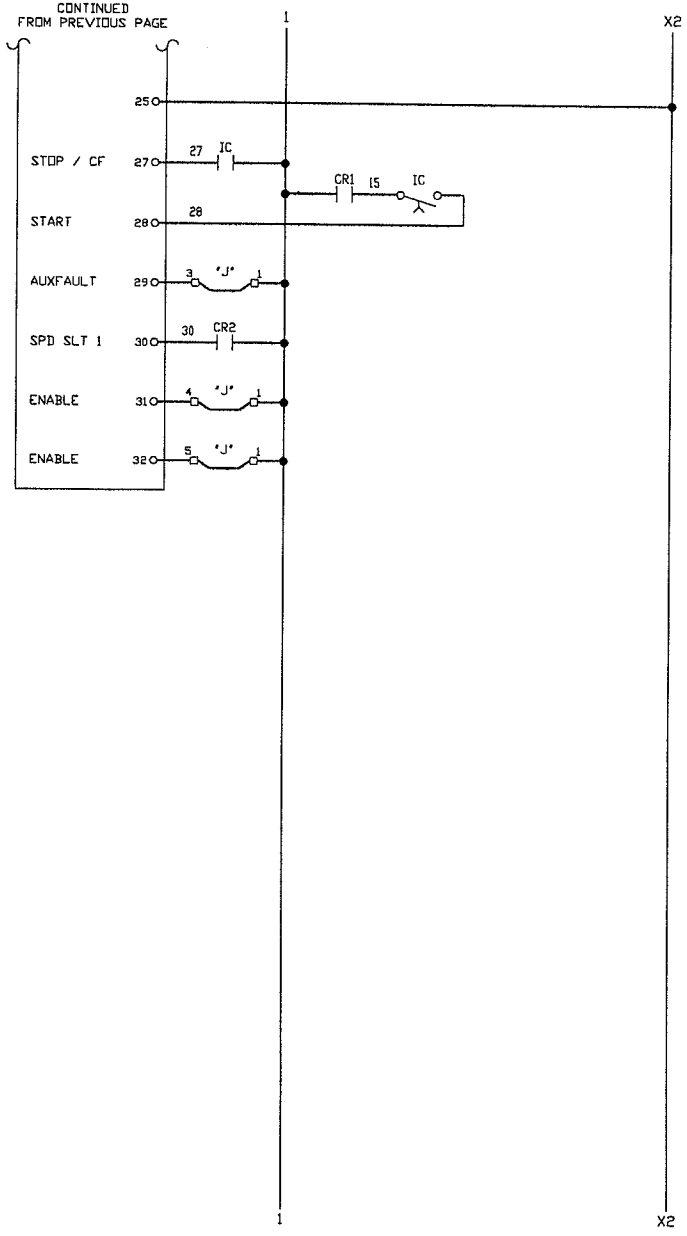
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DWN	JA
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ASSEM.	
SHEET	41 OF 60

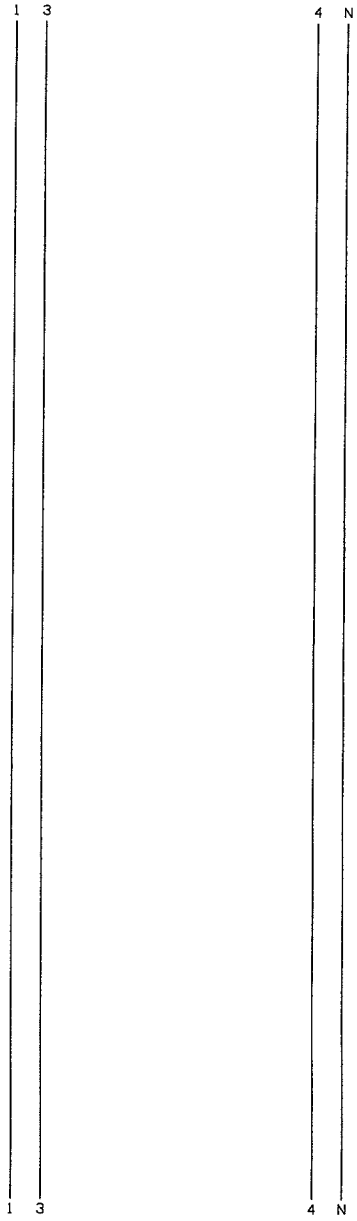
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO.6
PROJ. NO. 1520A
DWG. NO. 122A

FIELD OR AS NOTED

MCC-A COMP 12D

LCP-A





REVISION	
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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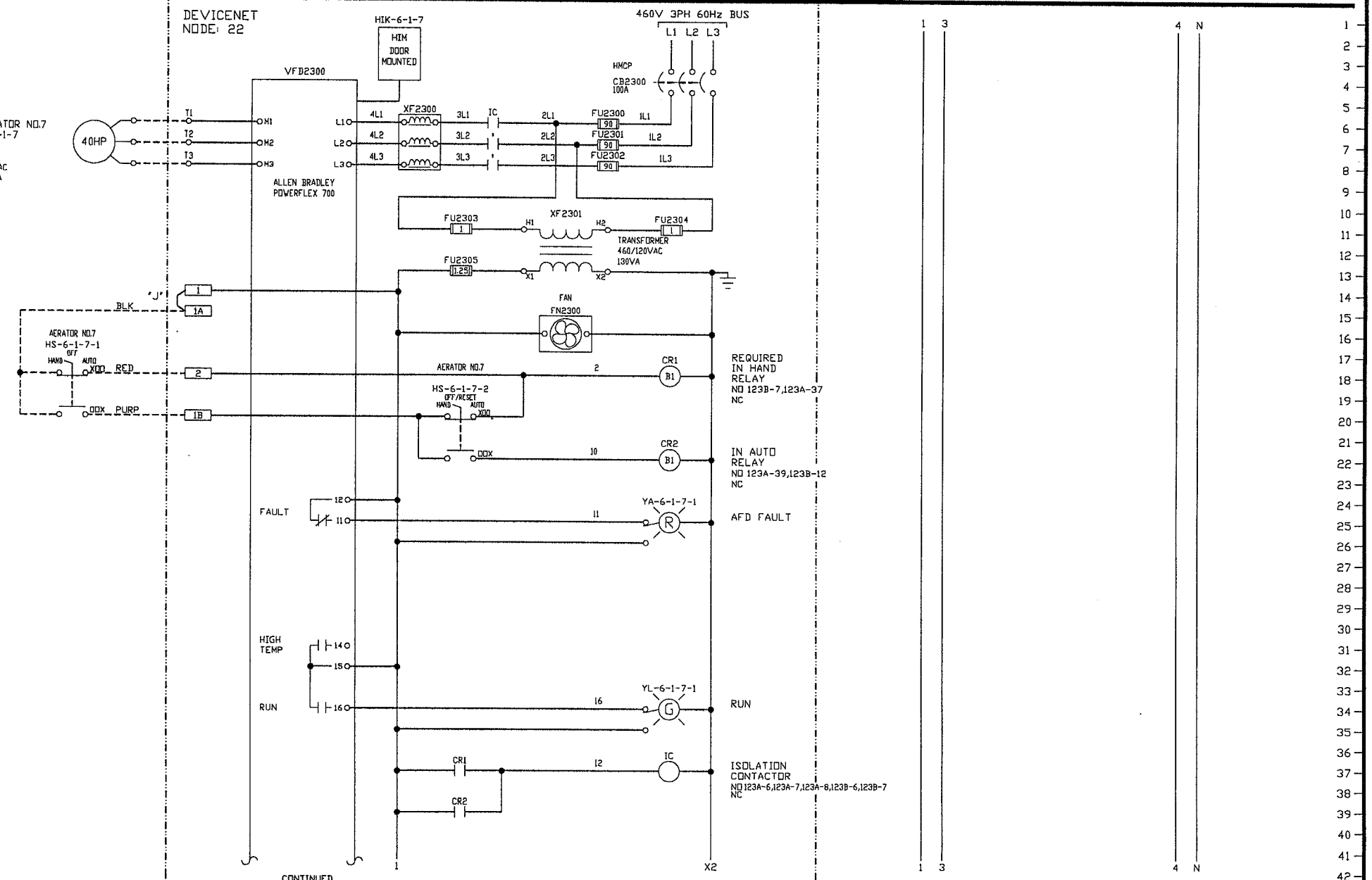
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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	42 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO. 6
PROJ. NO. 1520A
DWG. NO. 122B

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13005 16th Ave. North
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	43 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
AERATOR NO.7

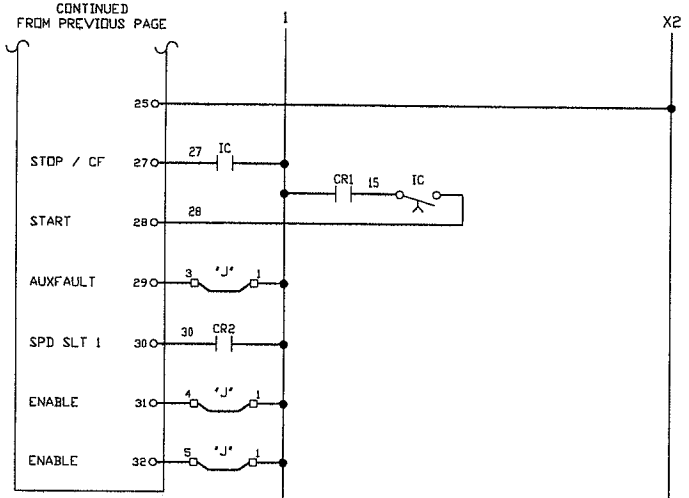
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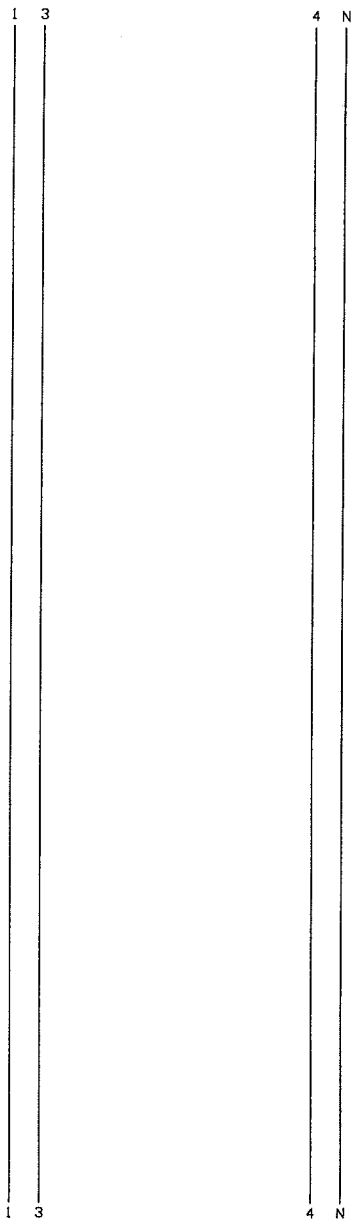
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FIELD OR AS NOTED

MCC-A COMP 13D

LCP-A





REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

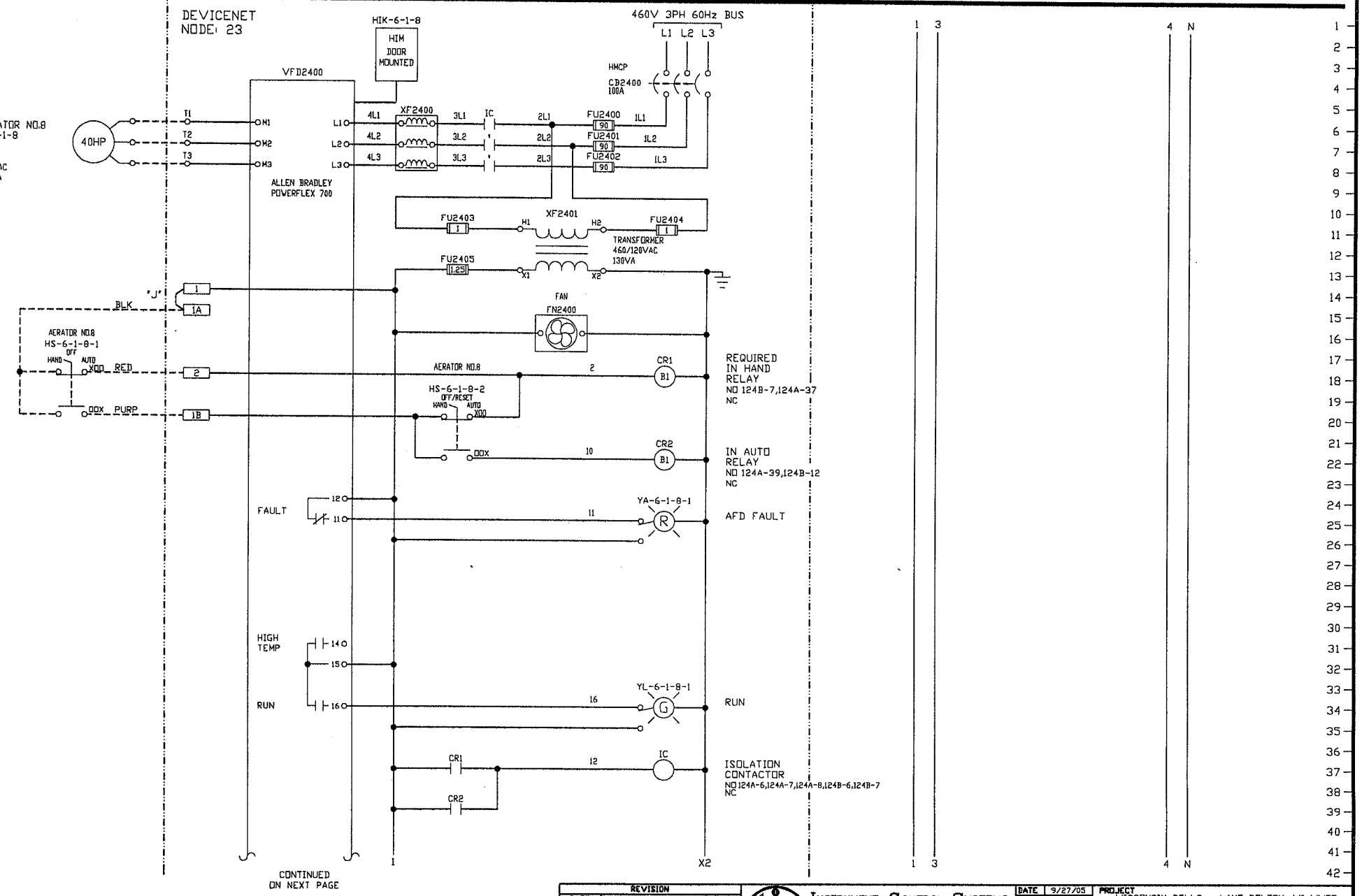
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	44 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
AERATOR NO.7
PROJ. NO. 1520A
DWG. NO. 123B

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	45 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
AERATOR NO.8

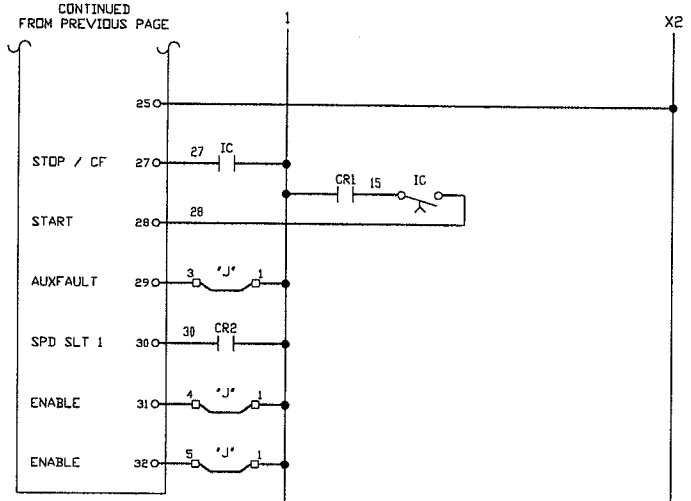
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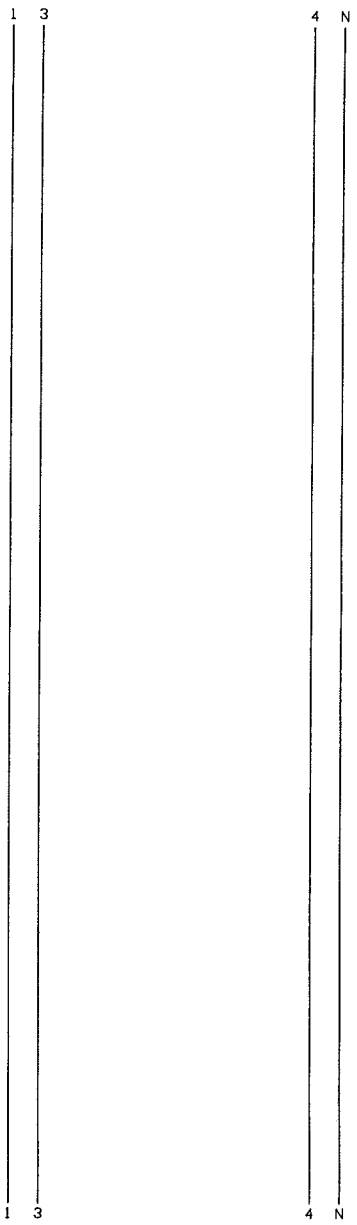
DWG. NO. 124A

FIELD OR AS NOTED

MCC-A COMP 14D

LCP-A





REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	46 OF 60

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

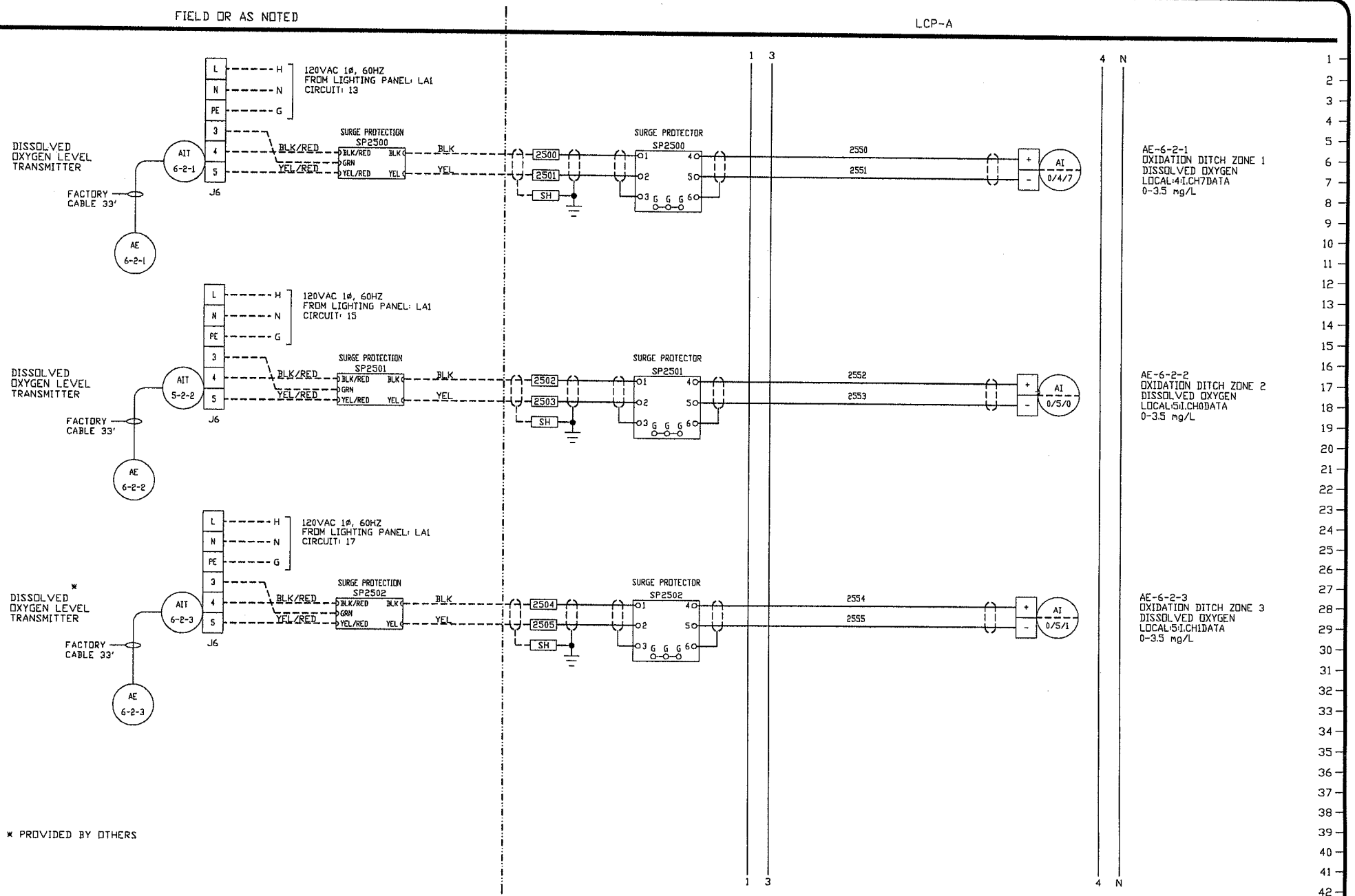
LCP-A
AERATOR NO.8

PROJ. NO. 1520A

DWG. NO. 124B

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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

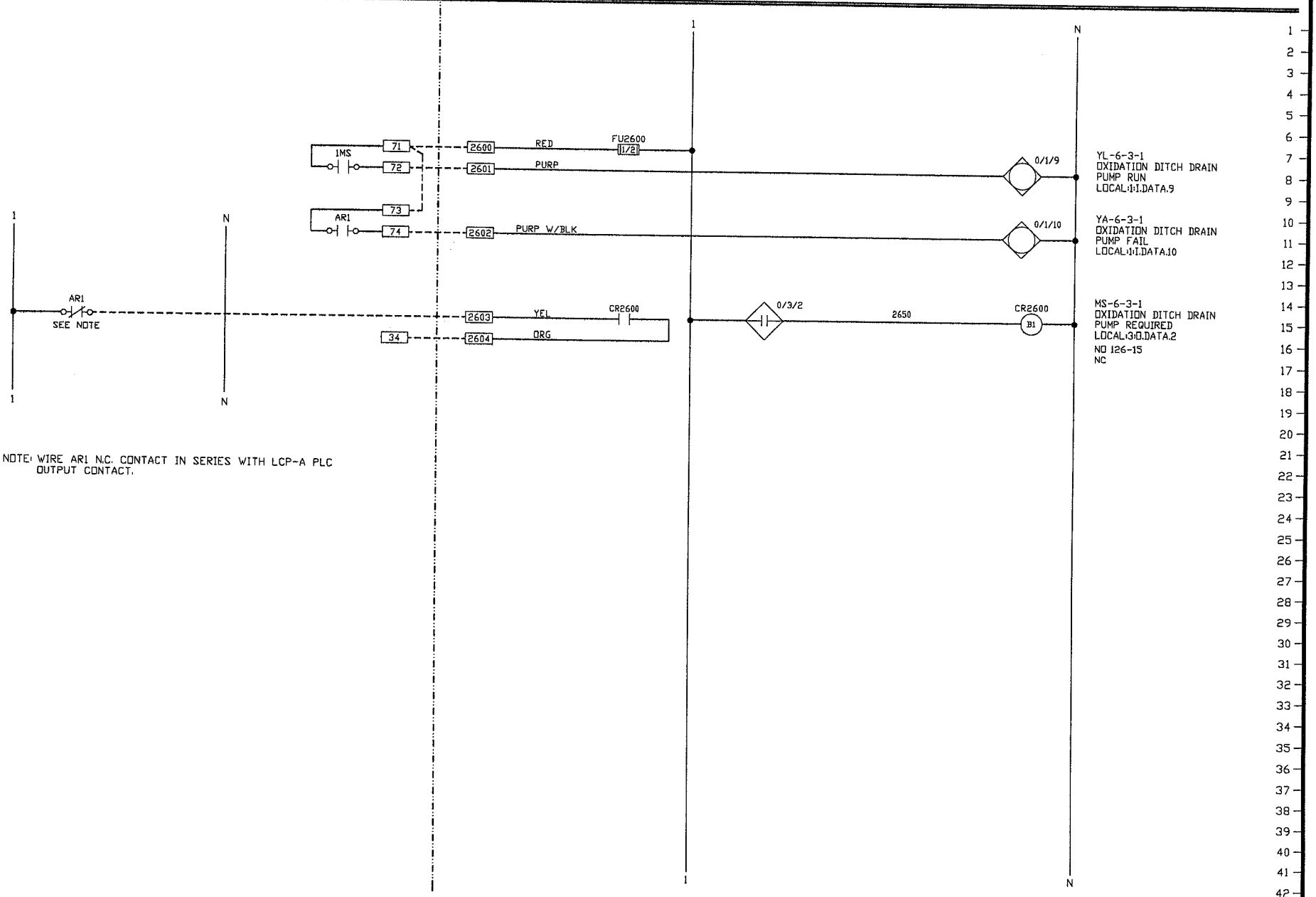
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	47 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
~~AERATION TANK~~
DISSOLVED OXYGEN
OXIDATION DITCH
PROJ. NO. 1520A
DWG. NO. 125

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DATE LAST EDITED: 11/16/2006



NOTE: WIRE AR1 N.C. CONTACT IN SERIES WITH LCP-A PLC OUTPUT CONTACT.

REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	48 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

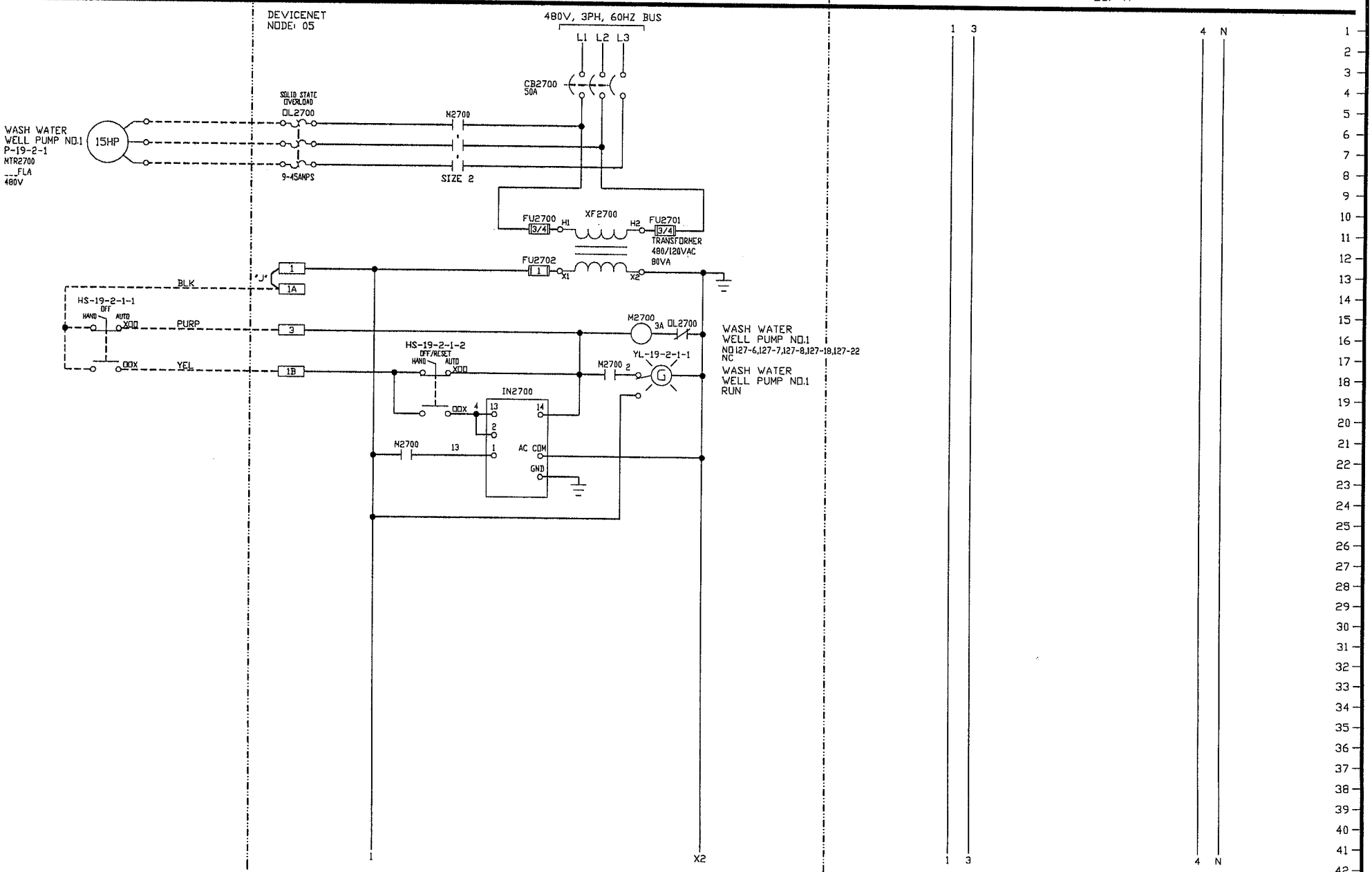
LCP-A
OXIDATION DITCH DRAIN PUMP
CONTROL PANEL

PROJ. NO. 1520A

DWG. NO. 126

DATE LAST EDITED: 11/16/2006

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REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

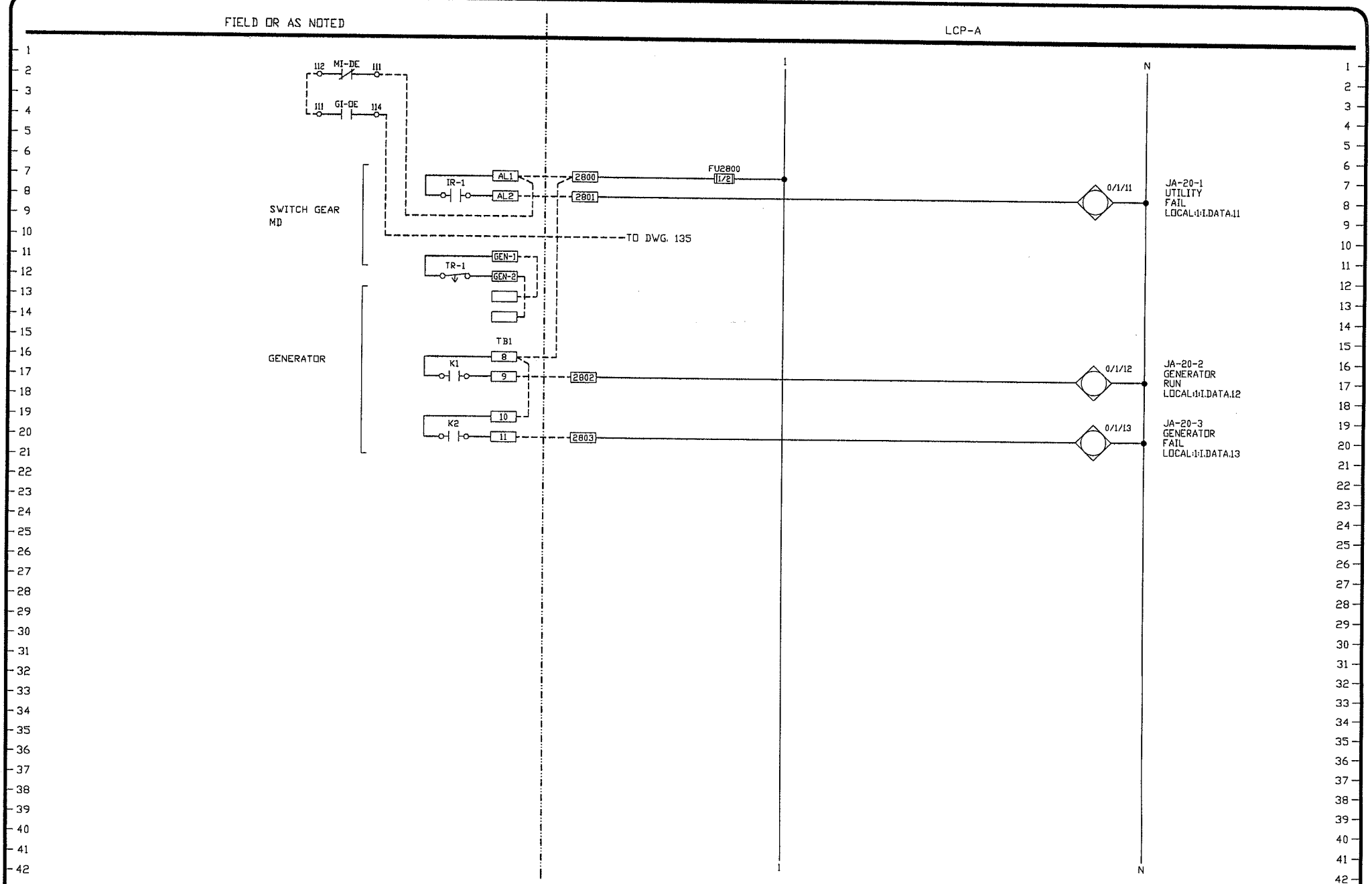
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	49 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
WASH WATER WELL PUMP NO.1
PROJ. NO. 1520A
DWG. NO. 127

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DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	50 OF 60

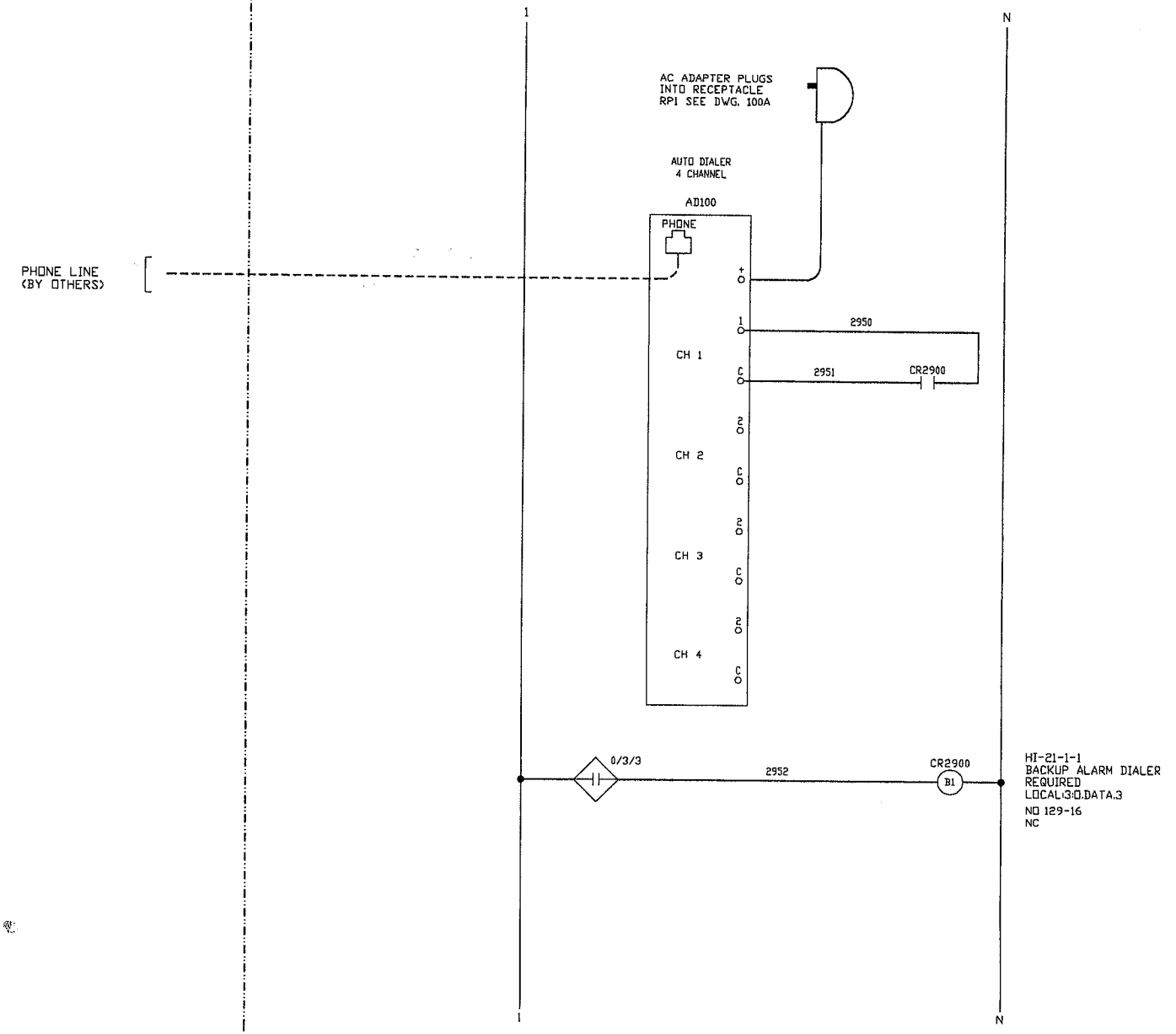
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
MAIN POWER MONITORING
PROJ. NO. 1520A
DWG. NO. 128

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FIELD OR AS NOTED

LCP-A



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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	51 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
AUTO DIALER

PROJ. NO. 1520A

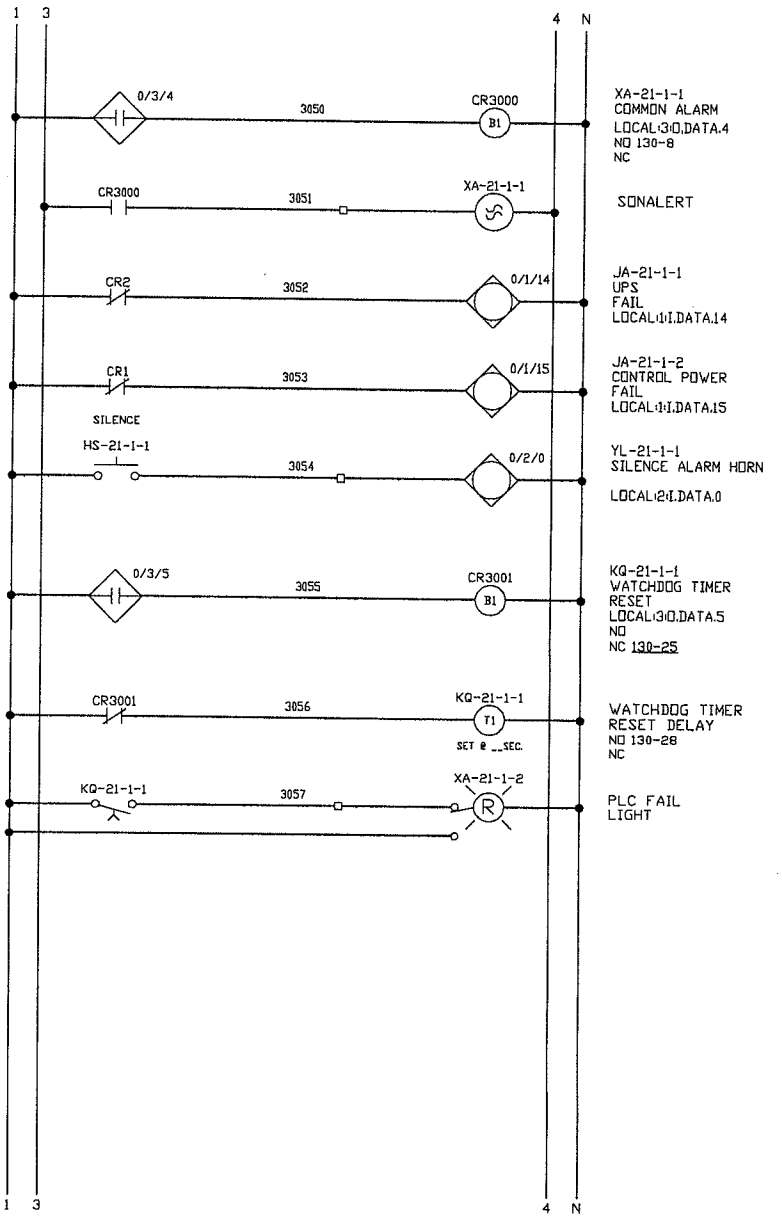
DWG. NO. 129

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11/16/06	AS INSTALLED

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13005 16th Ave. North
Plymouth, Minnesota 55441
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DATE	9/27/05
DWN.	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	52 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
ALARM MONITORING

PROJ. NO. 1520A
DWG. NO. 130

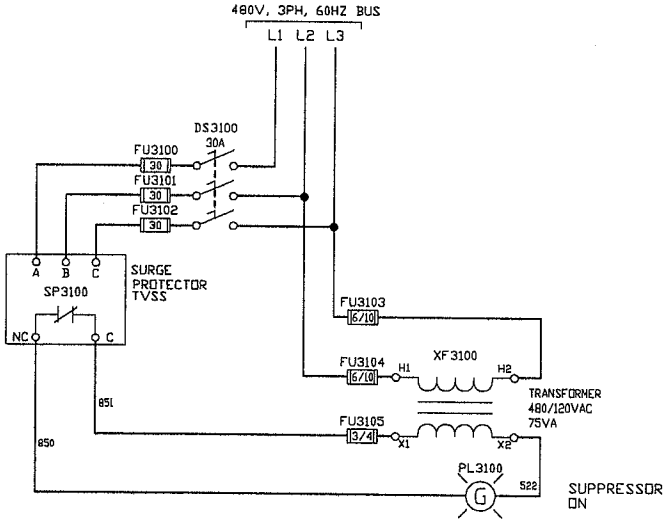
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DATE LAST EDITED: 11/16/2006

FIELD OR AS NOTED

MCC-A COMP 1G

FIELD OR AS NOTED



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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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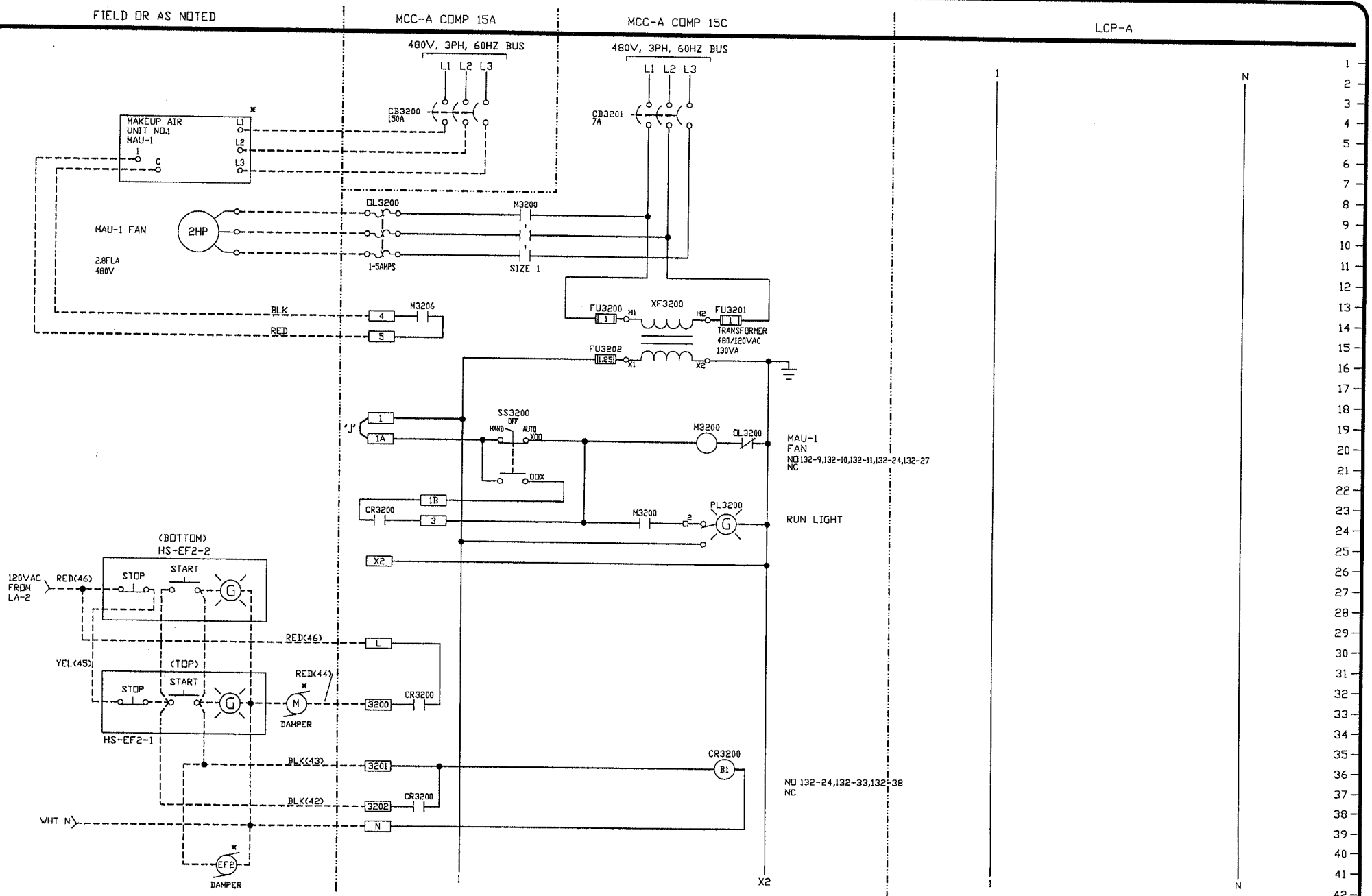
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	53 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-A
MOTOR CONTROL CENTER
SURGE PROTECTION

PROJ. NO. 1520A

DWG. NO. 131



* PROVIDED BY OTHERS

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DATE LAST EDITED: 11/16/2006

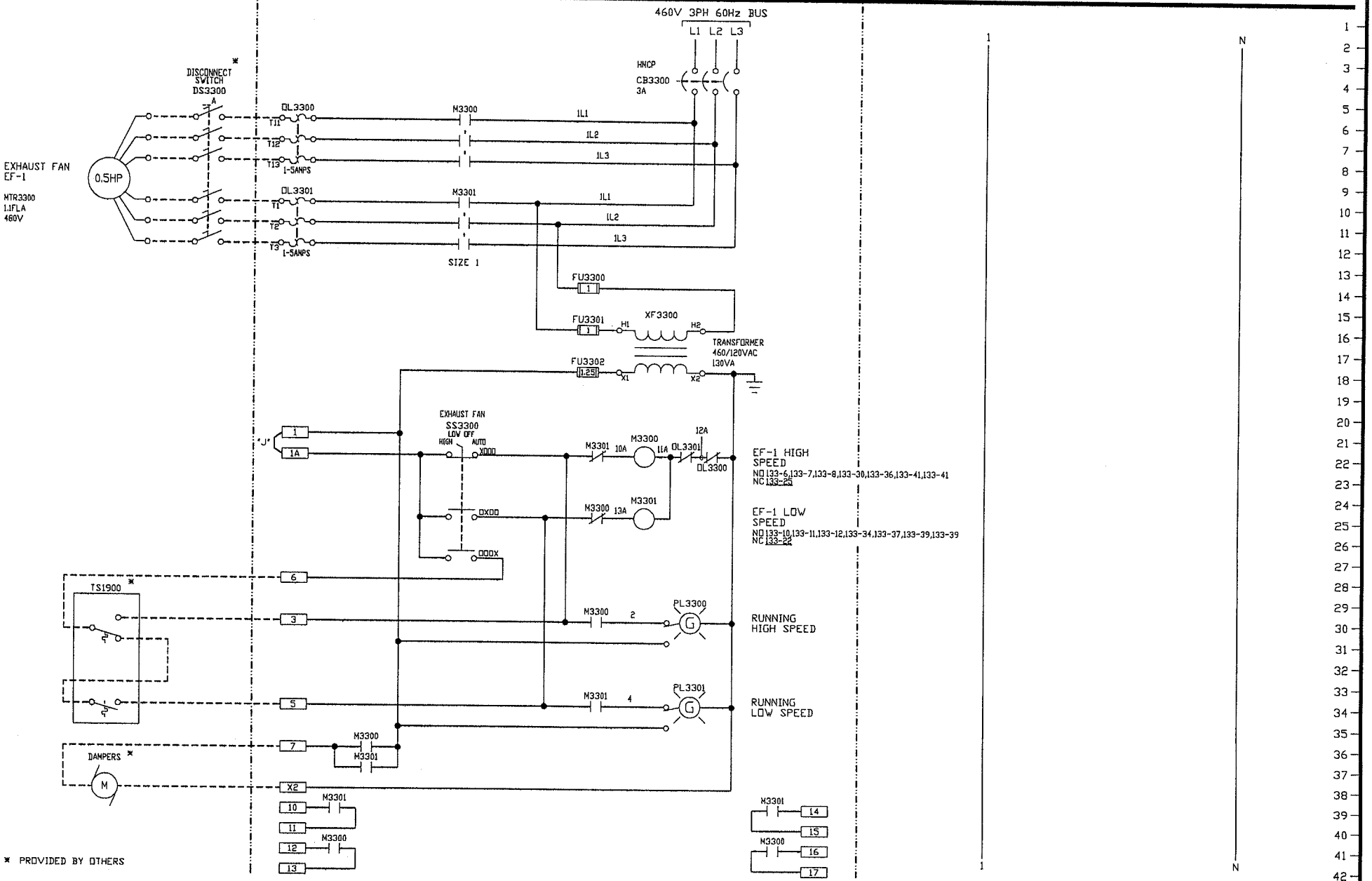
REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	54 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
MCC-A
MODULAR AIR UNIT MAU-1
PROJ. NO. 1520A
DWG. NO. 132



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	55 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
EXHAUST FAN EF-1
PROJ. NO. 1520A
DWG. NO. 133

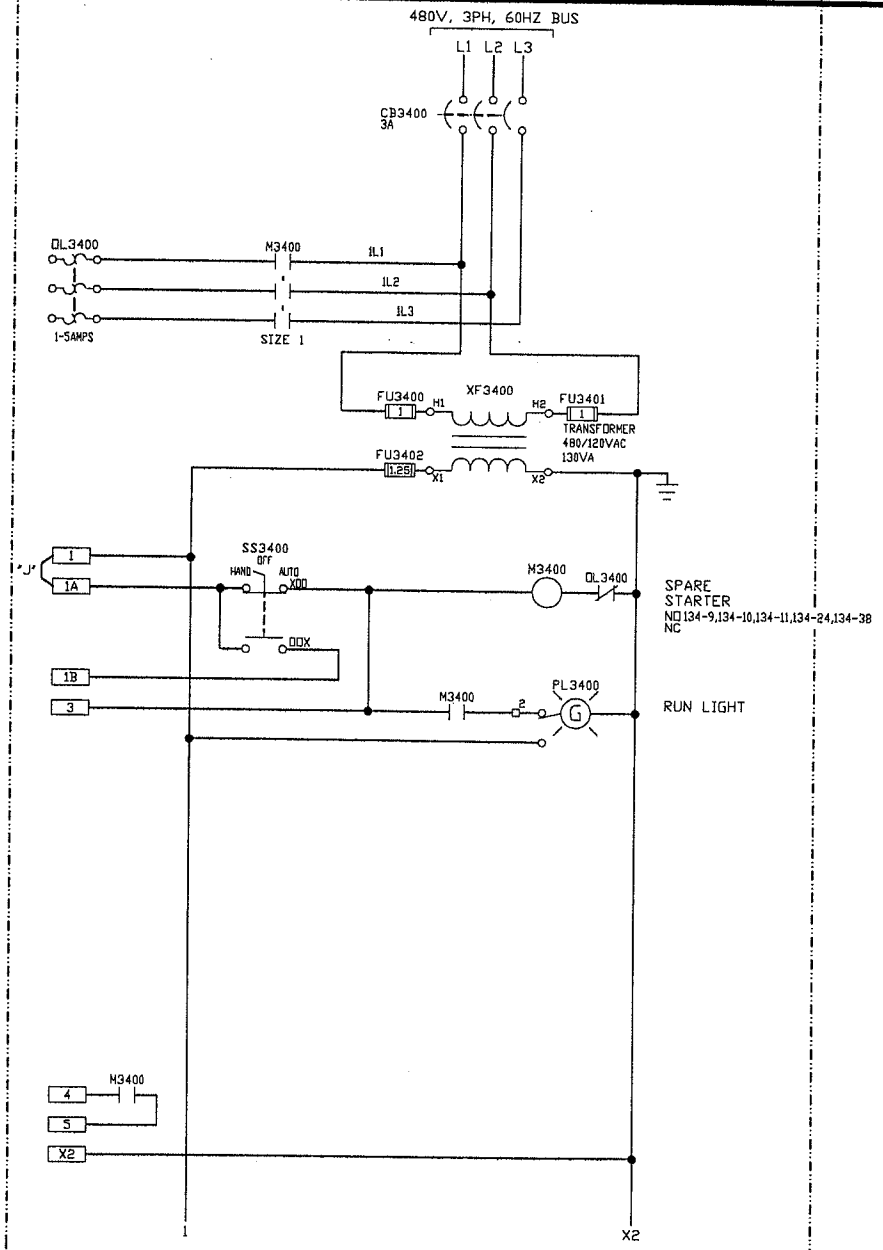
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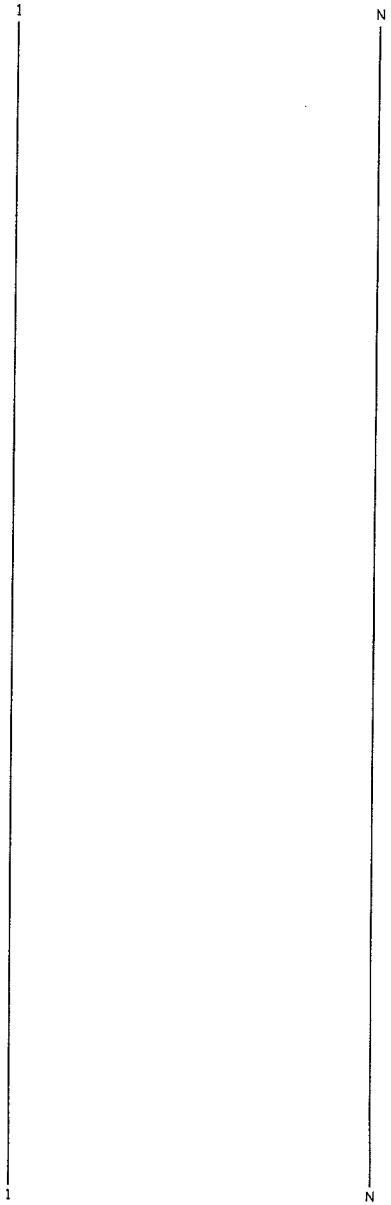
DATE LAST EDITED: 11/16/2006

FIELD OR AS NOTED

MCC-A COMP 15J

LCP-A





REVISION	
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN.	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	56 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-A
SPARE SIZE 1 STARTER

PROJ. NO. 1520A

DWG. NO. 134

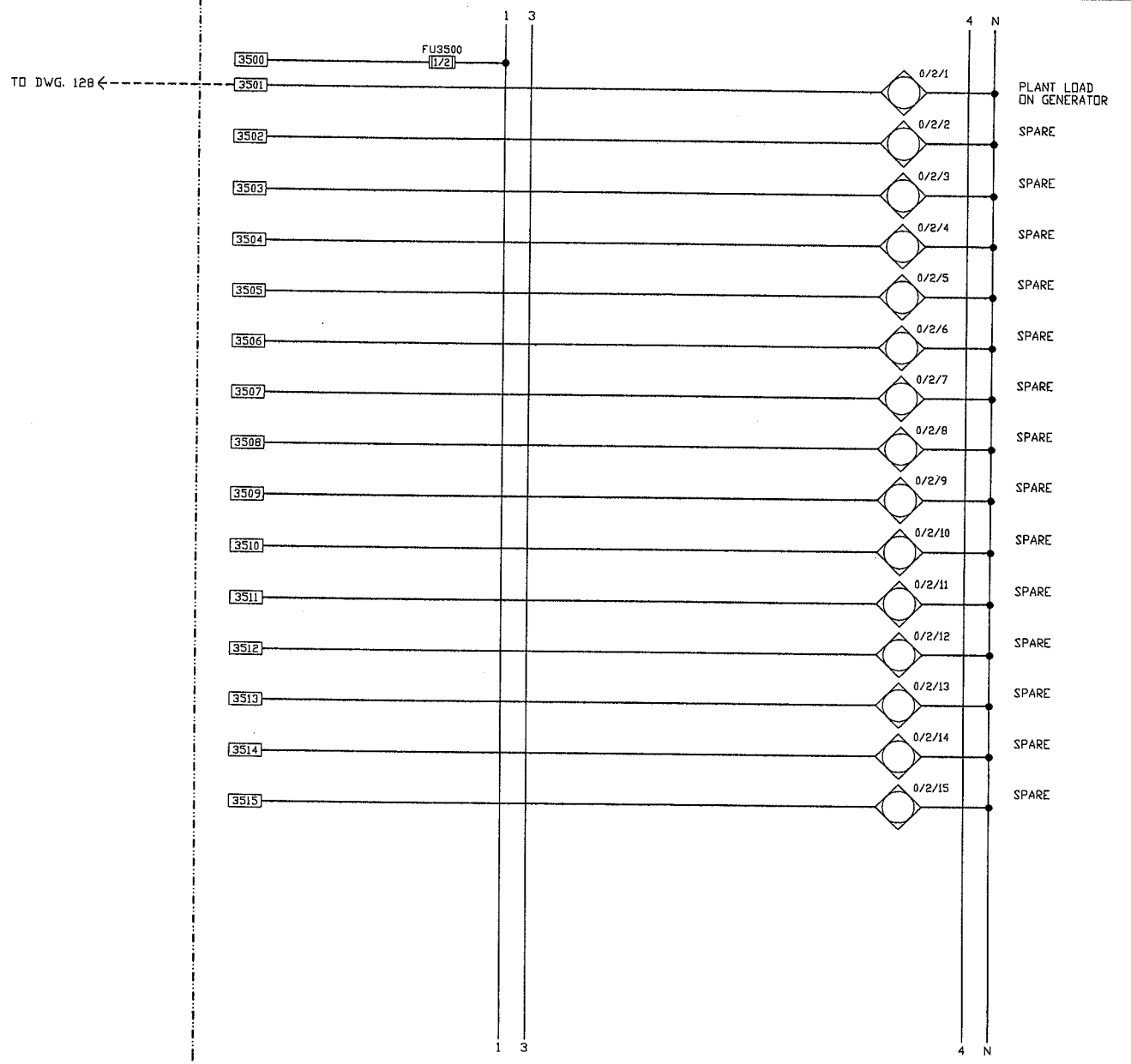
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LCP-A



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	57 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
SPARE DISCRETE INPUTS

PROJ. NO. 1520A
DWG. NO. 135

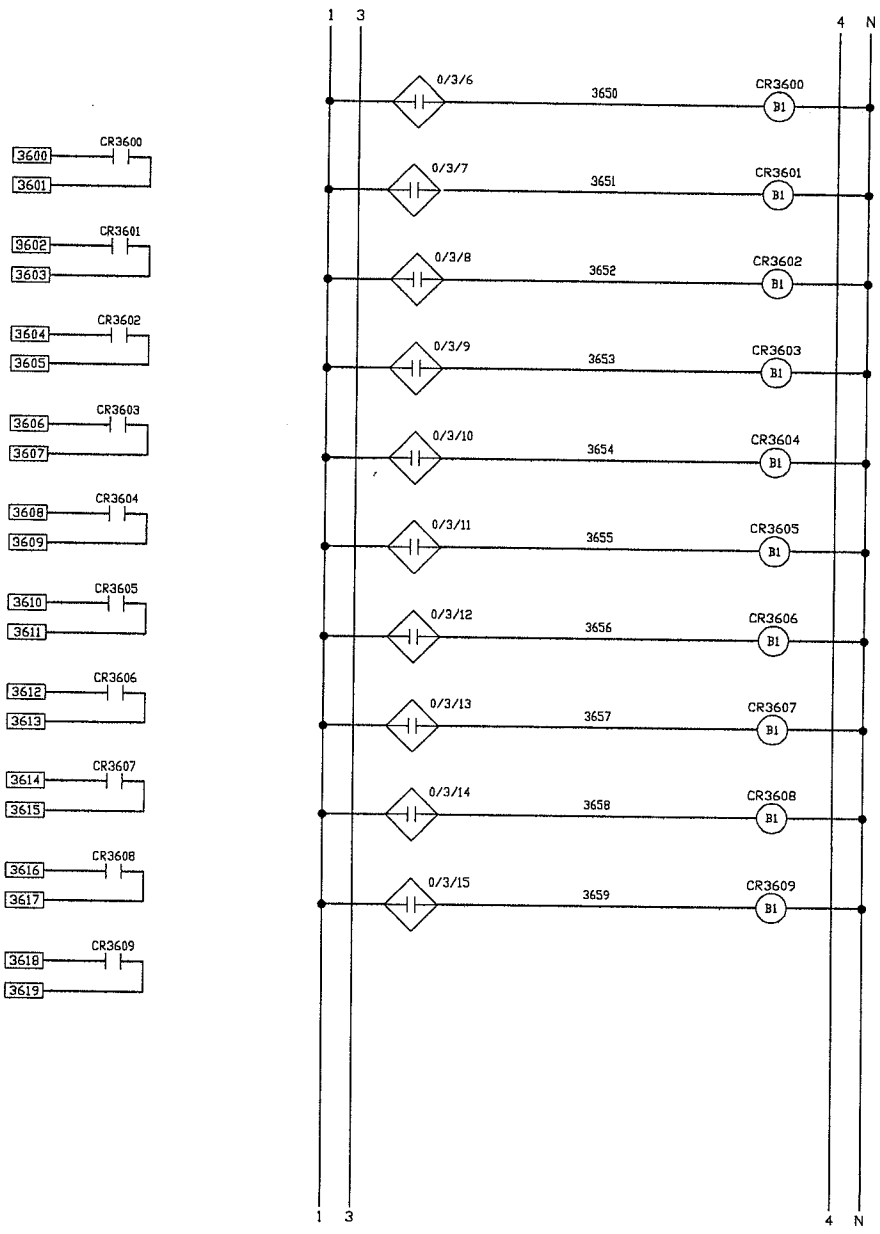
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DATE LAST EDITED: 11/16/2006

FIELD OR AS NOTED

LCP-A



REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	58 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
SPARE DISCRETE OUTPUTS
PROJ. NO. 1520A
DWG. NO. 136

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DATE LAST EDITED: 11/16/2006

FIELD OR AS NOTED

LCP-A

Well No.2
Pressure Transducer

PIT
19-2-1

Foxboro
IGP10S-T22E1 FN-HB501U313/1412
(Block + Bleed Valves Included)

FU3700 1/2
3700
3701
3702
4
SH
AI 0/5/2
Well No.2 Pressure Transducer
LOCAL:5:I.CH2DATA

FU3701 1/2
3703
3704
3705
4
SH
AI 0/5/3
SPARE
LOCAL:5:I.CH3DATA

FU3702 1/2
3706
3707
3708
4
SH
AI 0/5/4
SPARE
LOCAL:5:I.CH4DATA

FU3703 1/2
3709
3710
3711
4
SH
AI 0/5/5
SPARE
LOCAL:5:I.CH5DATA

FU3704 1/2
3712
3713
3714
4
SH
AI 0/5/6
SPARE
LOCAL:5:I.CH6DATA

FU3705 1/2
3715
3716
3717
4
SH
AI 0/5/7
SPARE
LOCAL:5:I.CH7DATA

1 3 4 N

REVISION	
DATE	DESCRIPTION
2/16/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN.	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	39 OF 60

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
SPARE ANALOG INPUTS
PROJ. NO. 1520A
DWG. NO. 137

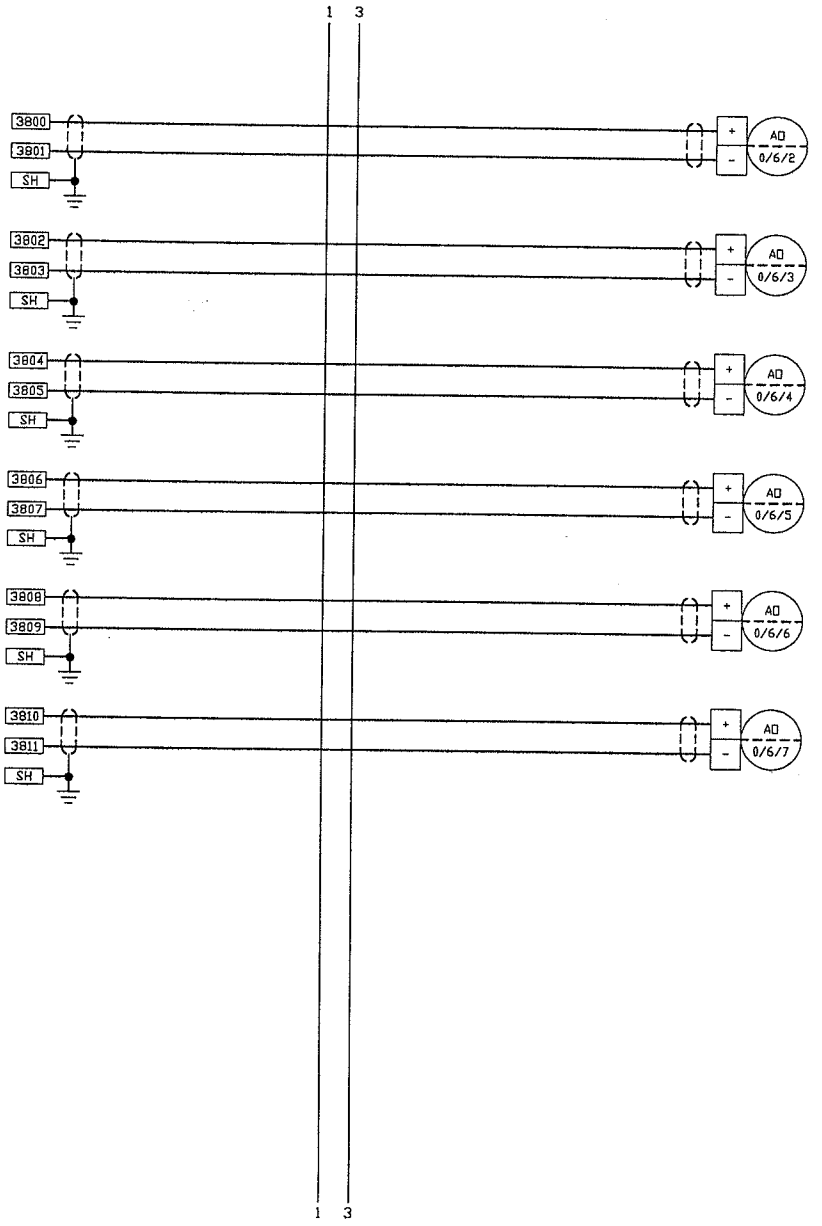
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LCP-A



REVISION	
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	60 OF 60

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
SPARE ANALOG OUTPUTS

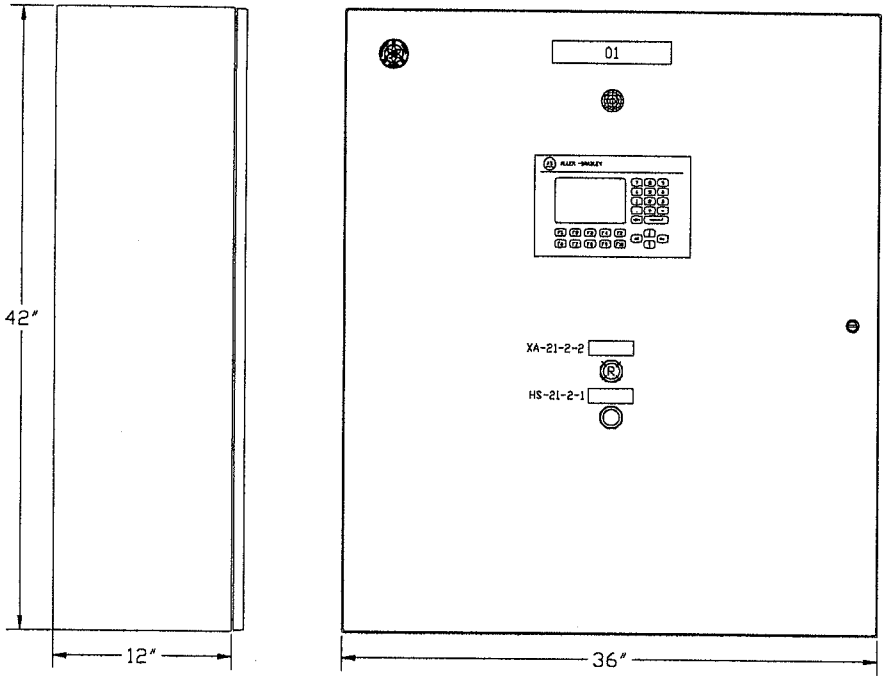
PROJ. NO. 1520A

DWG. NO. 138

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NAMEPLATE SCHEDULE					
TAG	DESC1	DESC2	DESC3	SIZE	REMARKS
01	LCP-B			1.5x8	
HS-21-2-1	SILENCE			1x3	
XA-21-2-2	PLC FAIL			1x3	

NAMEPLATES ARE WHITE WITH BLACK LETTERS

NOTES:

1. ENCLOSURE IS A NEMA TYPE 4,12 WALL-MOUNT HOFFMAN CSD423612 WITH INNER PANEL HOFFMAN CP4236.
2. FINISH IS ANSI 61 GRAY.
3. UL# BF-371432

SCALE

0 6" 12" 24"

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DATE LAST EDITED: 11/17/2006

REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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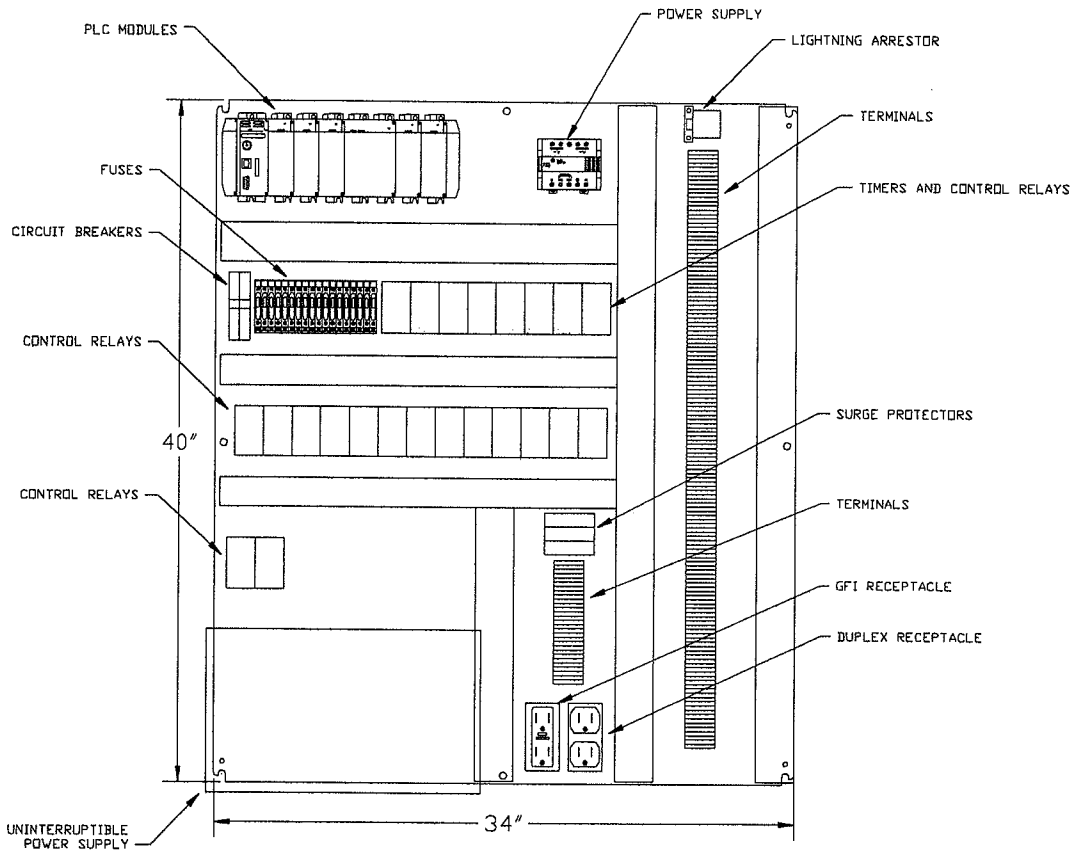
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	1 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
ENCLOSURE DETAIL

PROJ. NO. 1520B

DWG. NO. 001



PANEL LAYOUT

SCALE

0 6" 12" 24"

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DATE LAST EDITED 11/17/2006

REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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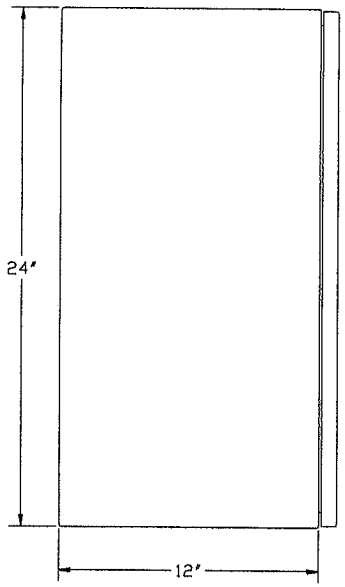
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	2 OF 42

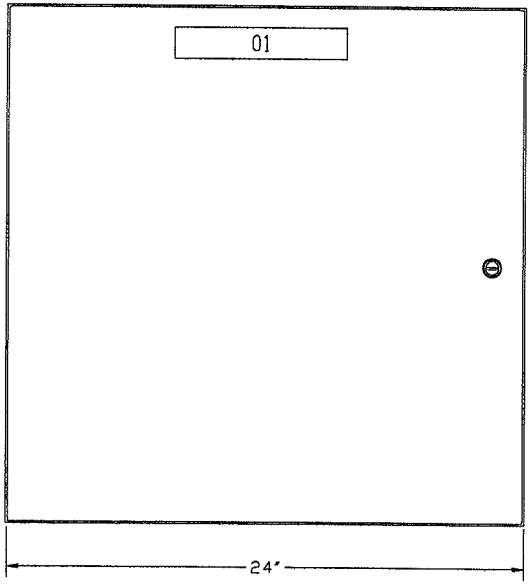
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

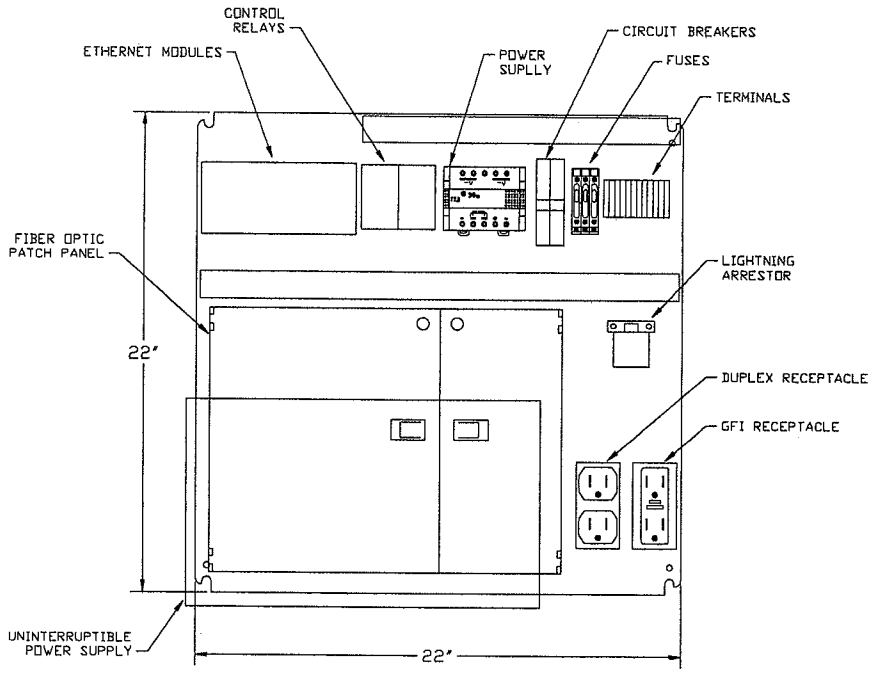
LCP-B
PANEL LAYOUT

PROJ. NO. 1520B

DWG. NO. 002







PANEL LAYOUT

NAMEPLATE SCHEDULE					
TAG	LINE 1	LINE 2	LINE 3	SIZE HxW	REMARKS
01	FIP-B			1.5x8	

NOTES:

1. ENCLOSURE IS A NEMA TYPE 4, 12 WALL-MOUNT HOFFMAN CONCEPT CSD242412 WITH INNER PANEL HOFFMAN CP2424.
2. FINISH IS ANSI 61 GRAY.
3. UL# BF-371417

SCALE

0 5" 10" 15"

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DATE LAST EDITED: 11/17/2006

REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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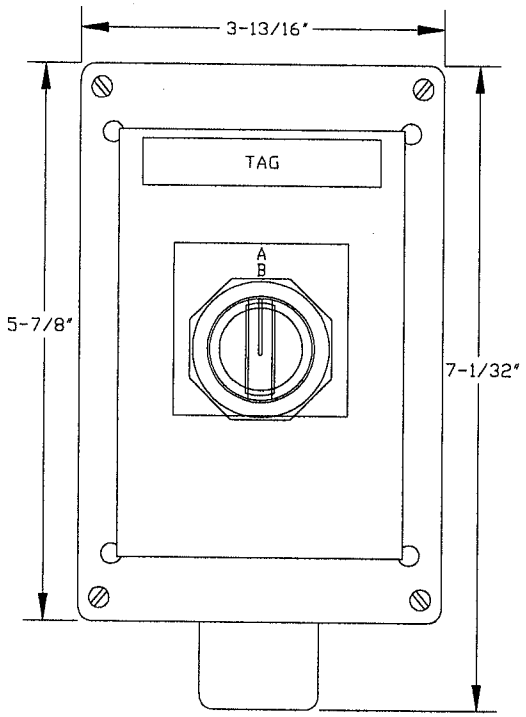
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	3 OF 42

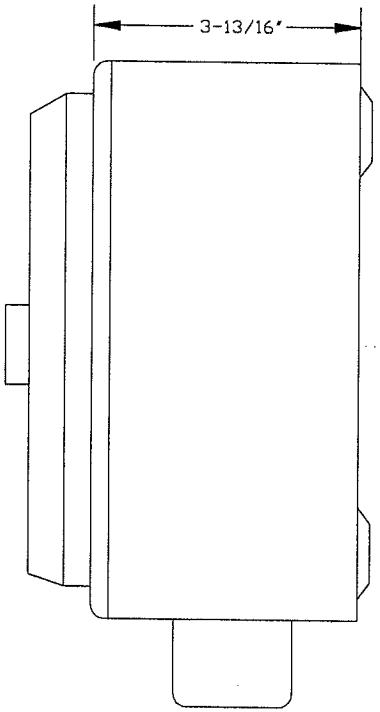
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

FIP-B
FIBER OPTIC NETWORK INTERFACE PANEL
ENCLOSURE DETAIL

PROJ. NO. 1520B

DWG. NO. 003





NAMEPLATE SCHEDULE					
	NAMEPLATE		LEGEND PLATE		
TAG	LINE 1	LINE 2	LINE A	LINE B	LEGEND NO.
HS-14-1-1-1	THREE BELT PRESS	UPPER BELT	OFF	HAND AUTO	800H-W551
HS-14-2-1-1	THREE BELT PRESS	LOWER BELT	OFF	HAND AUTO	800H-W551
HS-14-3-1-1	THREE BELT PRESS	HYDRAULIC PUMP	OFF	HAND AUTO	800H-W551
HS-15-2-1-1	BELT FILTER PRESS	BELT DRIVE	OFF	HAND AUTO	800H-W551
HS-15-3-1-1	BELT FILTER PRESS	HYDRAULIC PUMP	OFF	HAND AUTO	800H-W551
HS-16-1-1-1	THICKENED	SLUDGE PUMP	OFF	HAND AUTO	800H-W551
HS-16-2-1-1	T.S. DIGESTER	BLOWER NO.1	OFF	HAND AUTO	800H-W551
HS-16-2-2-1	T.S. DIGESTER	BLOWER NO.2	OFF	HAND AUTO	800H-W551
HS-16-3-1-1	DEWATERING PRESS	FEED PUMP	OFF	HAND AUTO	800H-W551
HS-18-1-1-1	SLUDGE CAKE	CONVEYOR NO.1	OFF	HAND AUTO	800H-W551
HS-18-1-1-7	SLUDGE CAKE	CONVEYOR NO.1	PAUSE		800H-W500E
HS-18-1-1-8	SLUDGE CAKE	CONVEYOR NO.1	PAUSE		800H-W500E
HS-18-2-1-1	SLUDGE CAKE	CONVEYOR NO.2	OFF	HAND AUTO	800H-W551
HS-19-3-1-1	WASHWATER WELL	PUMP NO.2	OFF	HAND AUTO	800H-W551

NAMEPLATES ARE 1/2"Hx2"W WHITE WITH BLACK 1/8" LETTERS

NOTES:

1. ONE HOLE ENCLOSURE IS NEMA 4X FIBERGLASS ALLEN BRADLEY 800H-R3HA4RL.
2. FINISH IS ROSITE GLASS POLYESTER.
3. QUANTITY (14)

SCALE

0 1" 2" 4"

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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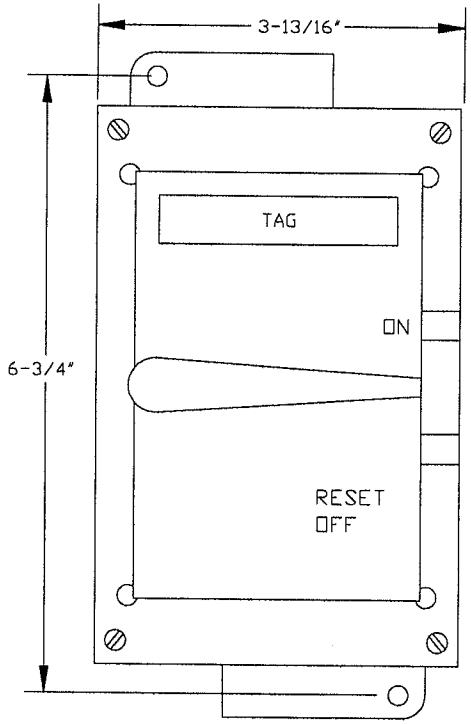
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DWN.	JA
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ENGR.	JJ
ASSEM.	
SHEET	4 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LOCAL CONTROL STATIONS
SINGLE DEVICE STATIONS
ENCLOSURE DETAIL

PROJ. NO. 1520B

DWG. NO. 004A



NAMEPLATE SCHEDULE				
TAG	LINE 1	LINE 2	LINE 3	SIZE
HS-17-2-1	POLYMER MIXER NO. 1			5/8"X1/4"
HS-17-2-2	POLYMER MIXER NO. 2			5/8"X1/4"

NAMEPLATE IS WHITE WITH BLACK LETTERS

NOTES:

1. MANUAL DOOR SWITCH IS NEMA 4 ALLEN BRADLEY 600-TCX5.
2. THERMAL HEATER IS ALLEN BRADLEY P36.
3. QUANTITY (2)

SCALE

0 1" 2" 4"

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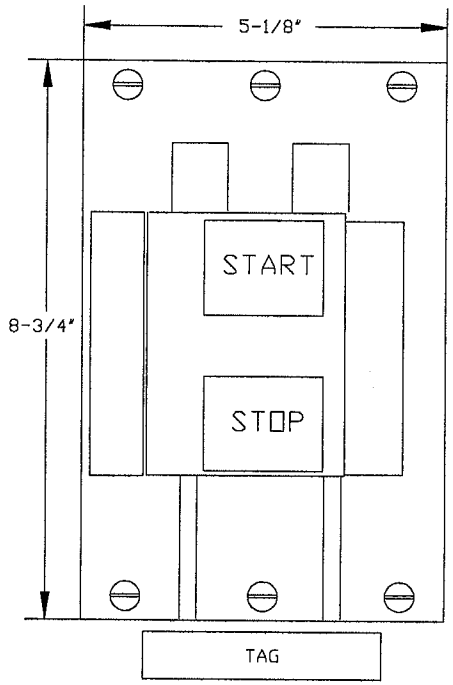
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SHEET	3 OF 63

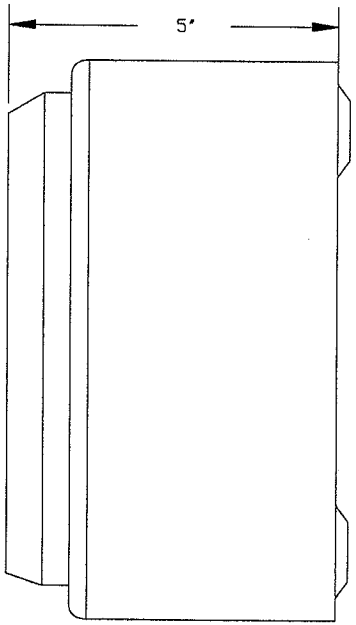
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LOCAL CONTROL STATIONS
MANUAL MOTOR STARTER
ENCLOSURE DETAIL

PROJ. NO. 1520B

DWG. NO. 004B





NAMEPLATE SCHEDULE			
TAG	LINE 1	LINE 2	SIZE
HS-17-4-1	POLYMER AIR	COMPRESSOR NO. 1	5/8"X2-1/4"

NAMEPLATES ARE WHITE WITH BLACK LETTERS

NOTES:

1. MANUAL MOTOR SWITCH IS NEMA 4X FIBERGLASS ALLEN BRADLEY 609-XCX.
2. QUANTITY (1)

SCALE

0 1" 2" 4"

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SHEET	6 OF 42

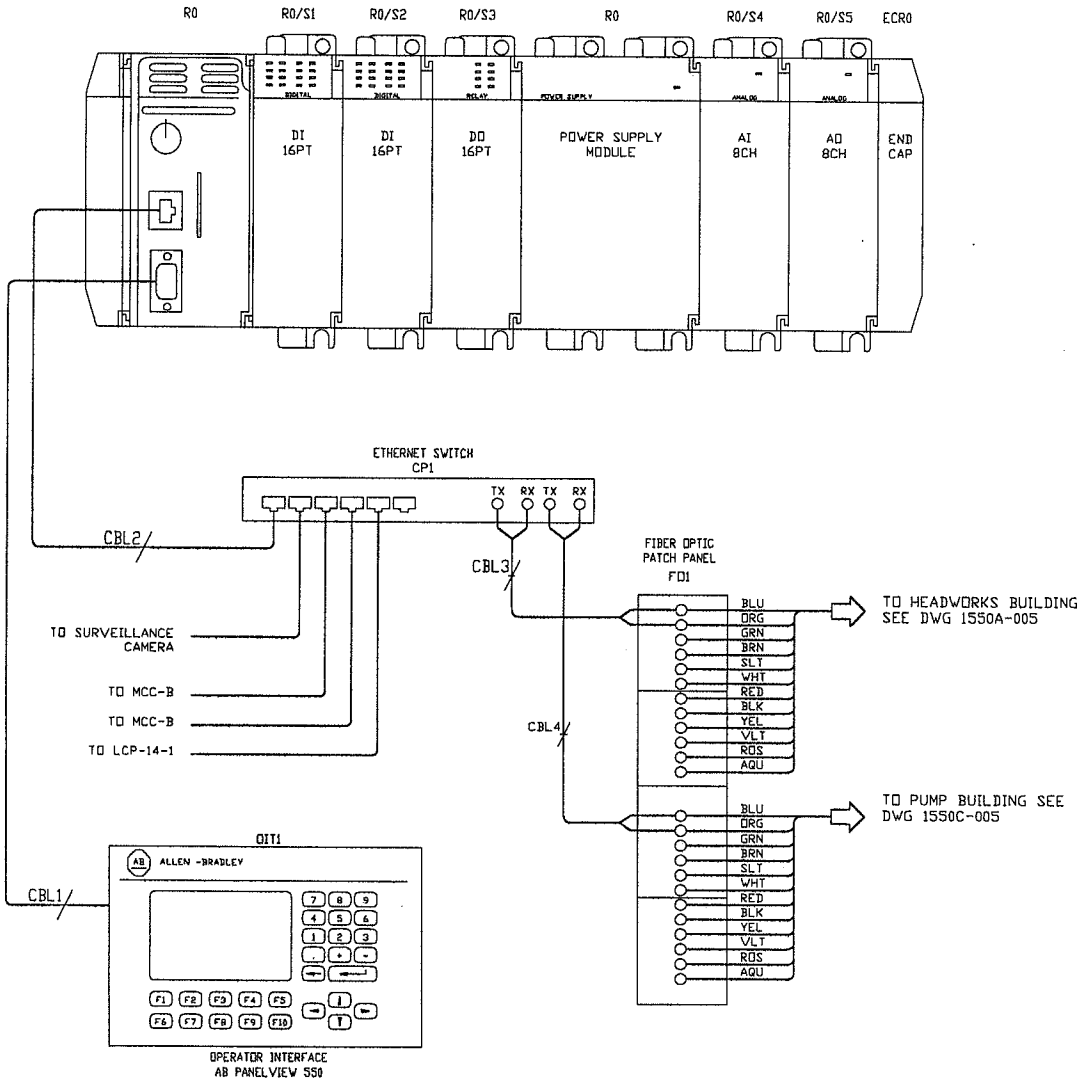
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LOCAL CONTROL STATIONS
MANUAL MOTOR SWITCH
ENCLOSURE DETAIL

PROJ. NO. 1520B

DWG. NO. 004C

CONTROL LOGIX I/O SCHEDULE



QTY	TAGS	DESCRIPTION	MFG	CATALOG
1	R0	CPU, CPACT LGX 1.5MB MEM CPU CPACT LGX, 1.5MB MEMORY 120V AC	ALLEN BRADLEY	1769-L35E
2	R0/S1 R0/S2	PLC DIGITAL I/O MODULE 16 POINT INPUT - GENERAL PURPOSE 85-132V AC (INPUTS)	ALLEN BRADLEY	1769-IA16
1	R0/S3	PLC DIGITAL I/O MODULE 16 POINT RELAY CONTACT OUTPUT (N.O.) 1.5A @ 120V AC	ALLEN BRADLEY	1769-OW16
1	R0	COMPACTLOGIX POWER SUPPLY 120V AC	ALLEN BRADLEY	1769-PA4
1	R0/S4	PLC ANALOG I/O MODULE 8 ANALOG INPUTS (+/-10VDC; +/-20mA) 14 BIT RESOLUTION	ALLEN BRADLEY	1769-IF8
1	R0/S5	PLC ANALOG I/O MODULE 1769-OF8C 16 BIT RESOLUTION 8 4-20MA	ALLEN BRADLEY	1769-OF8C
1	ECR0	EXPANDABLE RACK RIGHT SIDE END CAP	ALLEN BRADLEY	1769-ECR
1	CBL1	DATA COMMUNICATIONS CABLE RS232 USING DH-485 PROTOCOL 3 METER (10FT)	ALLEN BRADLEY	2706-NC13
1	CBL2	ETHERNET CABLE CAT 5E ETHERNET CABLE CUT TO LENGTH	GENERIC	CAT5E
2	CBL3 CBL4	FIBER OPTIC PATCH CABLE, SC-SC, MM 1 METER (1 PAIR) (2) FIBERS	PANDUIT	F6D3-3M1
1	OIT1	OPERATOR INTERFACE PANELVIEW 550 KEYPAD N/A 120VAC LCD MONOCHROME	ALLEN BRADLEY	2711-K5A16
1	CP1	INDUSTRIAL ETHERNET SWITCH WITH 6 PORTS	N-TRON	[redacted]SC-S
1	FO1	FIBER OPTIC PATCH PANEL OPTICOM 24/48 FIBER (4 FAPS)	PANDUIT	FWME4
1	FO1	FIBER ADAPTER PANEL WITH 3 DUAL SC CONNECTORS	PANDUIT	FAP3WBUDSCZ

706K

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PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-A
PLC I/O SCHEDULE
PROJ. NO. 1520B
DWG. NO. 005

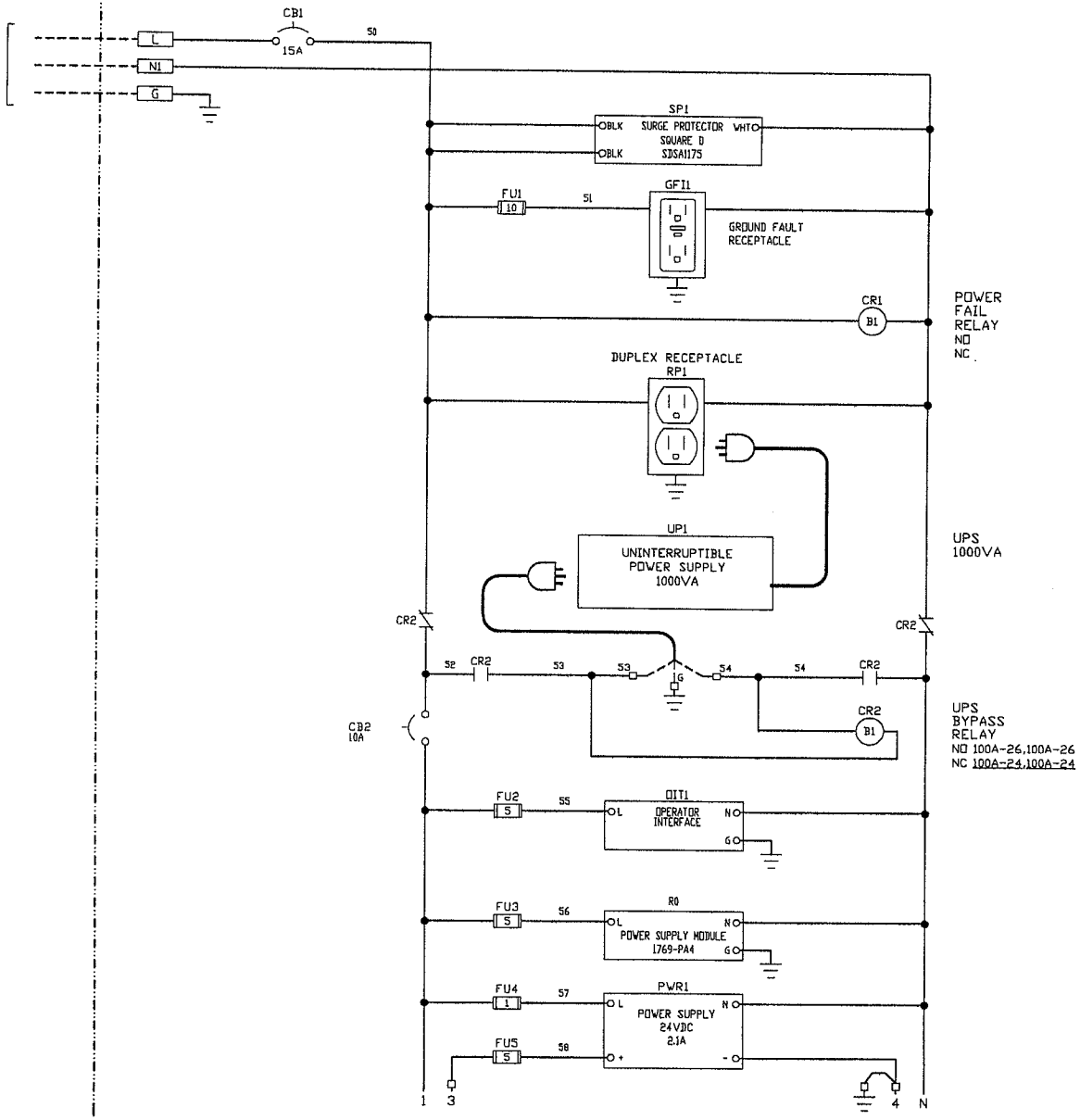
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LCP-B

120VAC, 1Ø, 60HZ
POWER FROM
LIGHTING PANEL: LB1
CIRCUIT: 6



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ENGR.	JJ
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SHEET	8 OF 42

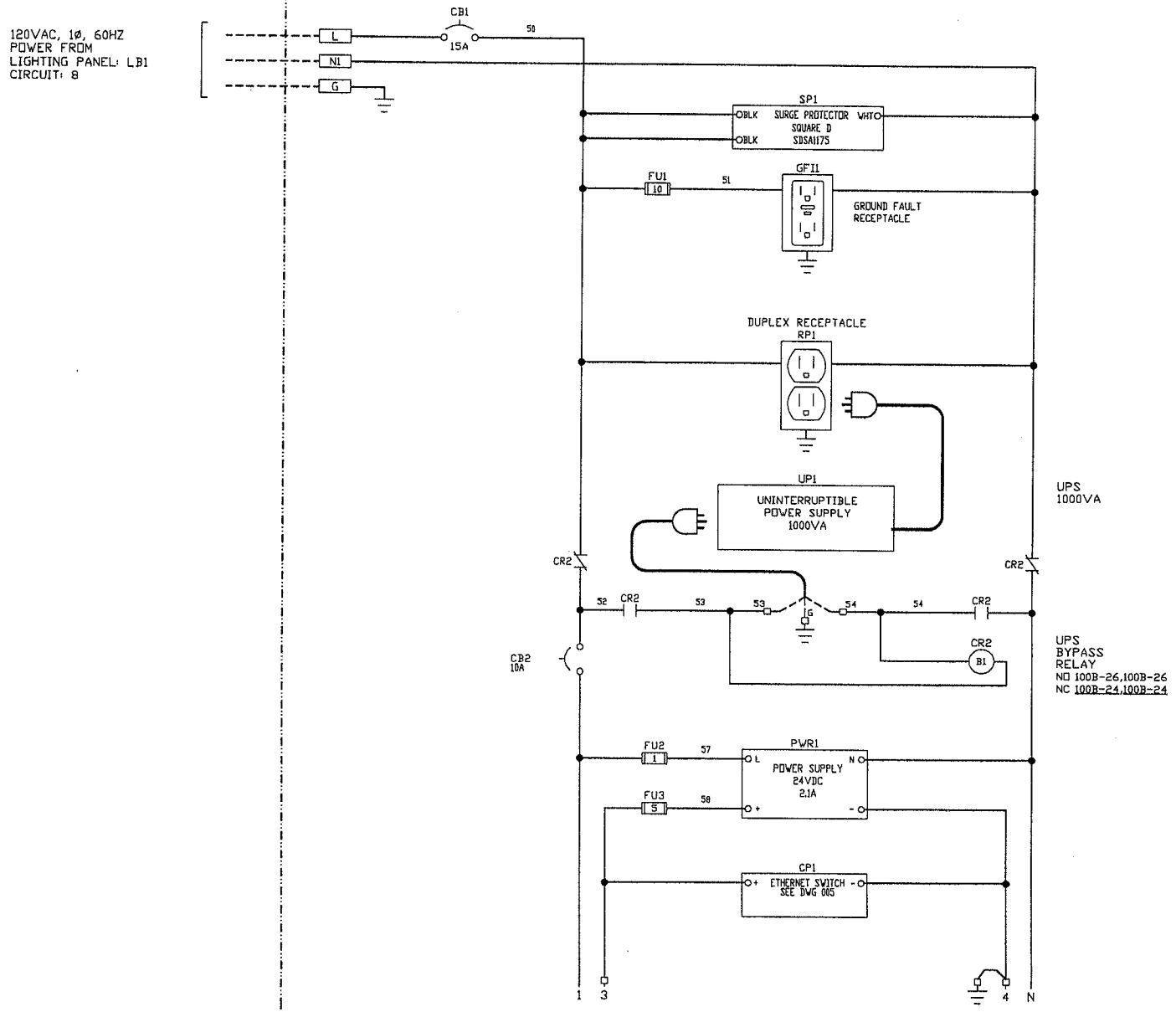
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-B
CONTROL POWER
PROJ. NO. 1520B
DWG. NO. 100A

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FIP-B



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13005 16th Ave. North
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DWN	JA
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ENGR.	JJ
ASSEM.	
SHEET	9 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

FIP-B
CONTROL POWER

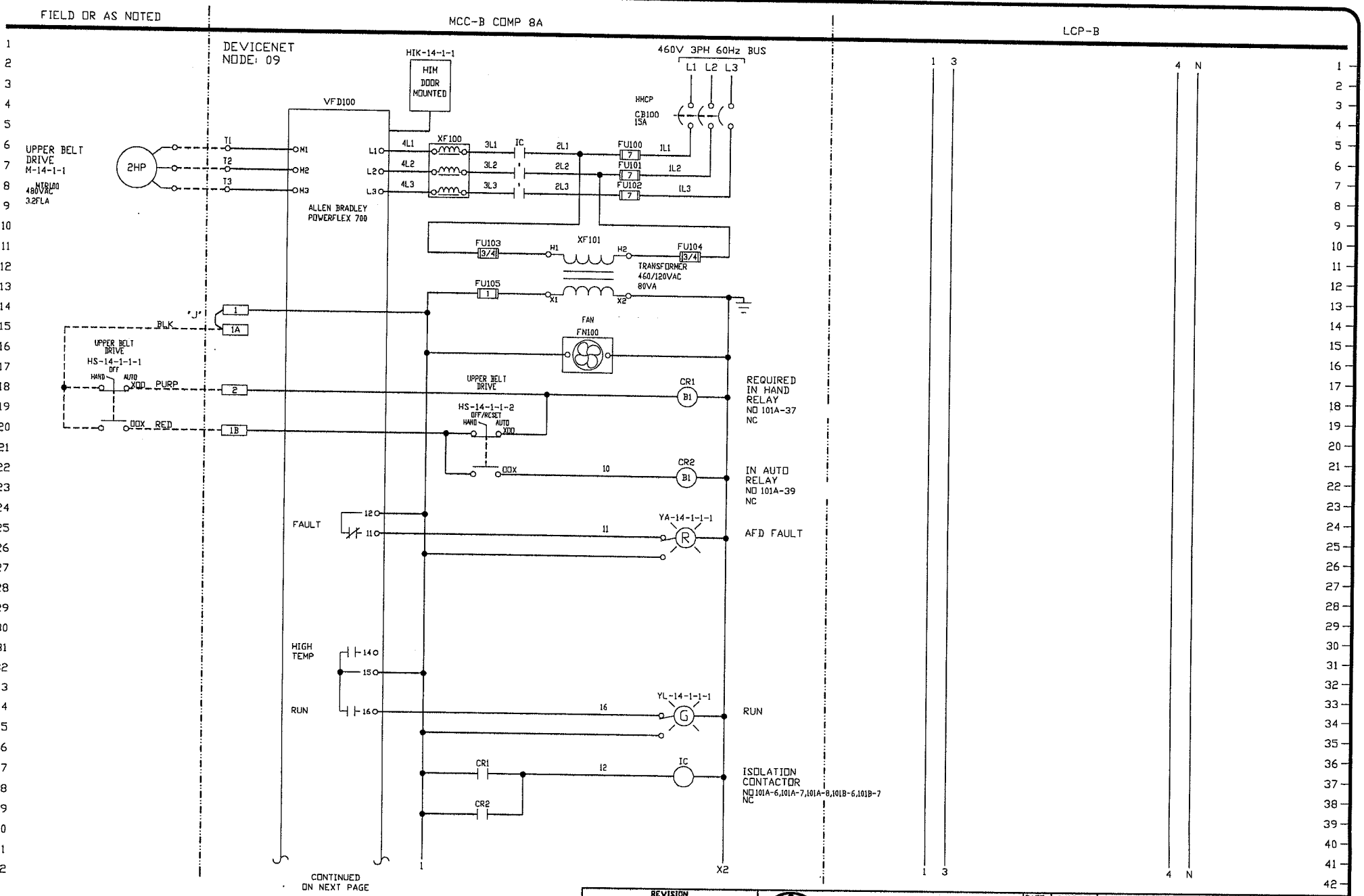
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DWG. NO. 100B

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ASSEM.	
SHEET	10 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
THICKENING/DEWATERING PRESS
UPPER BELT DRIVE

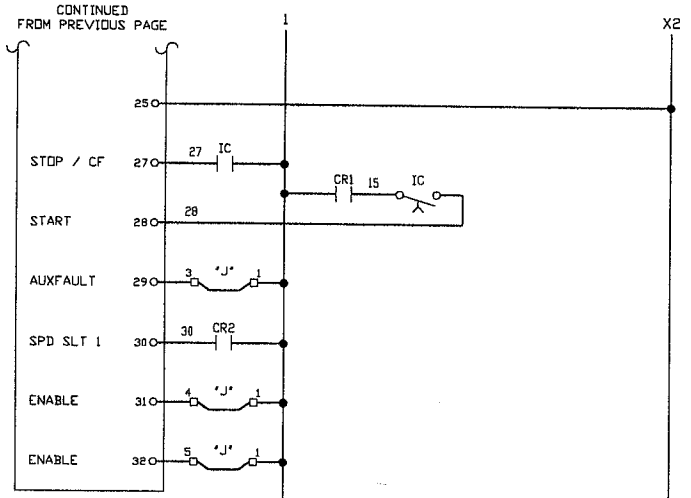
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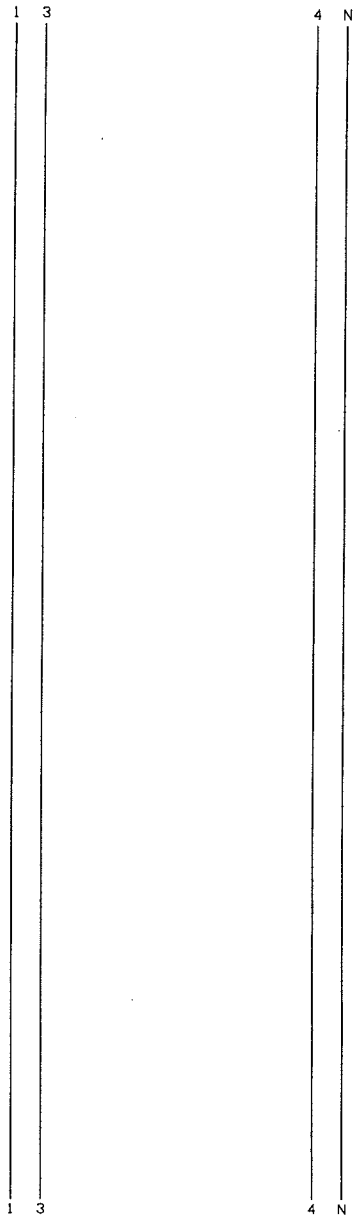
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FIELD OR AS NOTED

MCC-B COMP 8A

LCP-B





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SHEET	11 OF 42

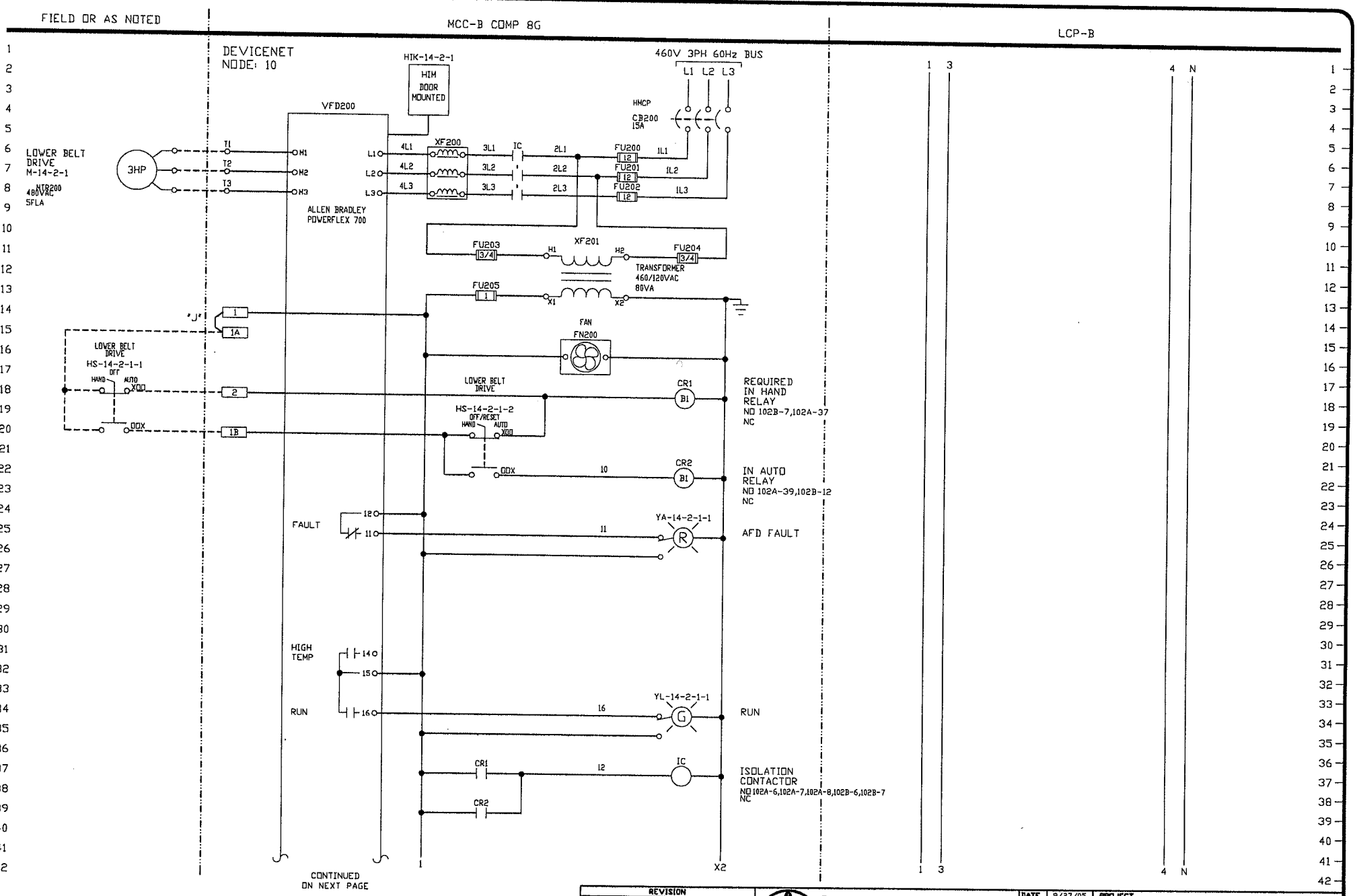
PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
THICKENING/DEWATERING PRESS
UPPER BELT DRIVE

PROJ. NO. 1520B
DWG. NO. 101B

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SHEET	12 OF 42

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

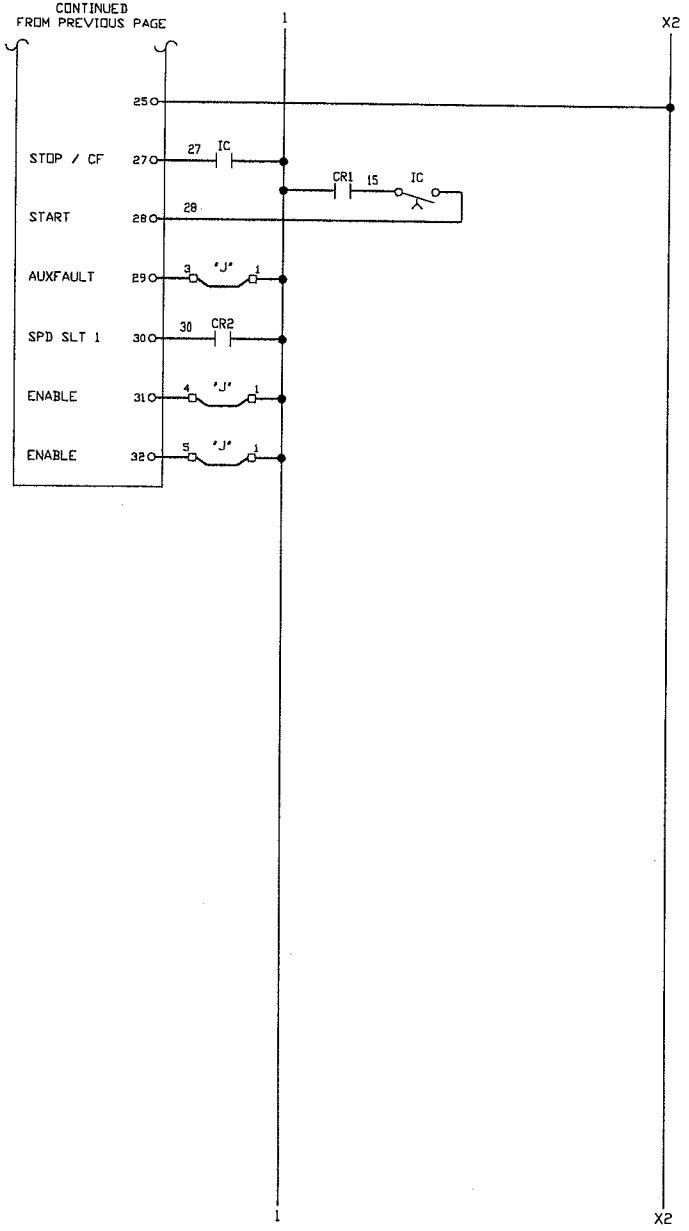
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THICKENING/DEWATERING PRESS
LOWER BELT DRIVE

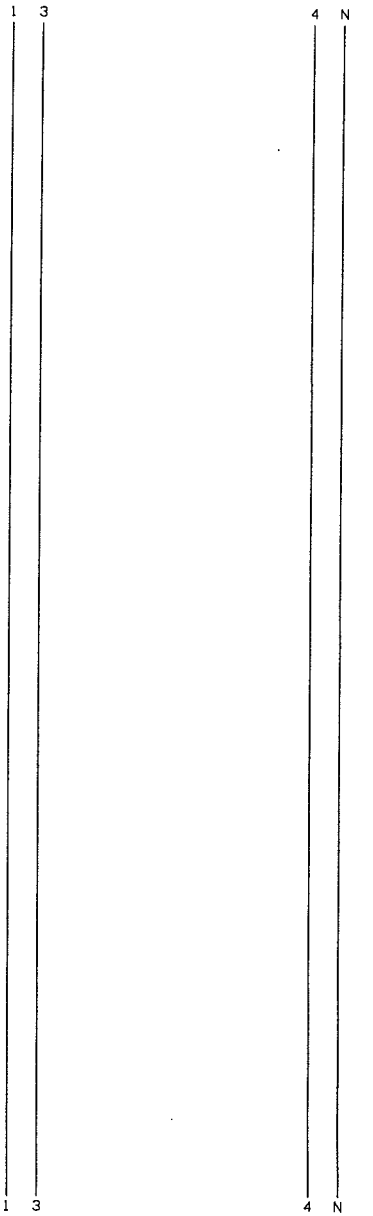
PROJ. NO. 1520B
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FIELD OR AS NOTED

MCC-B COMP 8G

LCP-B





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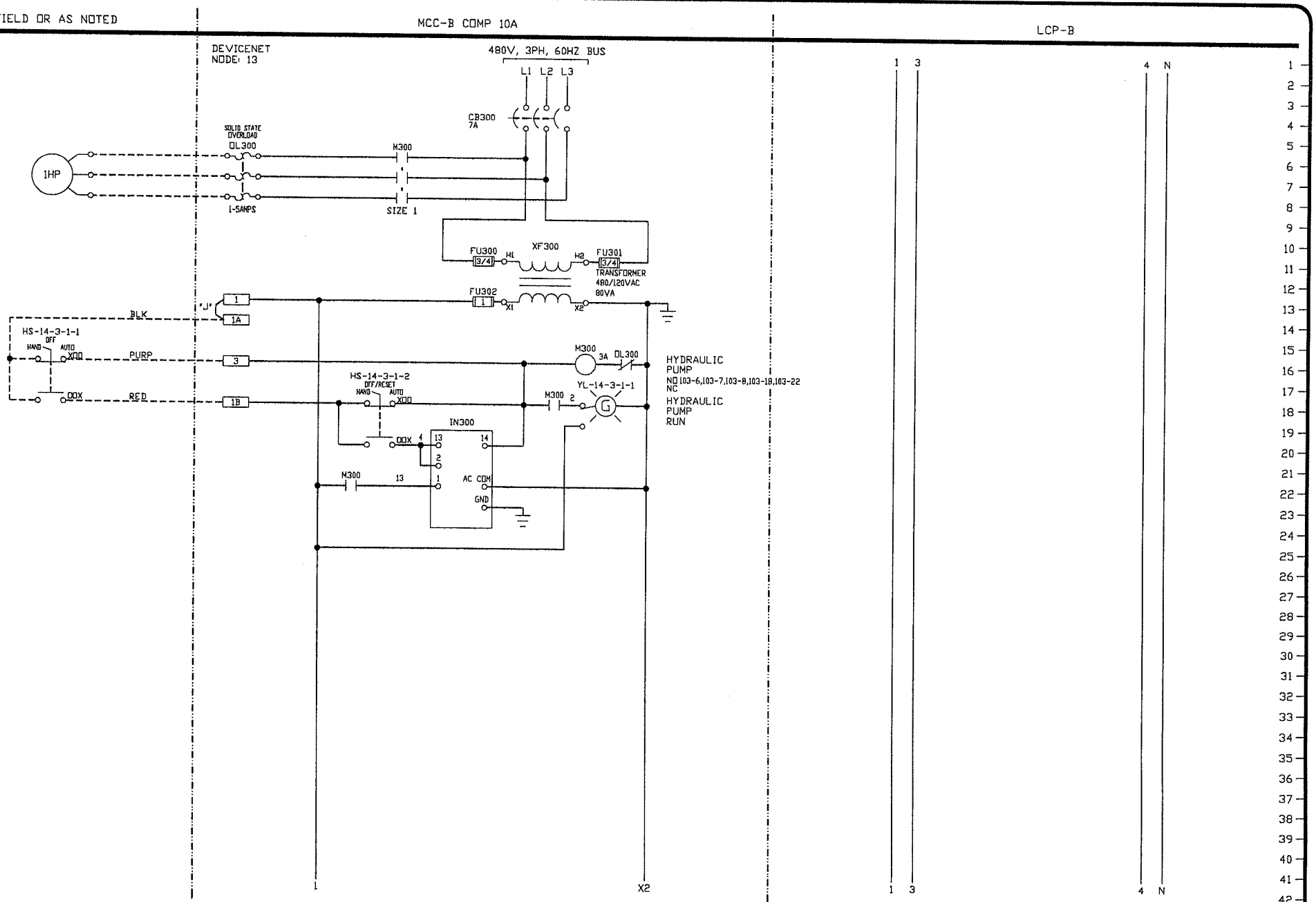
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SHEET	13 OF 42

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
THICKENING/DEWATERING PRESS
LOWER BELT DRIVE

PROJ. NO. 1520B

DWG. NO. 102B



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SHEET	14 OF 42

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
THICKENING/DEWATERING PRESS
HYDRAULIC PUMP

PROJ. NO. 1520B
DWG. NO. 103

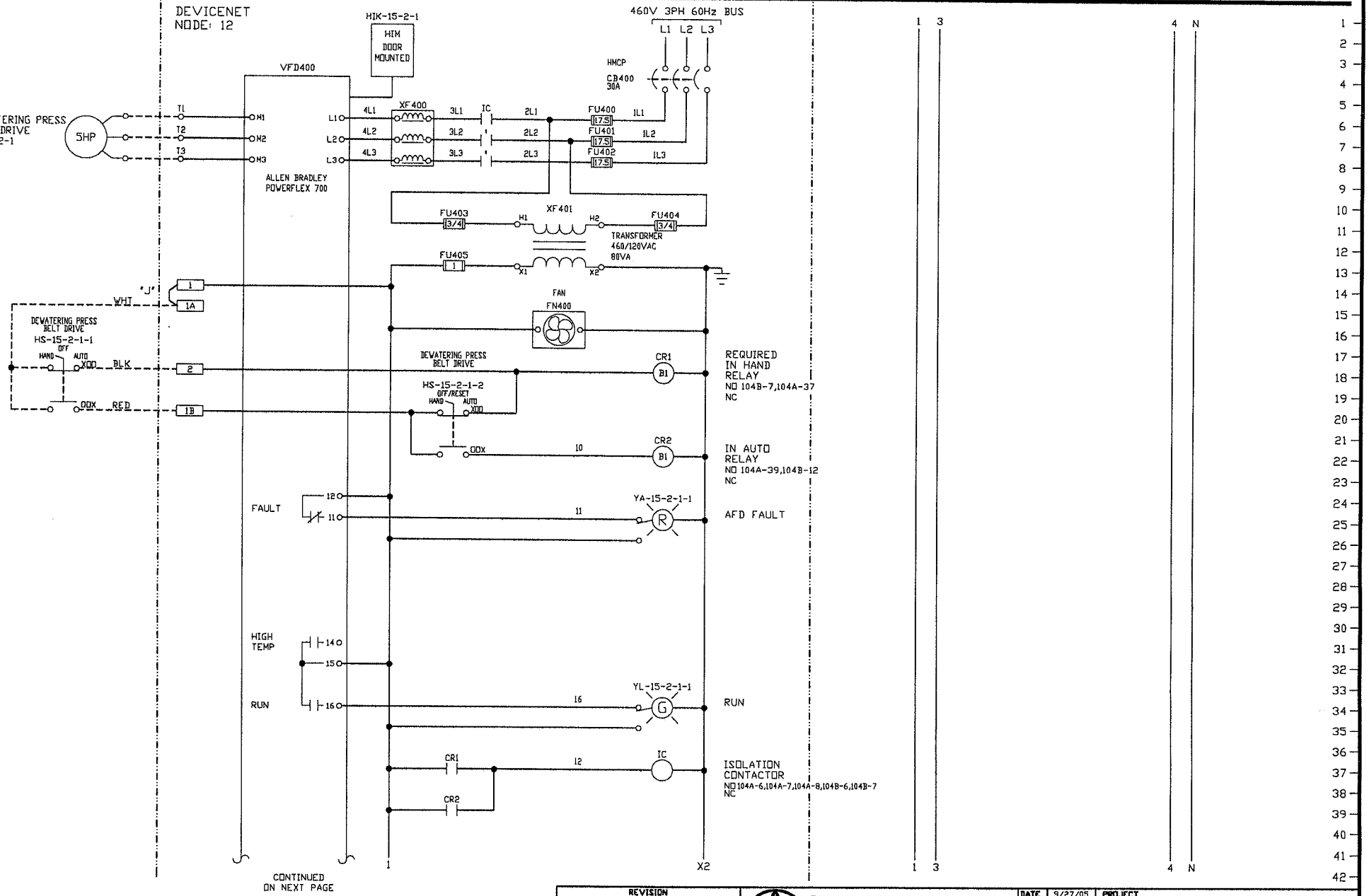
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LCP-B



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ENGR.	JJ
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SHEET	15 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
DEWATERING PRESS BELT DRIVE

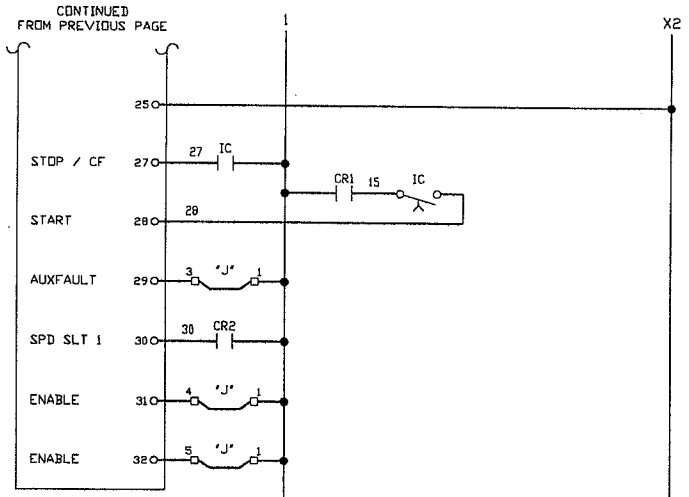
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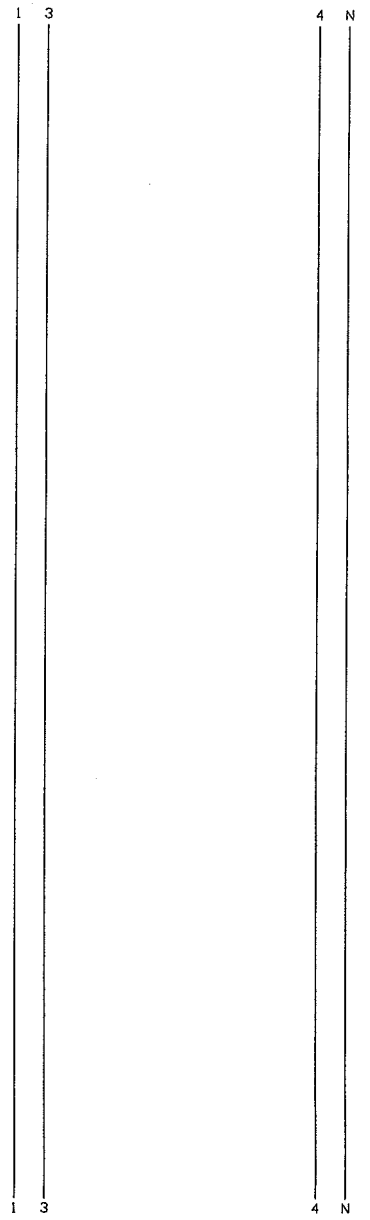
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LCP-B





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SHEET	16 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
DEWATERING PRESS BELT DRIVE

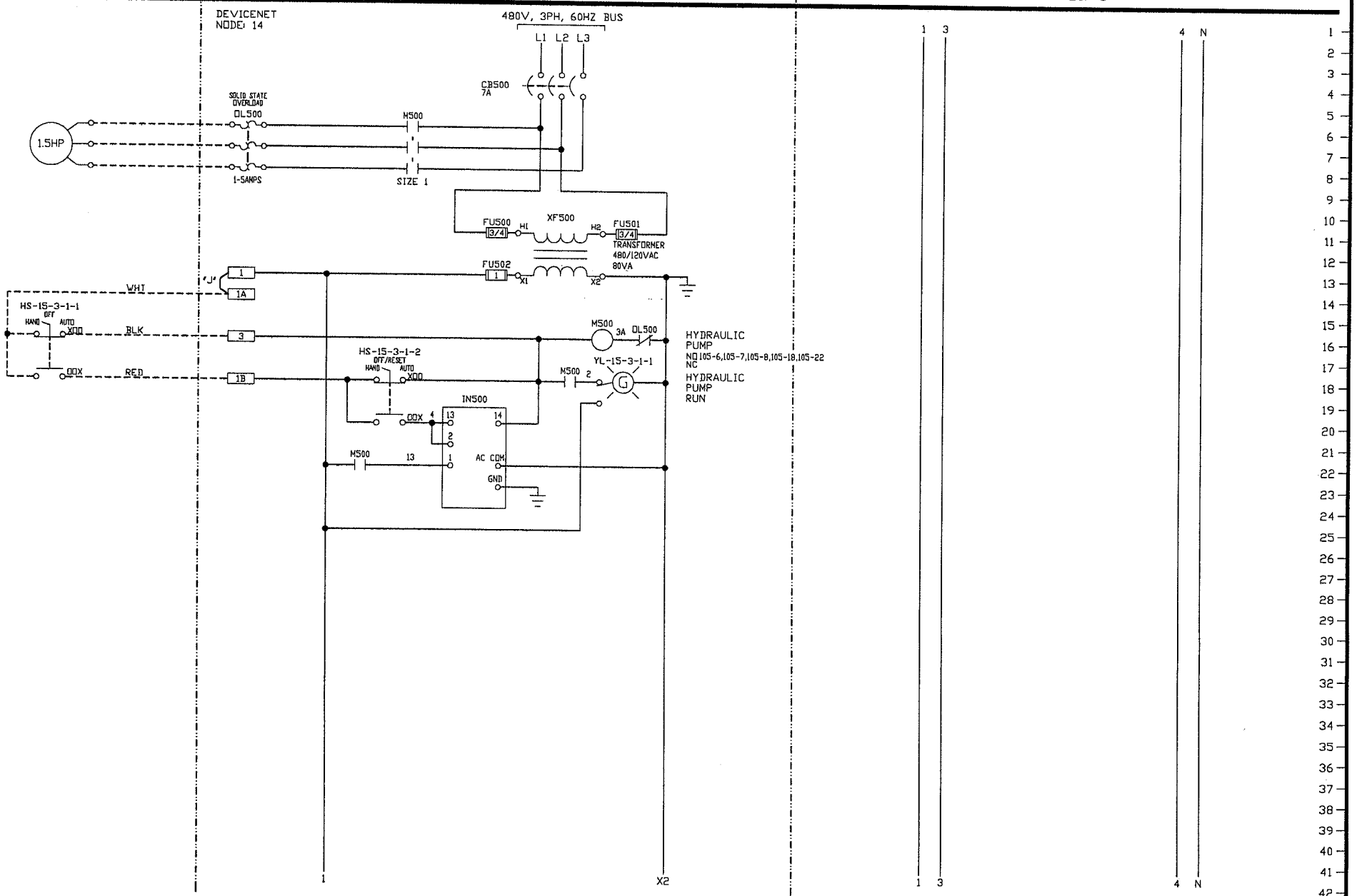
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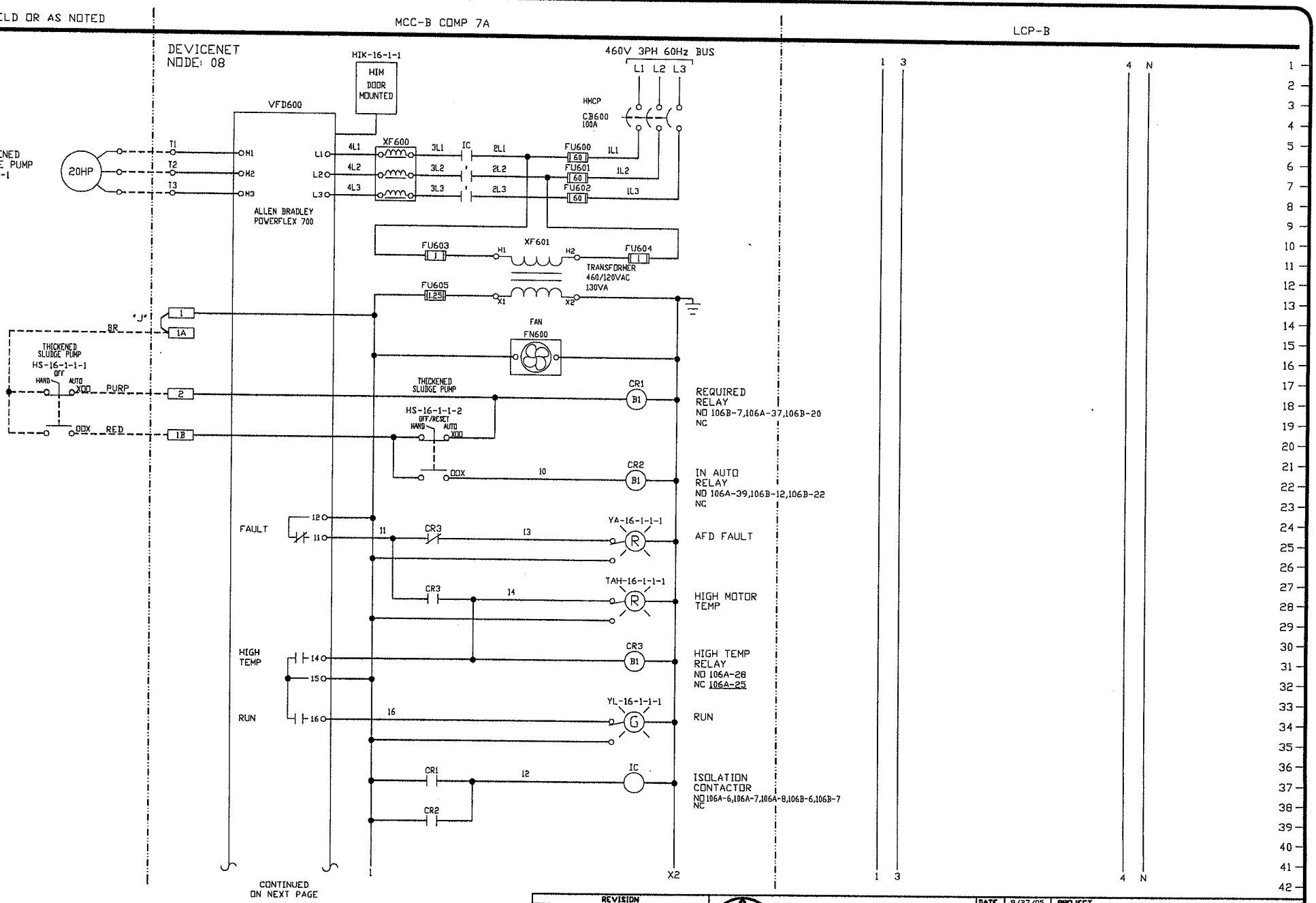
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ENGR.	JJ
ASSEM.	
SHEET	17 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
DEWATERING PRESS
HYDRAULIC PUMP

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DWG. NO. 105



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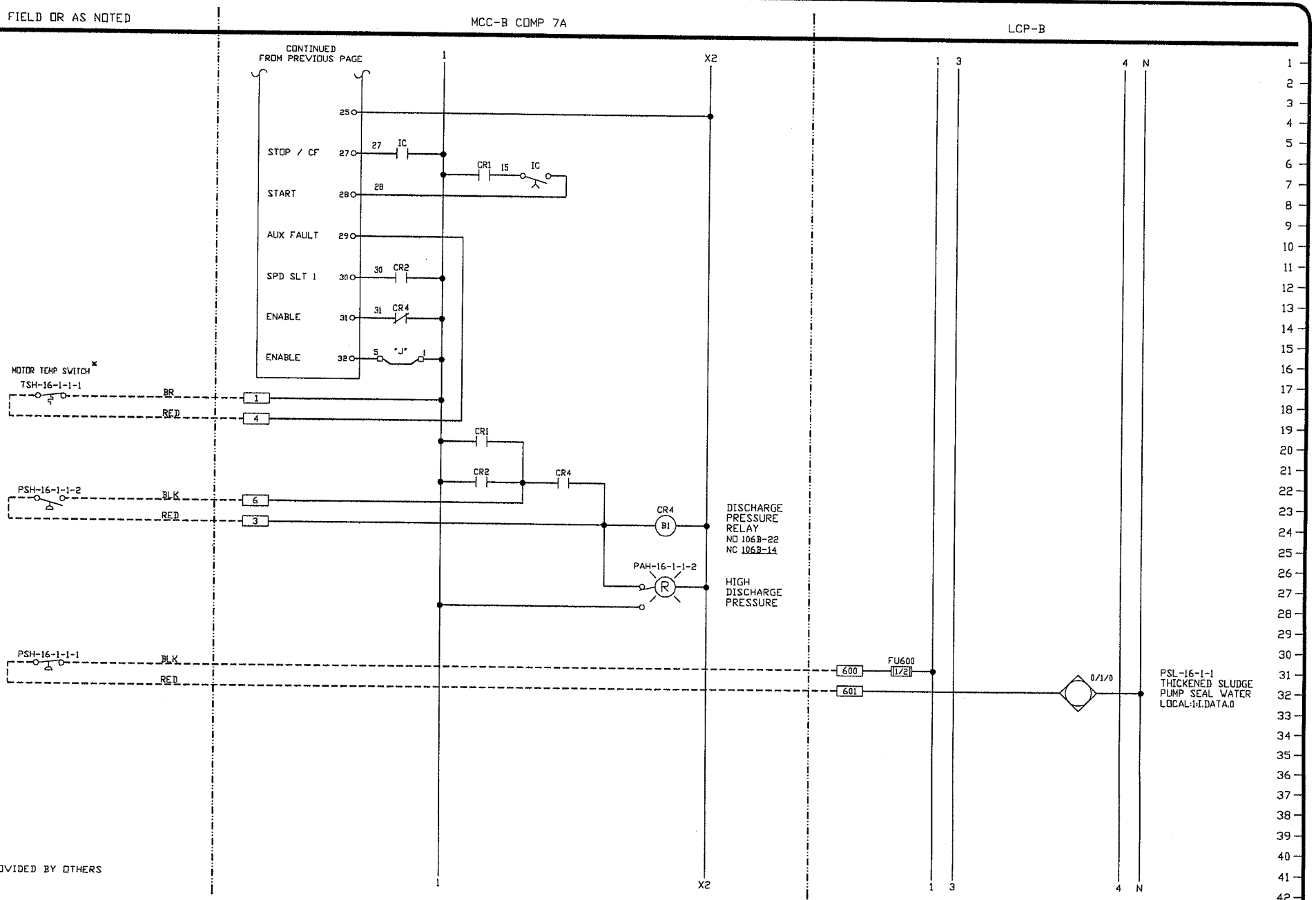
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ENGR.	JJ
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SHEET	18 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
THICKENED SLUDGE PUMP

PROJ. NO. 1520B

DWG. NO. 106A



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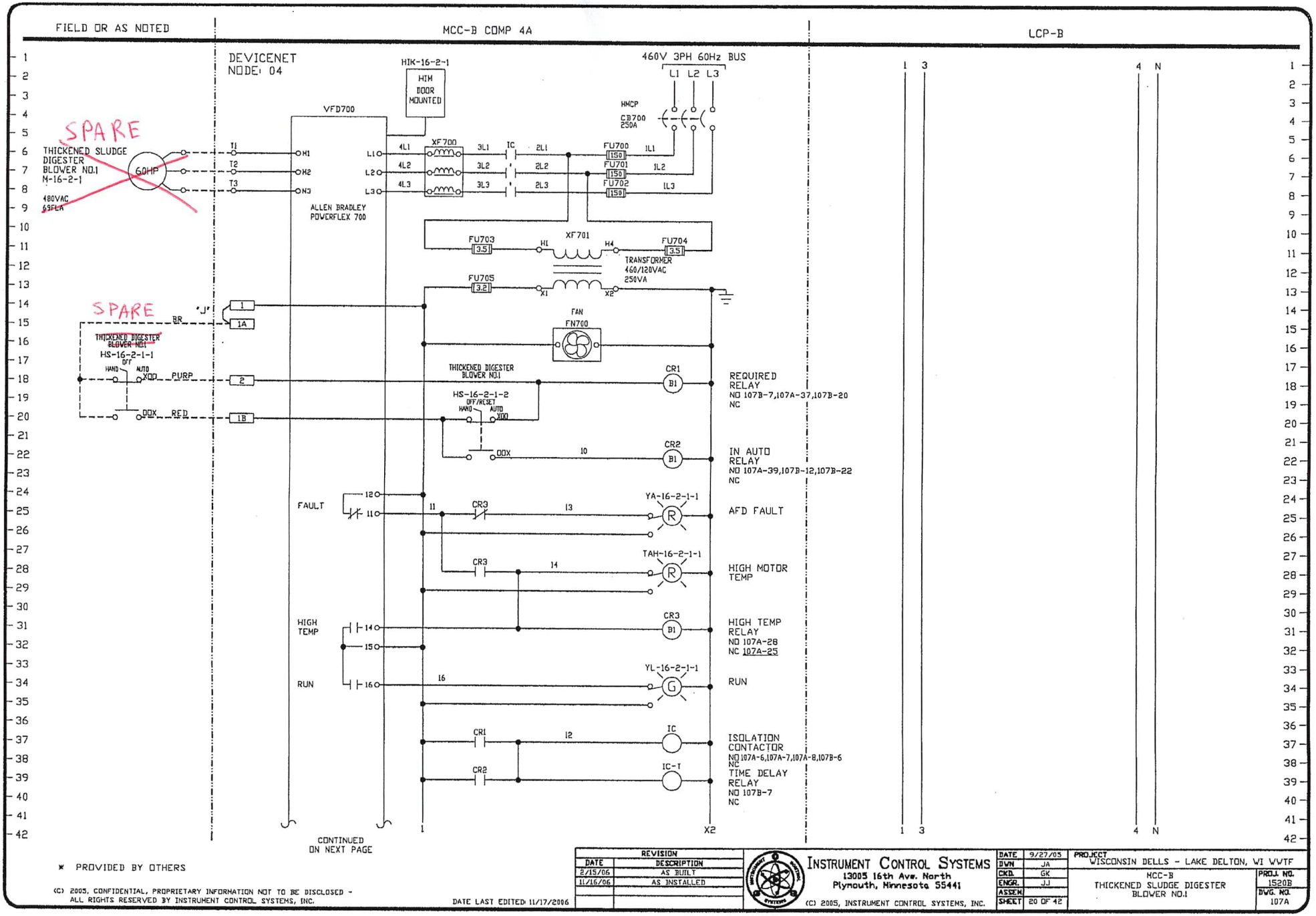
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SHEET	19 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
MCC-B
THICKENED SLUDGE PUMP
PROJ. NO. 1520B
DWG. NO. 106B

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ASSEM.	
SHEET	20 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
THICKENED SLUDGE DIGESTER BLOWER NO.1

PROJ. NO. 1520B

DWG. NO. 107A

FIELD OR AS NOTED | MCC-B COMP 4A | LCP-B

CONTINUED FROM PREVIOUS PAGE

STOP / CF 27
START 28
AUX FAULT 29
SPD SLT 1 30
ENABLE 31
ENABLE 32

27 IC
CR1 15 IC-T
28
30 CR2
31 CR4
5 "J" 1

MOTOR TEMP SWITCH
TSH-16-2-1-1
BLK 1
RED 4

TSH-16-2-1-2
BR 6
RED 3

CR1
CR2 CR4
CR4 B1

HIGH AIR TEMPERATURE RELAY
NO 107B-22
NC 107B-14

TAH-16-2-1-2 R
HIGH AIR TEMPERATURE

1 X2
1 3
4 N

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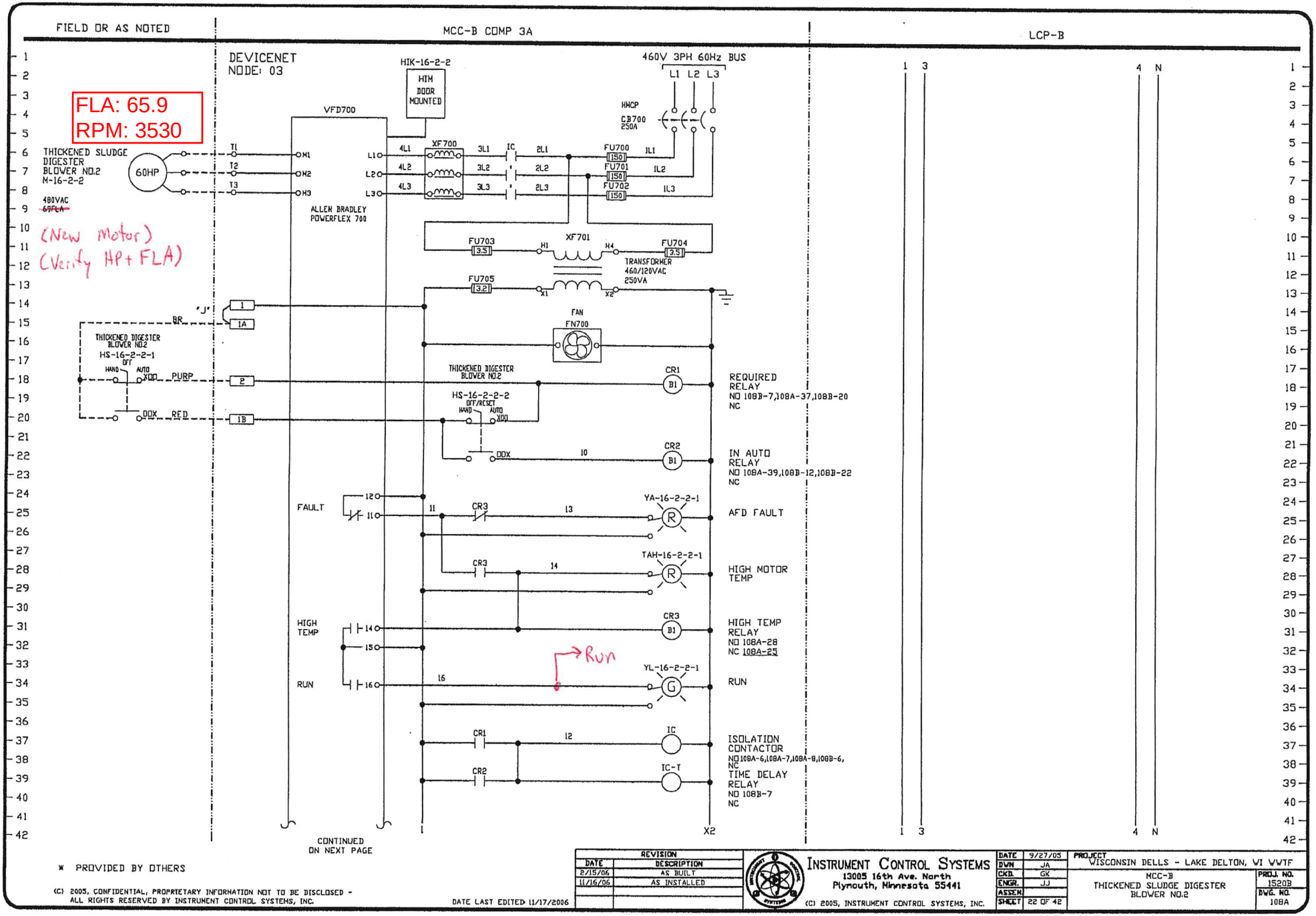
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DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

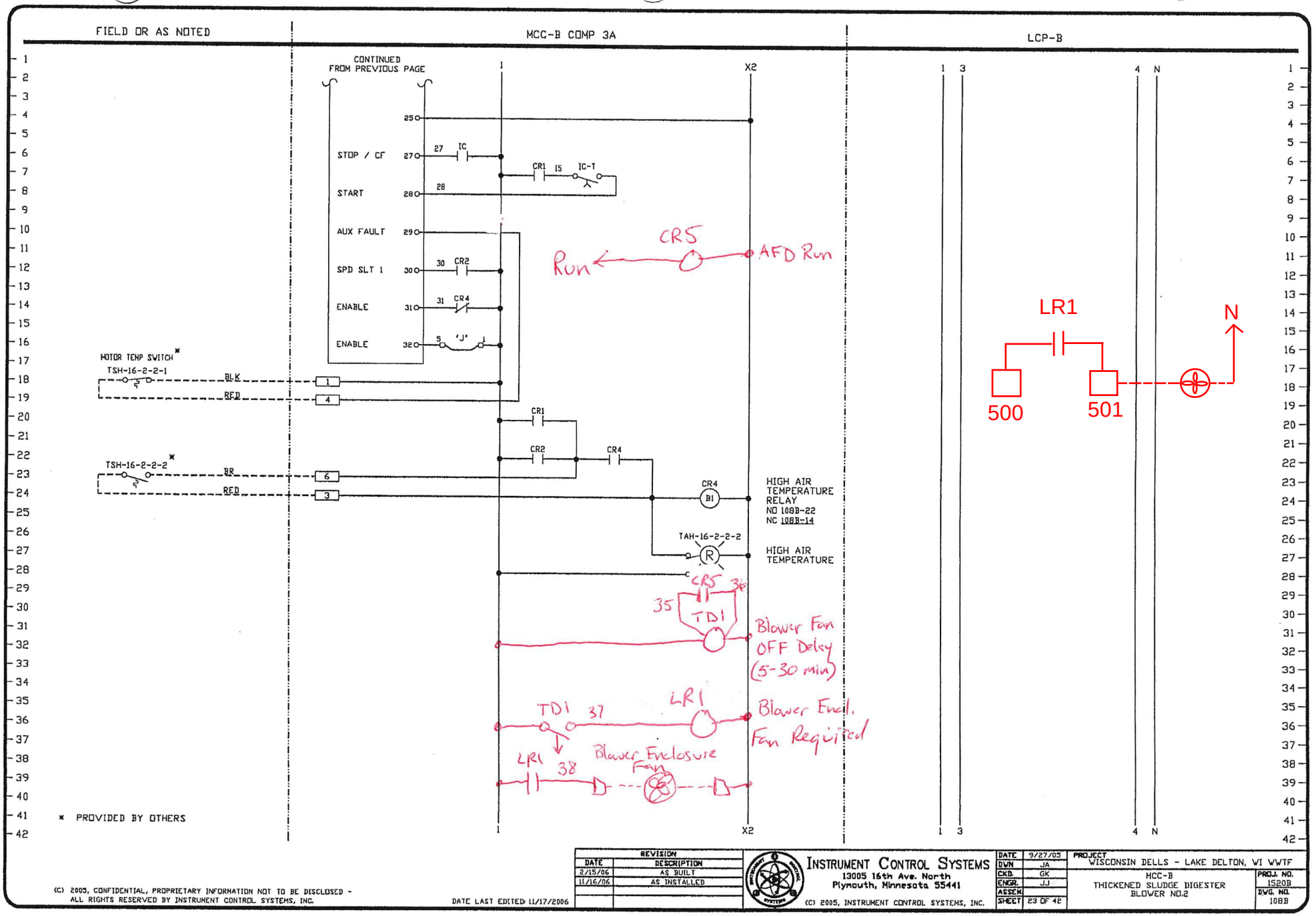
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	21 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
NCC-B
THICKENED SLUDGE DIGESTER BLOWER NO.1
PROJ. NO. 1520B
DWG. NO. 107B


FIELD OR AS NOTED
MCC-B COMP 3A
LCP-B
DEVICENET
NODE: 03
HIK-16-2-2
HIM
DOOR
MOUNTED
460V 3PH 60Hz BUS
L1 L2 L3
HWCP
CB700
250A
VFD700
FLA: 65.9
RPM: 3530
THICKENED SLUDGE
DIGESTER
BLOWER NO.2
M-16-2-2
60HP
480VAC
69FLA
(New Motor)
(Verify HP+ FLA)
T1
T2
T3
H1
H2
H3
L1
L2
L3
4L1
4L2
4L3
XF700
3L1
3L2
3L3
IC
2L1
2L2
2L3
FU700
FU701
FU702
150
1L1
1L2
1L3
ALLEN BRADLEY
POWERFLEX 700
FU703
FU704
3.5
XF701
H1
H4
TRANSFORMER
460/120VAC
250VA
FU705
3.2
X1
X2
"J"
1
1A
BR
FAN
FN700
THICKENED DIGESTER
BLOWER NO.2
HS-16-2-2-1
OFF
HAND
AUTO
XDO
PURP
2
DOX
RED
1B
THICKENED DIGESTER
BLOWER NO.2
HS-16-2-2
OFF/RESET
HAND
AUTO
XDO
CR1
B1
REQUIRED
RELAY
NO 108B-7,108A-37,108B-20
NC
DOX
10
CR2
B1
IN AUTO
RELAY
NO 108A-39,108B-12,108B-22
NC
FAULT
12
11
CR3
13
YA-16-2-2-1
R
AFD FAULT
CR3
14
TAH-16-2-2-1
R
HIGH MOTOR
TEMP
HIGH
TEMP
14
15
CR3
B1
HIGH TEMP
RELAY
NO 108A-28
NC 108A-25
Run
RUN
16
16
YL-16-2-2-1
G
RUN
CR1
12
IC
ISOLATION
CONTACTOR
NO 108A-6,108A-7,108A-8,108B-6,
NC
CR2
IC-T
TIME DELAY
RELAY
NO 108B-7
NC
1
X2
1 3
4 N
CONTINUED
ON NEXT PAGE
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REVISION
DATE
DESCRIPTION
2/15/06
AS BUILT
11/16/06
AS INSTALLED
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.
DATE 9/27/05
DWN JA
CKD. GK
ENGR. JJ
ASSEM.
SHEET 22 OF 42
PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF
MCC-B
THICKENED SLUDGE DIGESTER
BLOWER NO.2
PROJ. NO.
1520B
DWG. NO.
108A



REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

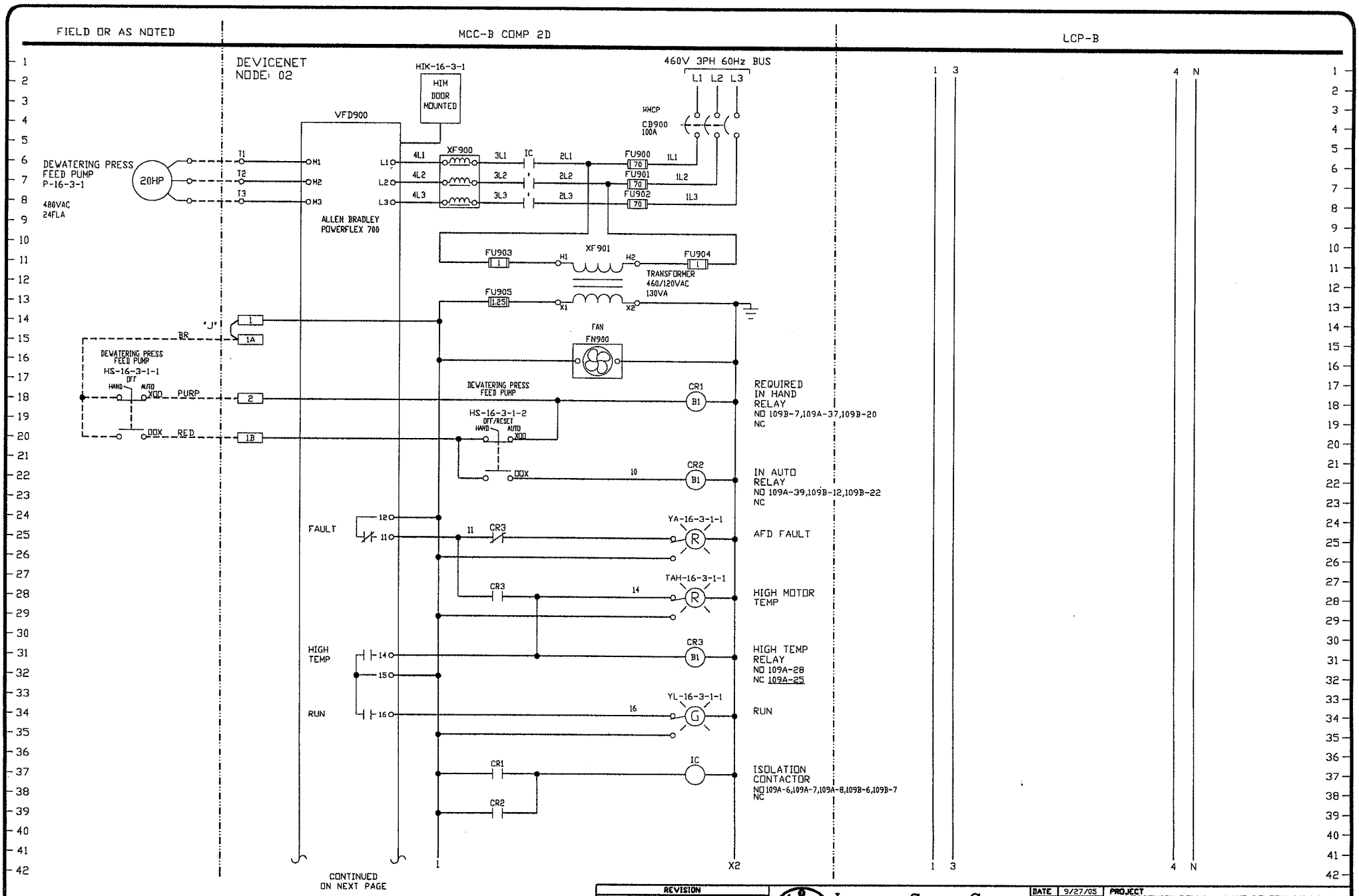
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	23 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
MCC-B
THICKENED SLUDGE DIGESTER BLOWER NO.2
PROJ. NO. 1520B
DWG. NO. 108B

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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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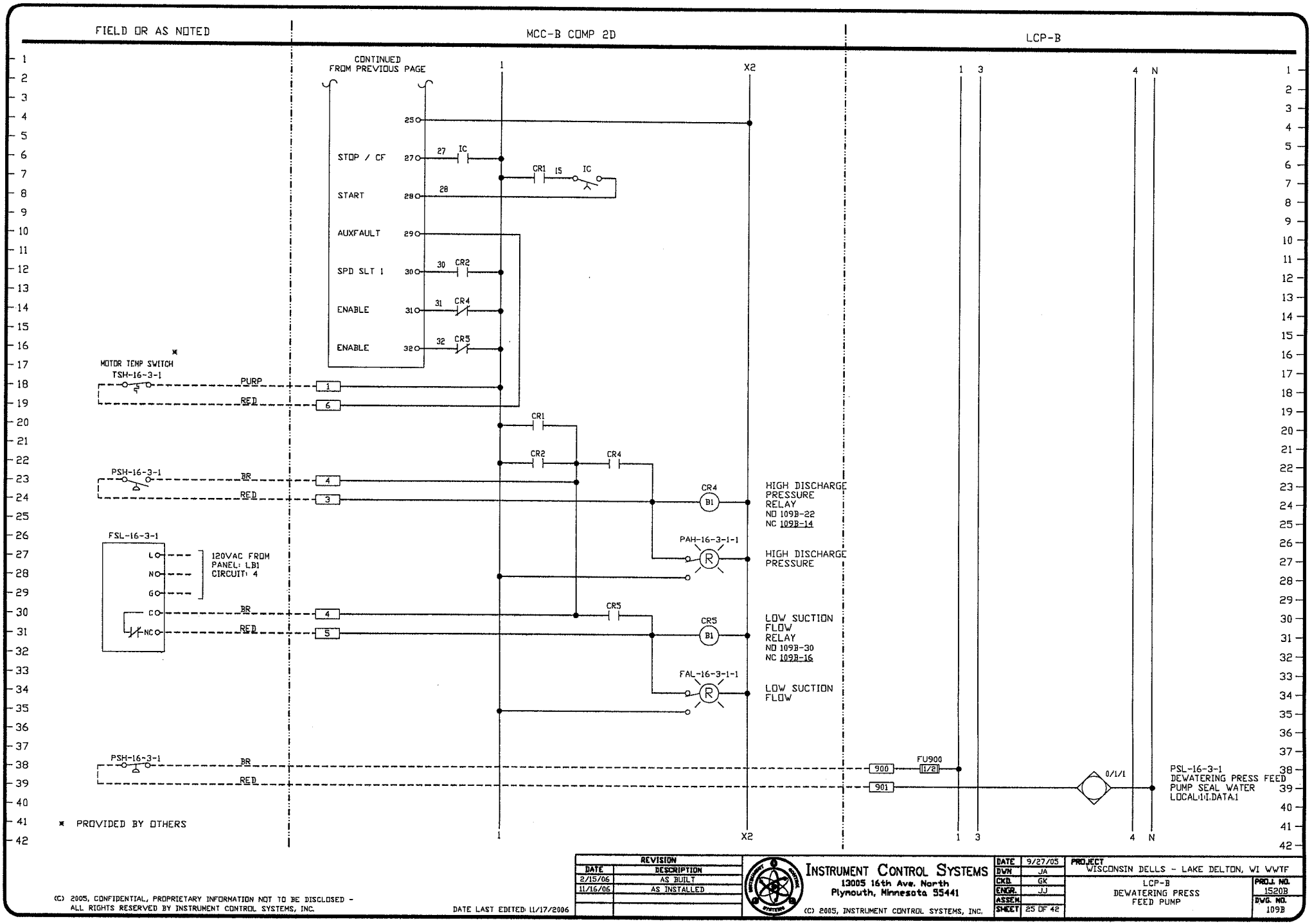
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	24 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
DEWATERING PRESS
FEED PUMP

PROJ. NO. 1520B

DWG. NO. 109A



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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

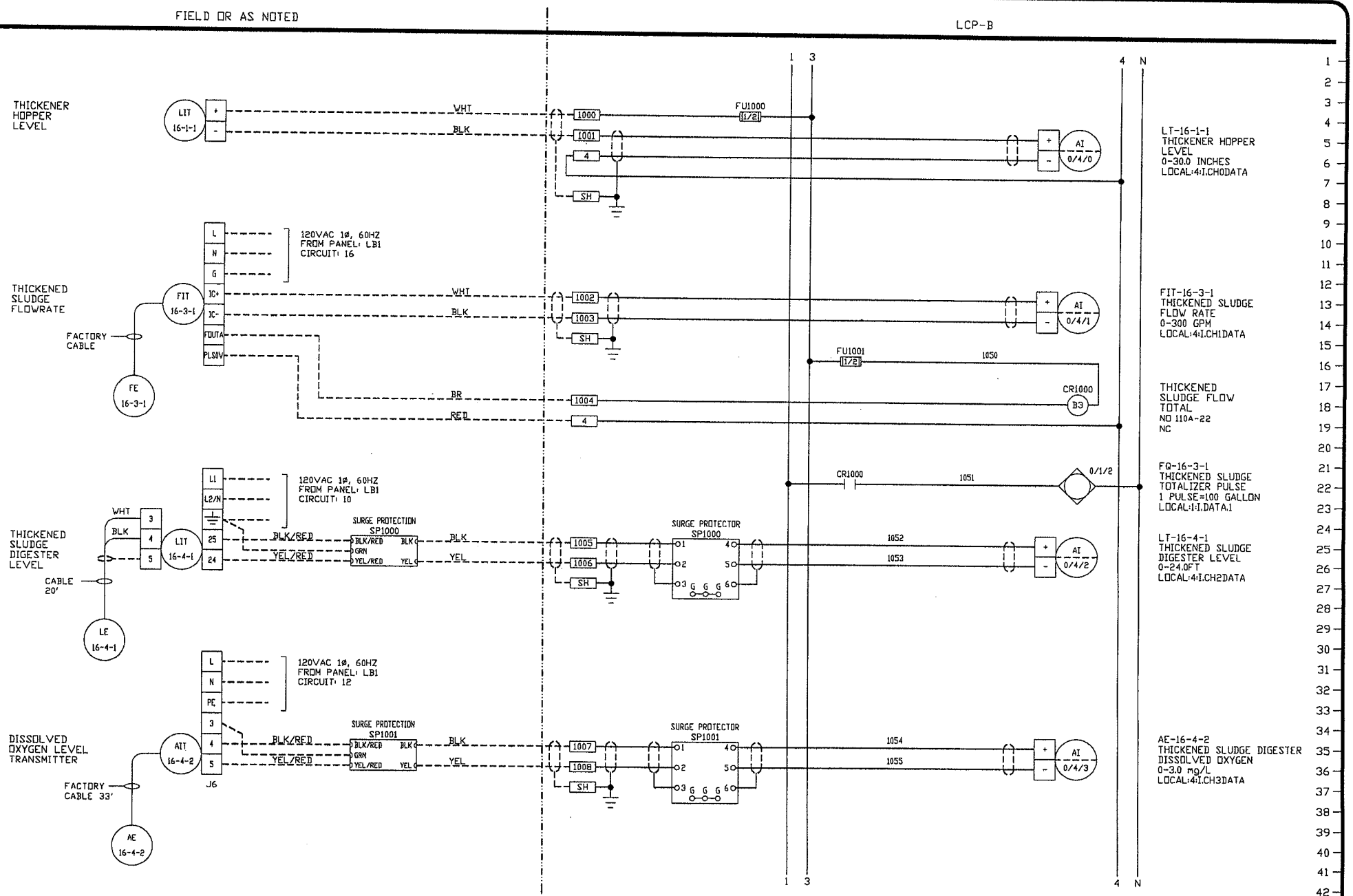
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	25 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
DEWATERING PRESS FEED PUMP

PROJ. NO. 1520B
DWG. NO. 109B



REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

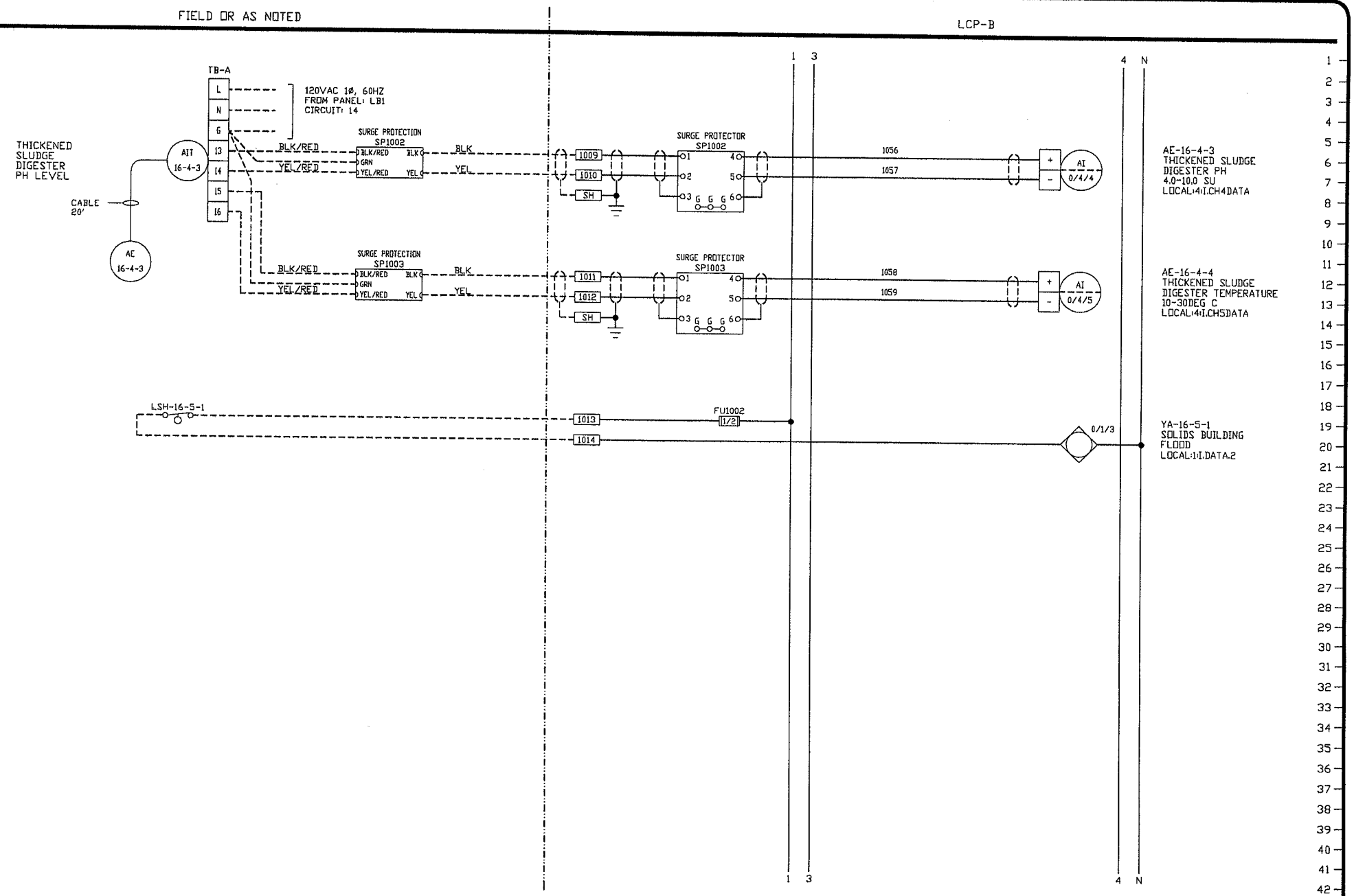
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	26 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-B
THICKENED SLUDGE TRANSMITTERS
PROJ. NO. 1520B
DWG. NO. 110A

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13005 16th Ave. North
Plymouth, Minnesota 55441

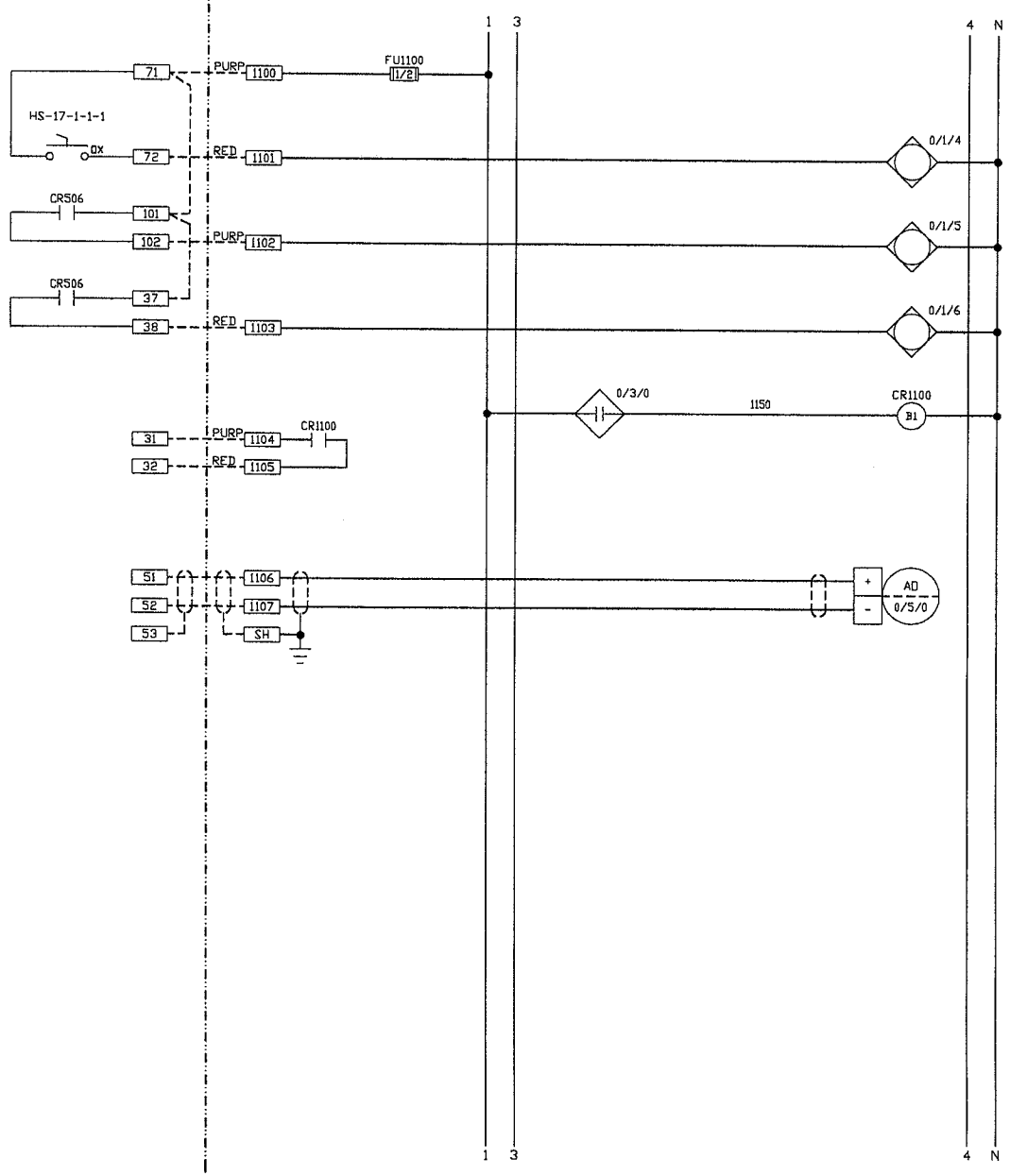
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	27 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-B
THICKENED SLUDGE
TRANSMITTERS
PROJ. NO. 1520B
DWG. NO. 110B

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FIELD OR AS NOTED | LCP-17-1-1 * | LCP-B



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2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	28 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
POLYMER FEED UNIT NO.1

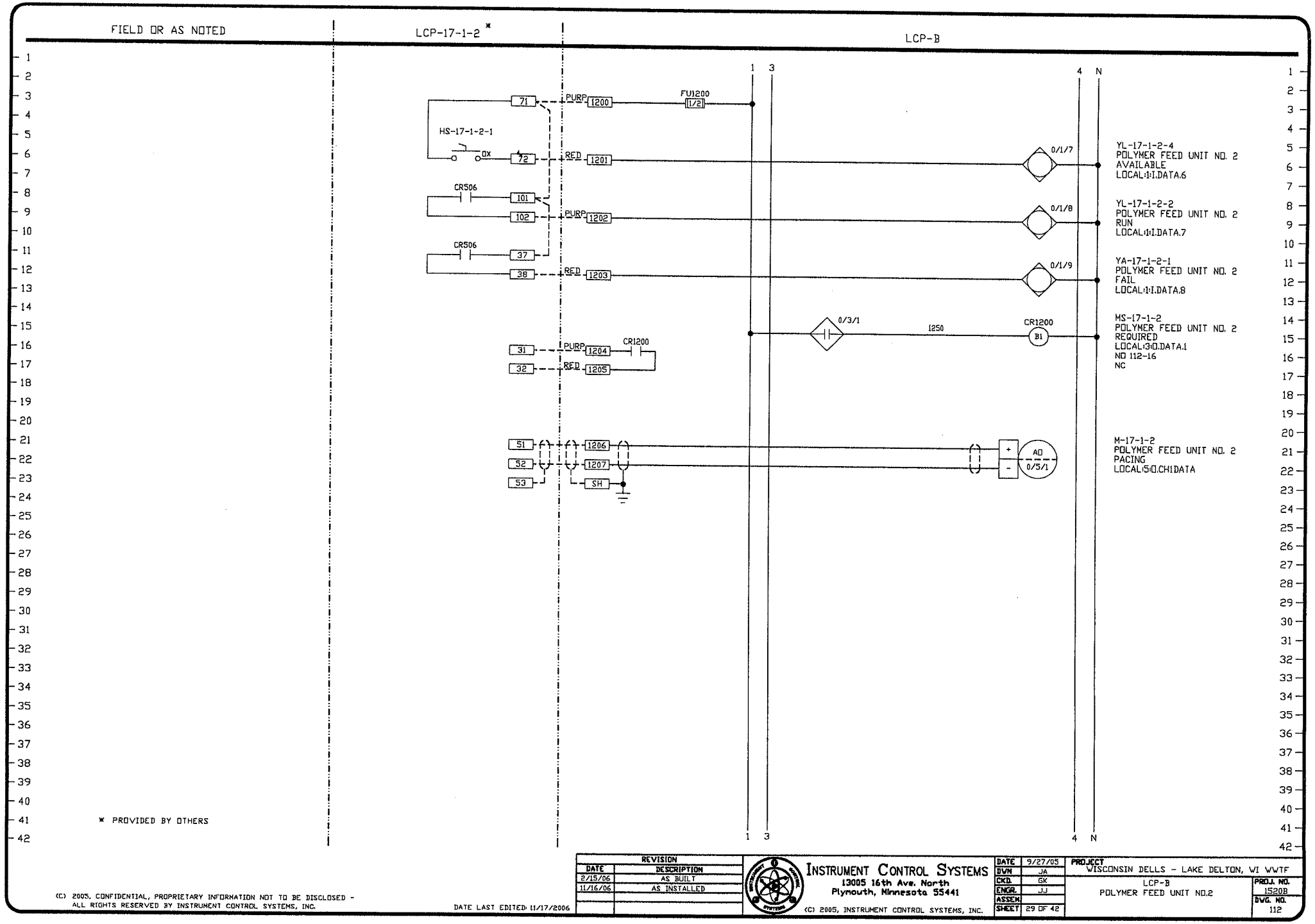
PROJ. NO. 1520B

DWG. NO. 111

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

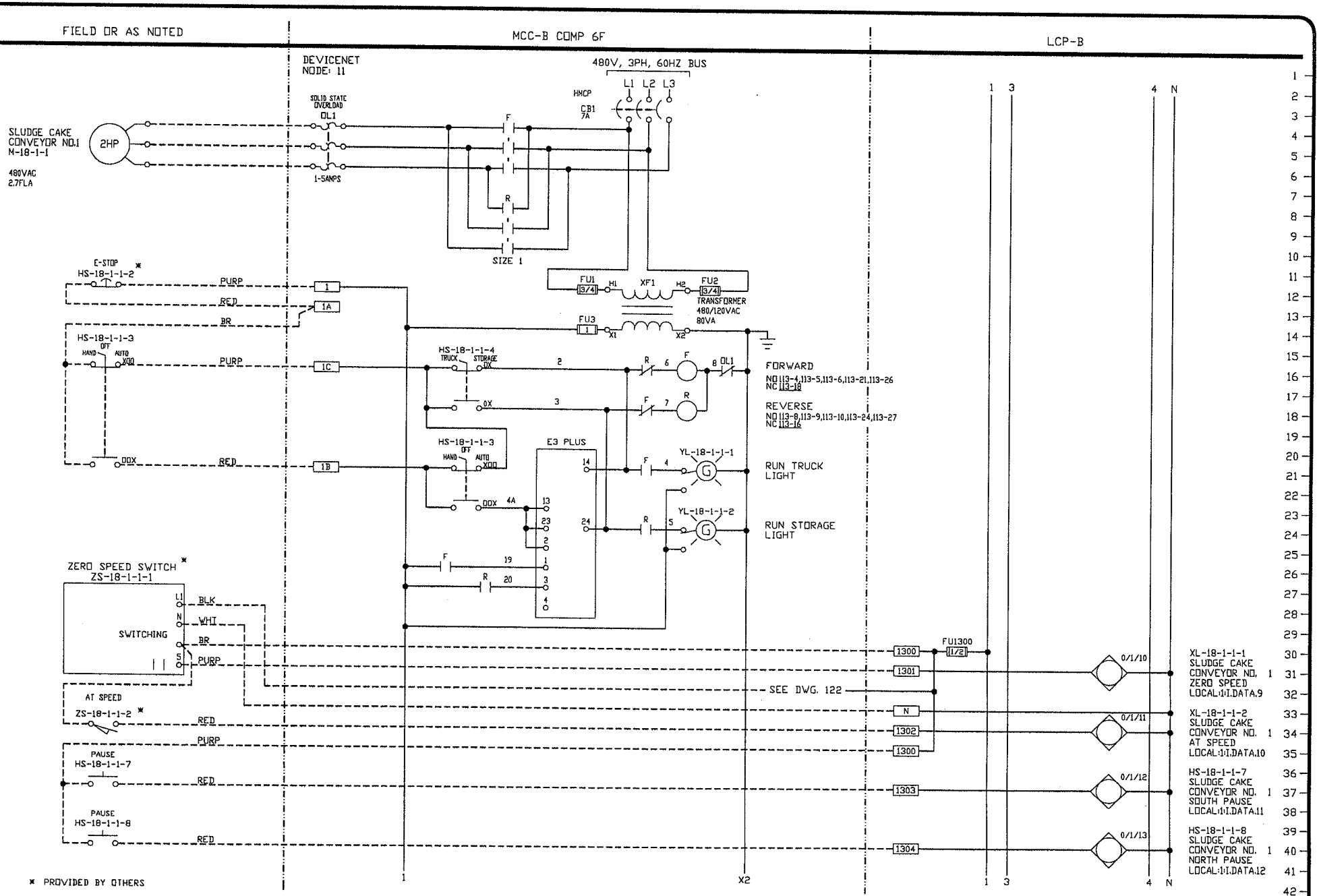
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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	29 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-B
POLYMER FEED UNIT NO.2
PROJ. NO. 1520B
DWG. NO. 112

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13005 16th Ave. North
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	30 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

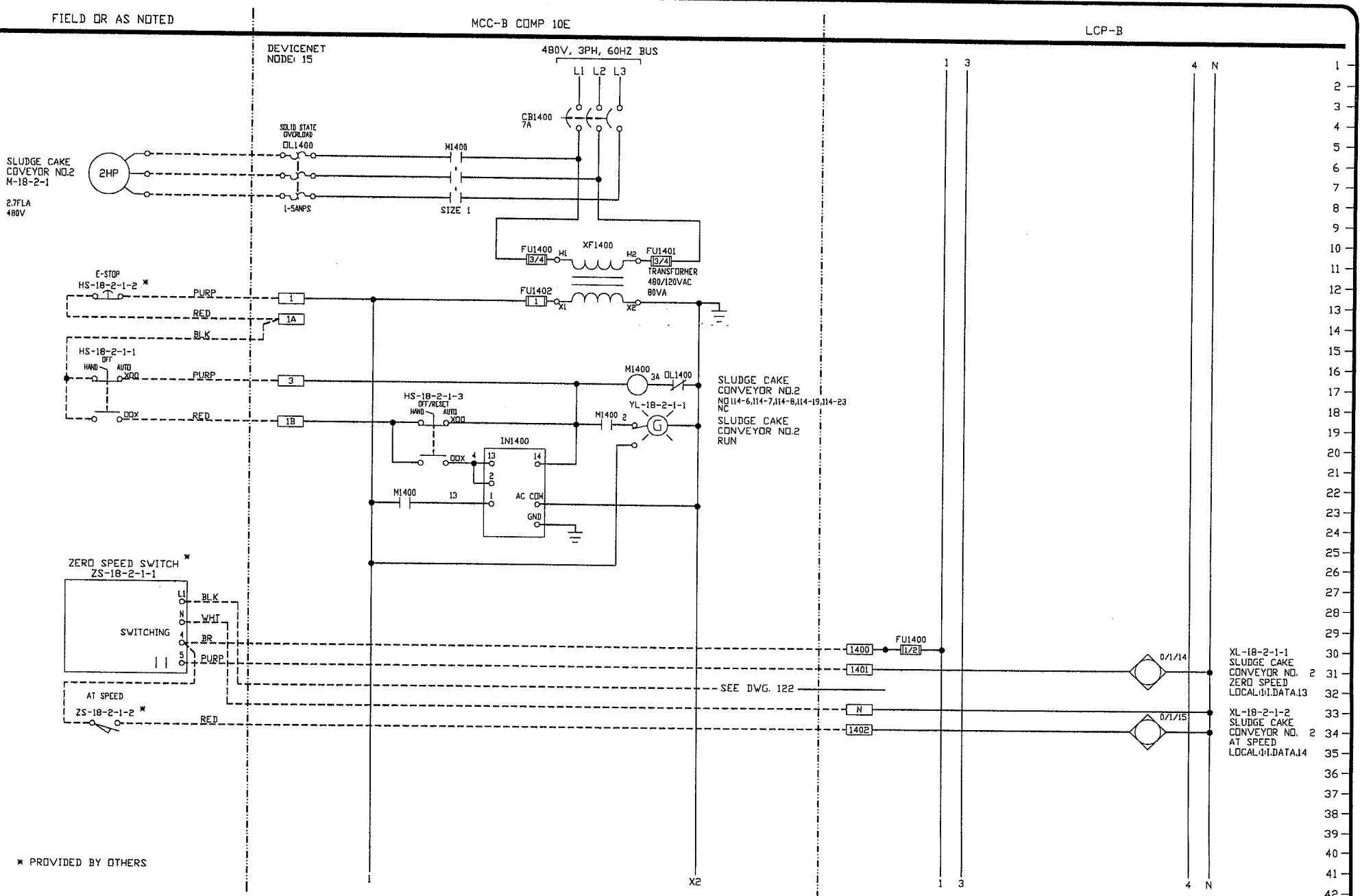
LCP-B
SLUDGE CAKE CONVEYOR NO.1

PROJ. NO. 1520B

DWG. NO. 113

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	31 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

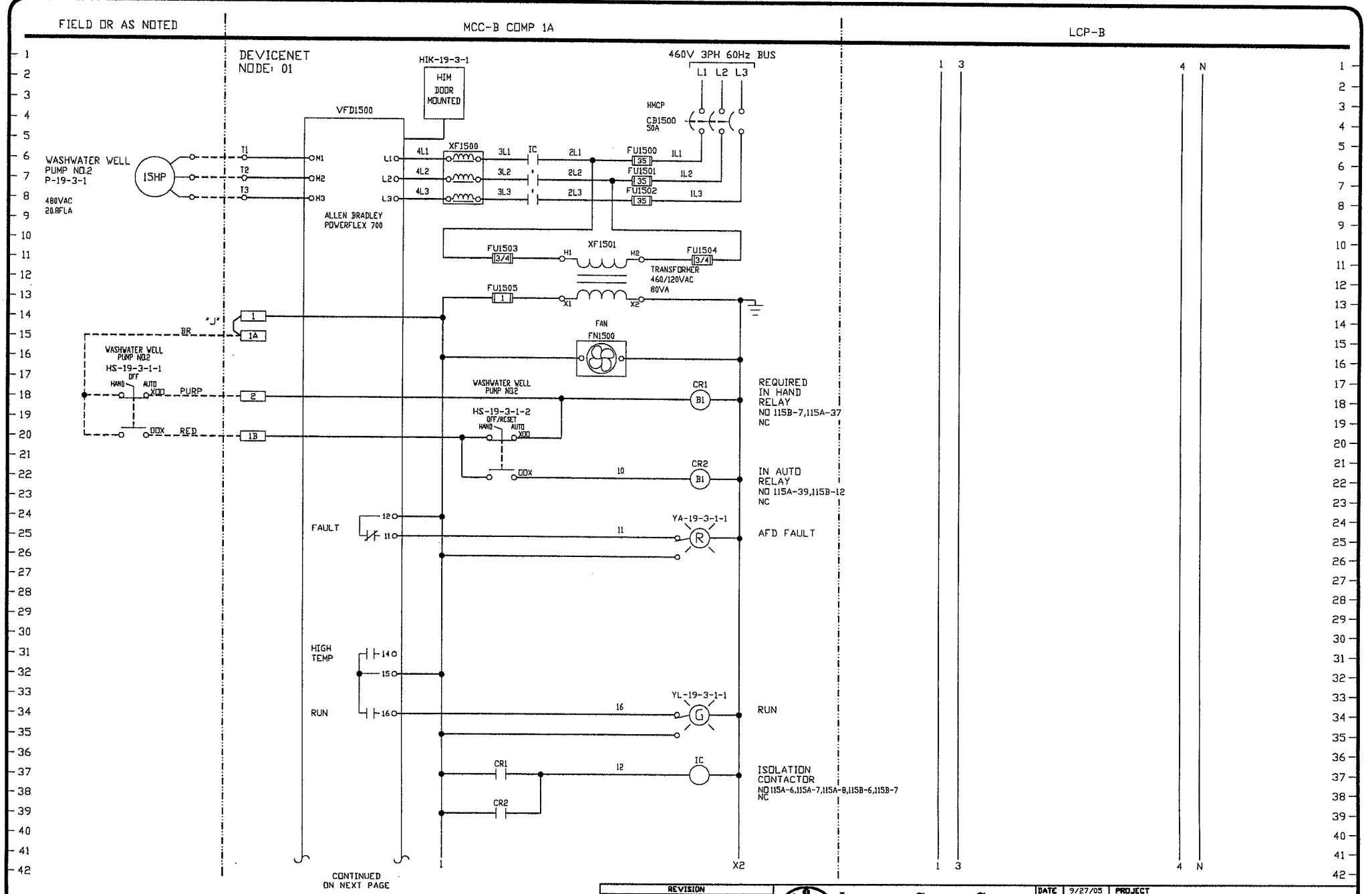
MCC-B
SLUDGE CAKE CONVEYOR NO.2

PROJ. NO. 1520B

DWG. NO. 114

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DATE	DESCRIPTION
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	32 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
WASHWATER WELL PUMP NO.2

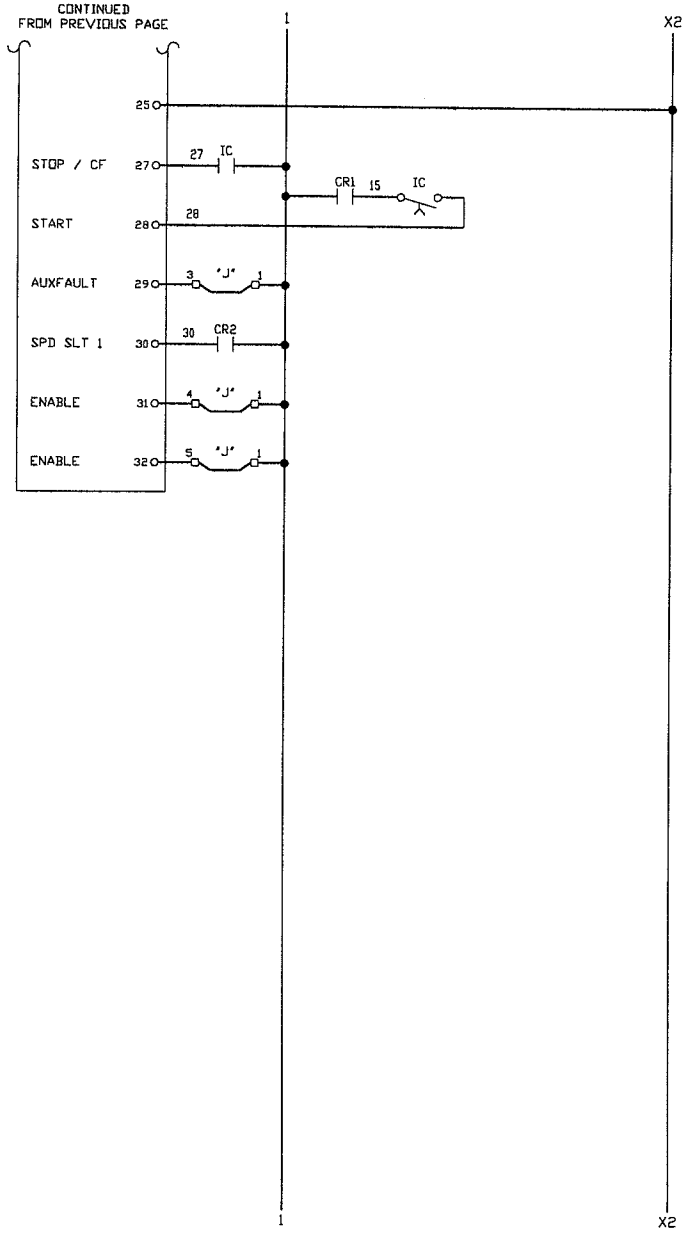
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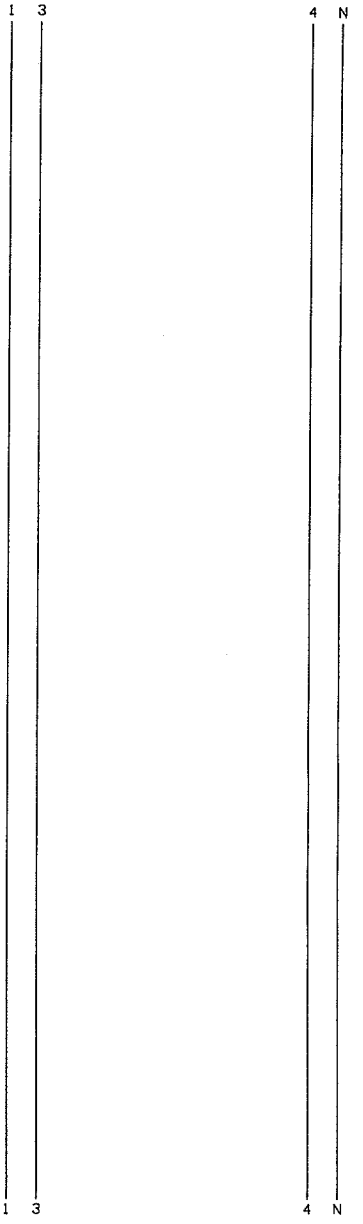
DWG. NO. 115A

FIELD OR AS NOTED

MCC-B COMP 1A

LCP-B





REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	33 OF 42

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
WASHWATER WELL PUMP NO.2

PROJ. NO. 1520B
DWG. NO. 115B

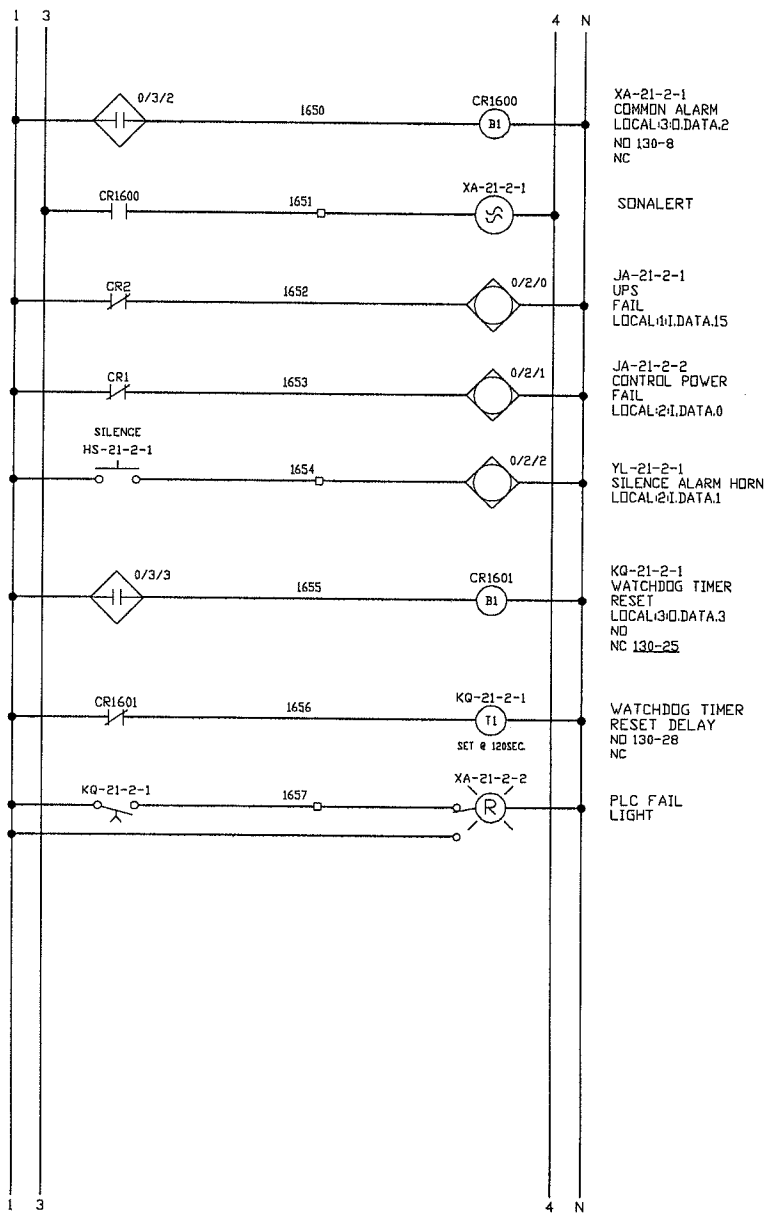
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEN.	
SHEET	34 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
ALARM MONITORING

PROJ. NO. 1520B

DWG. NO. 116

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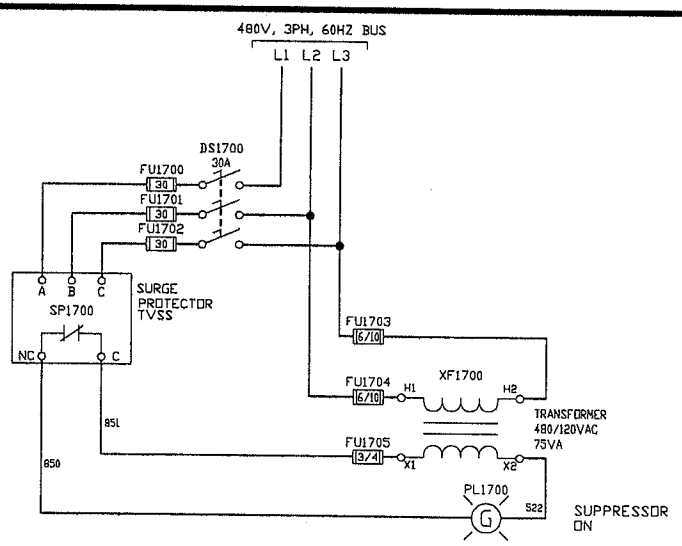
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FIELD OR AS NOTED

MCC-B COMP 10G

FIELD OR AS NOTED



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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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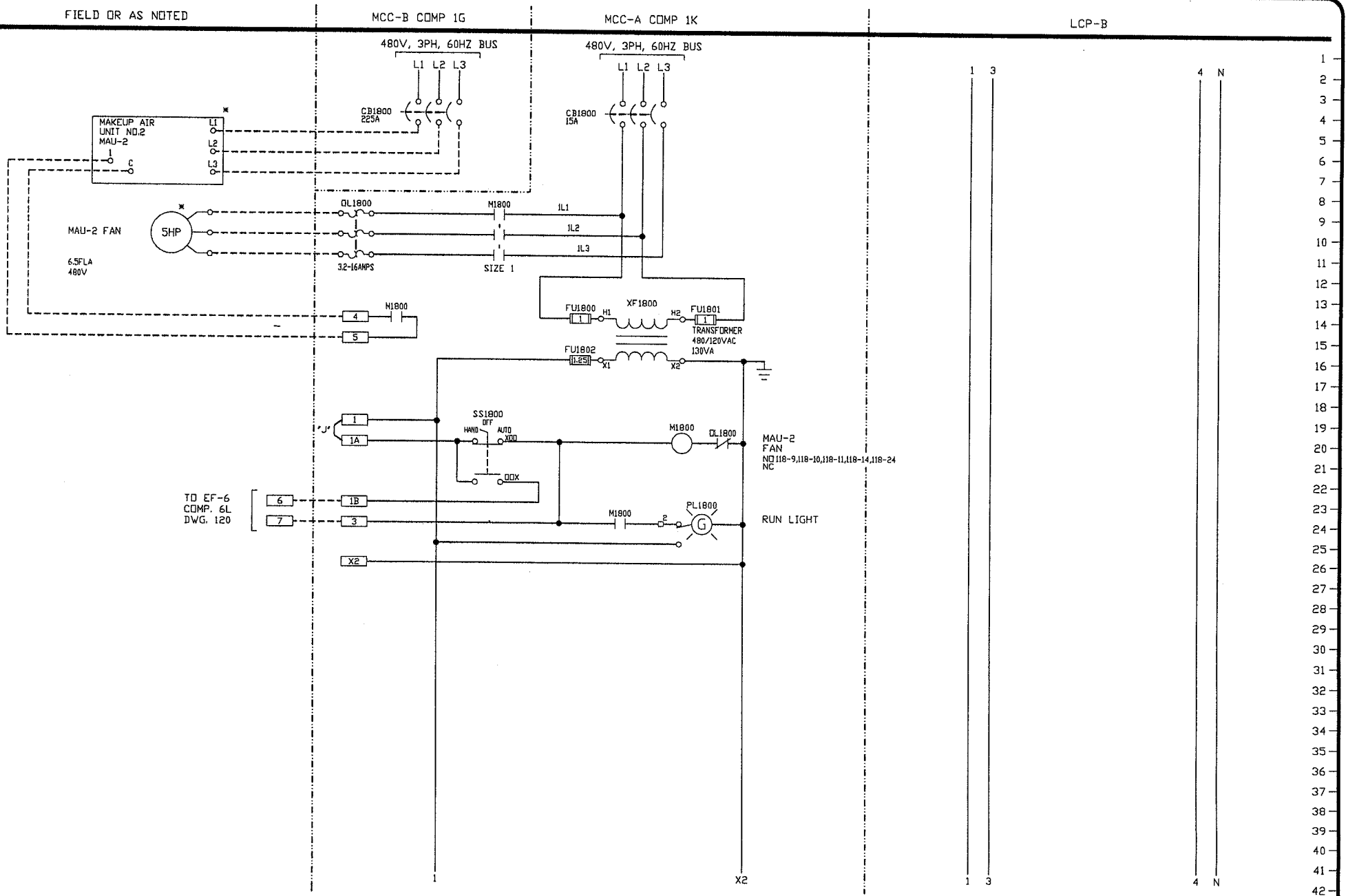
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	35 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
MOTOR CONTROL CENTER
SURGE PROTECTION

PROJ. NO. 1520B

DWG. NO. 117



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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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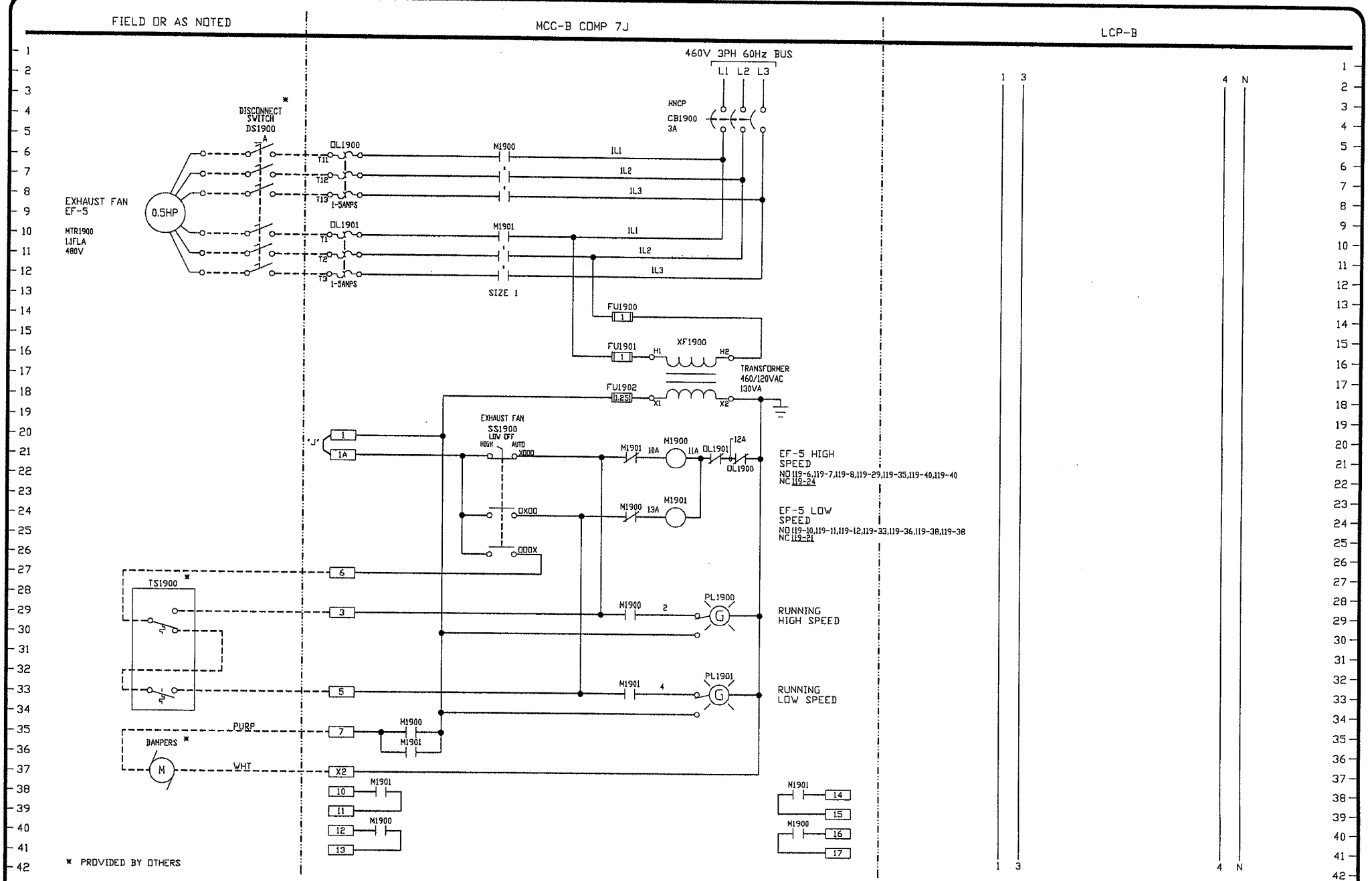
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	36 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

MCC-B
MODULAR AIR UNIT MAU-2

PROJ. NO. 1520B

DWG. NO. 118



REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

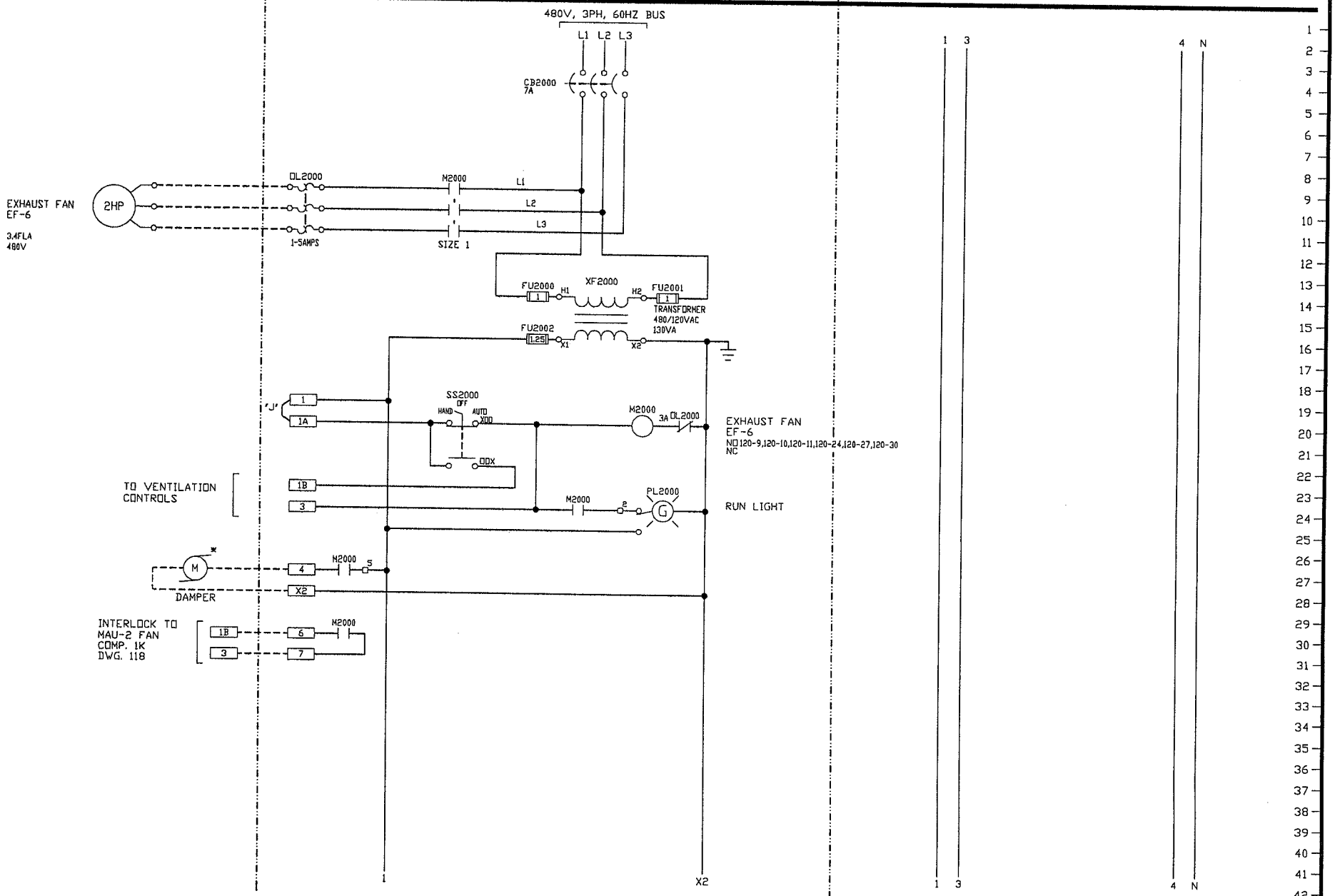
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	37 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
MCC-B
EXHAUST FAN EF-5
PROJ. NO. 1520B
DWG. NO. 119

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DATE	DESCRIPTION
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	38 OF 42

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

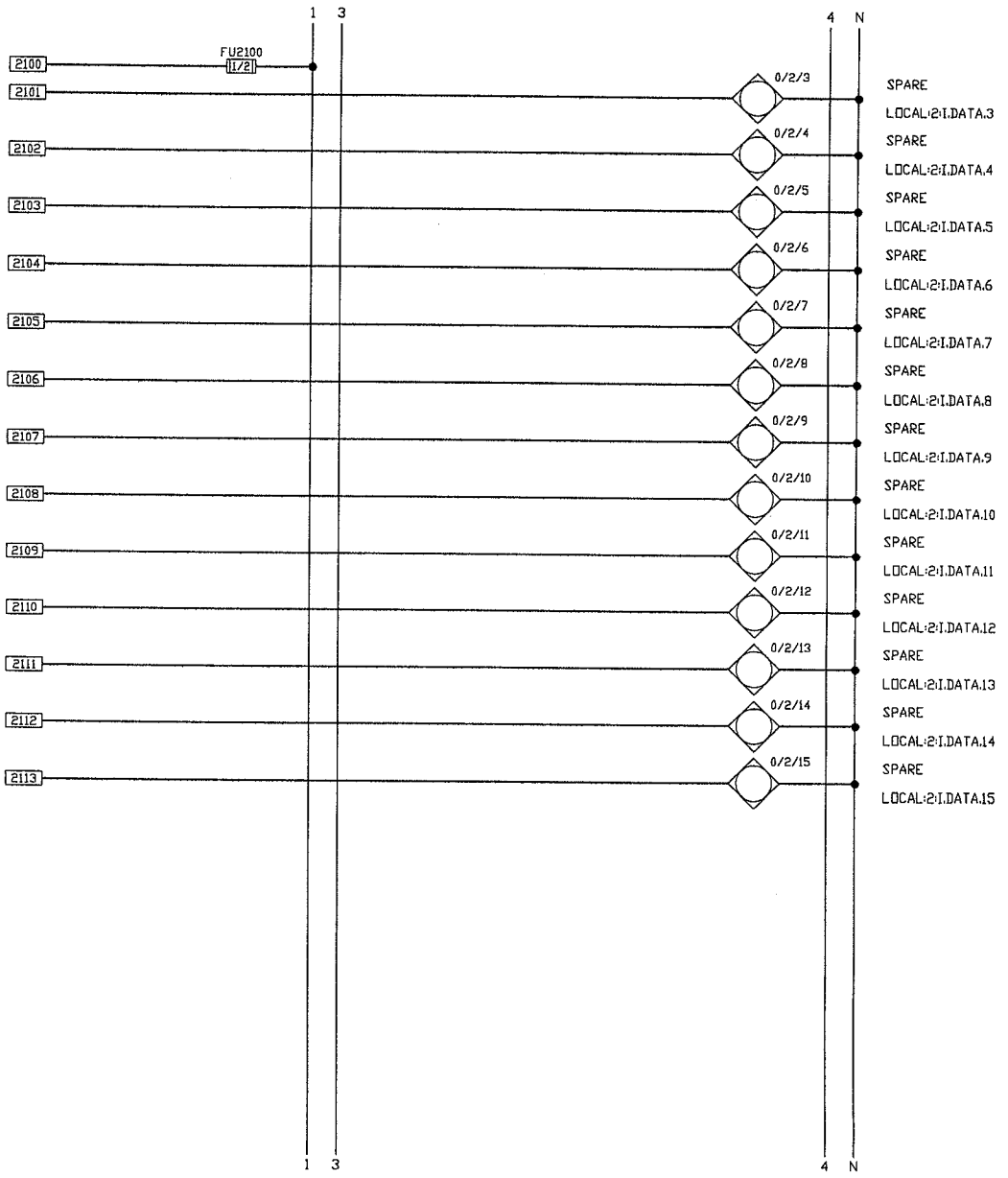
MCC-B
EXHAUST FAN EF-6

PROJ. NO. 1520B

DWG. NO. 120

FIELD OR AS NOTED

LCP-B



REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	39 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
SPARE DISCRETE INPUTS

PROJ. NO. 1520B

DWG. NO. 121

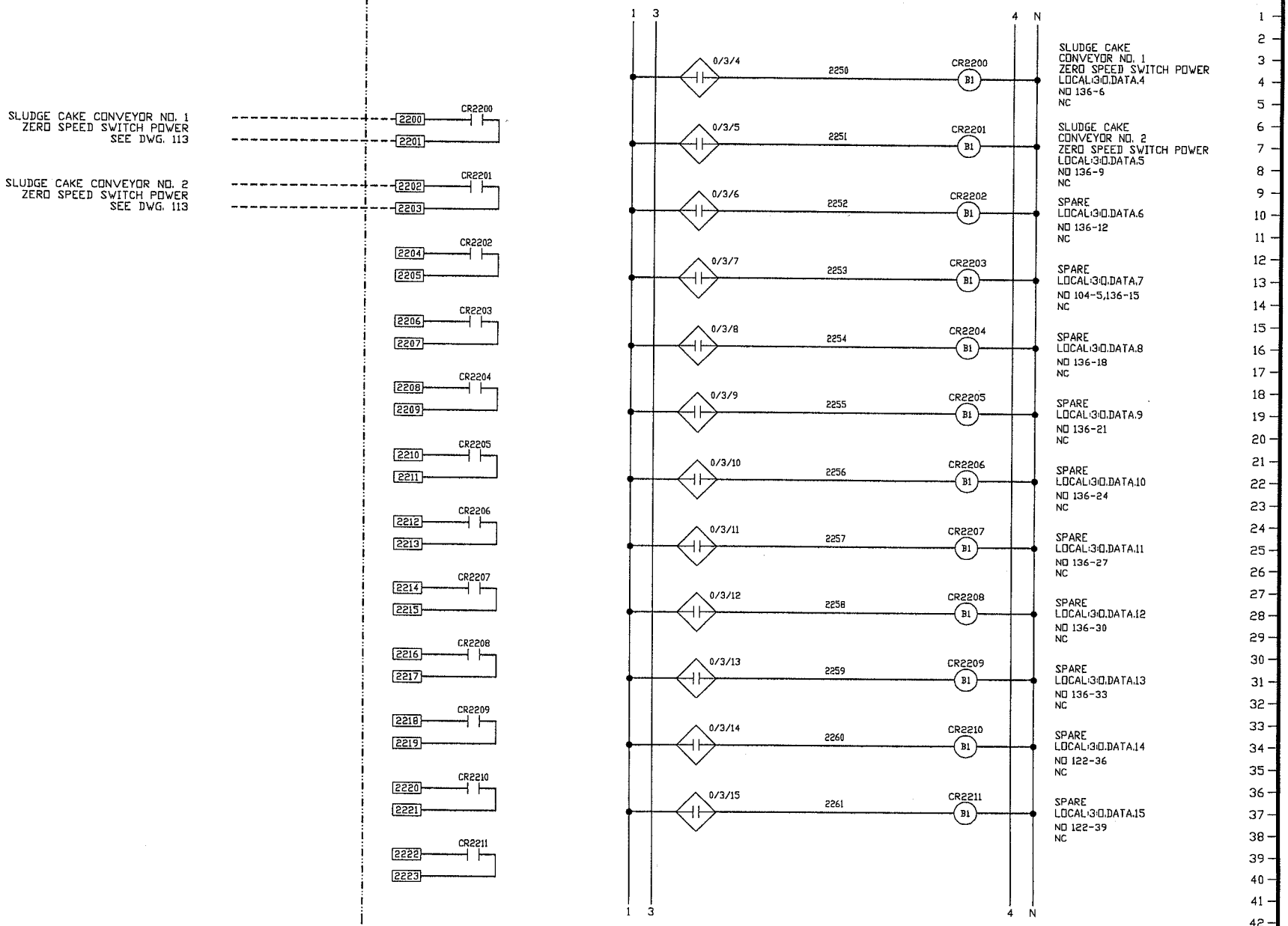
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LCP-B



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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
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CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	40 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B
SPARE DISCRETE OUTPUTS

PROJ. NO. 1520B

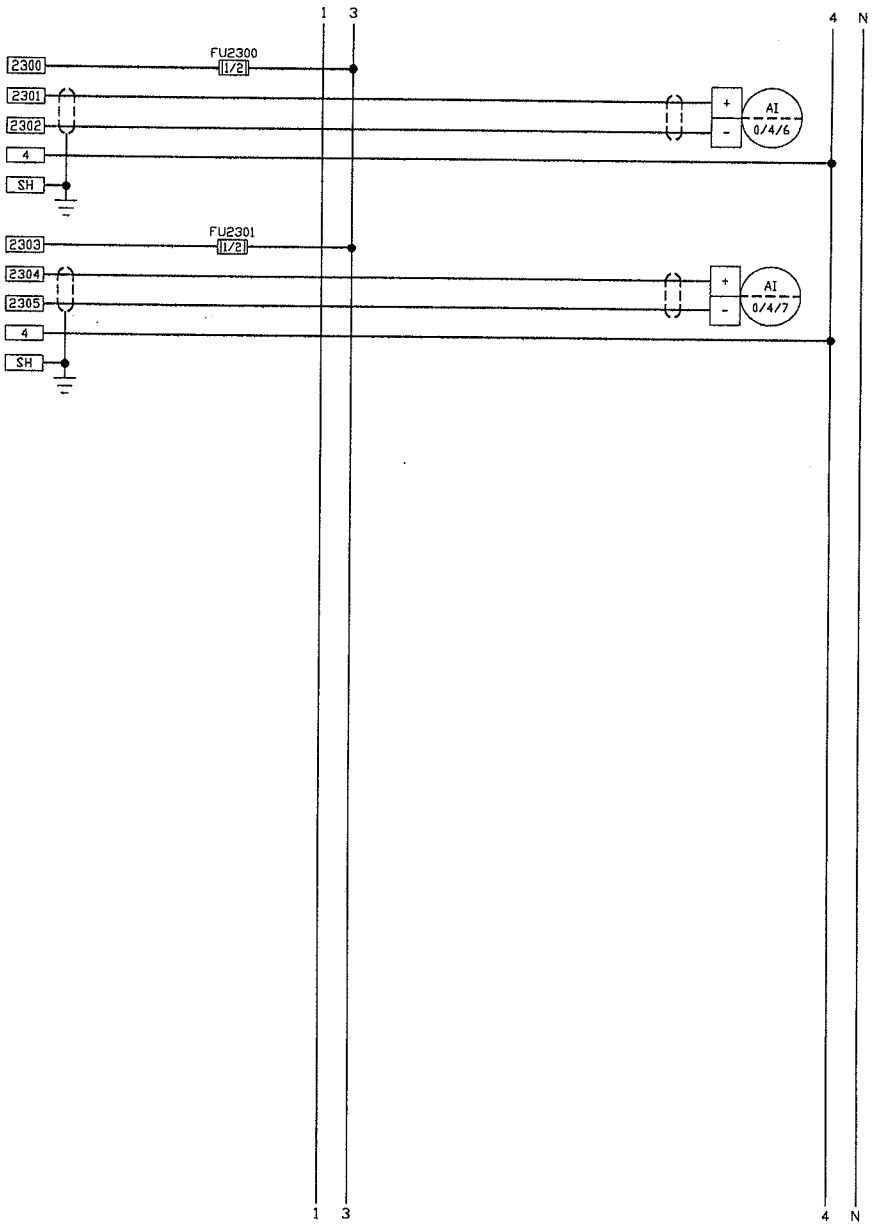
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13005 16th Ave. North
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DATE	9/27/05
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SHEET	41 OF 42

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-B

SPARE ANALOG INPUTS

PROJ. NO. 1520B

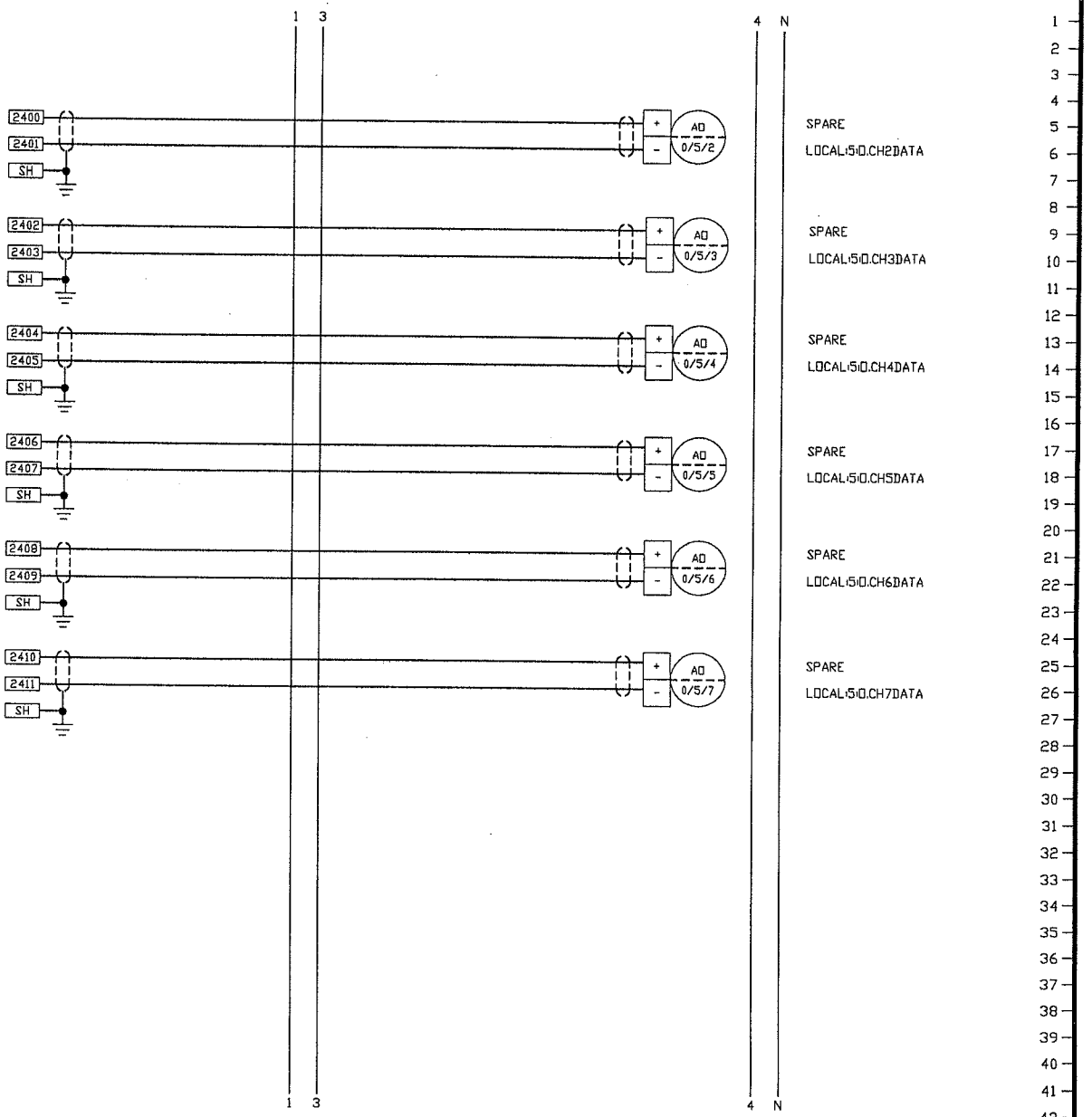
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ASSEM.	
SHEET	42 OF 42

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

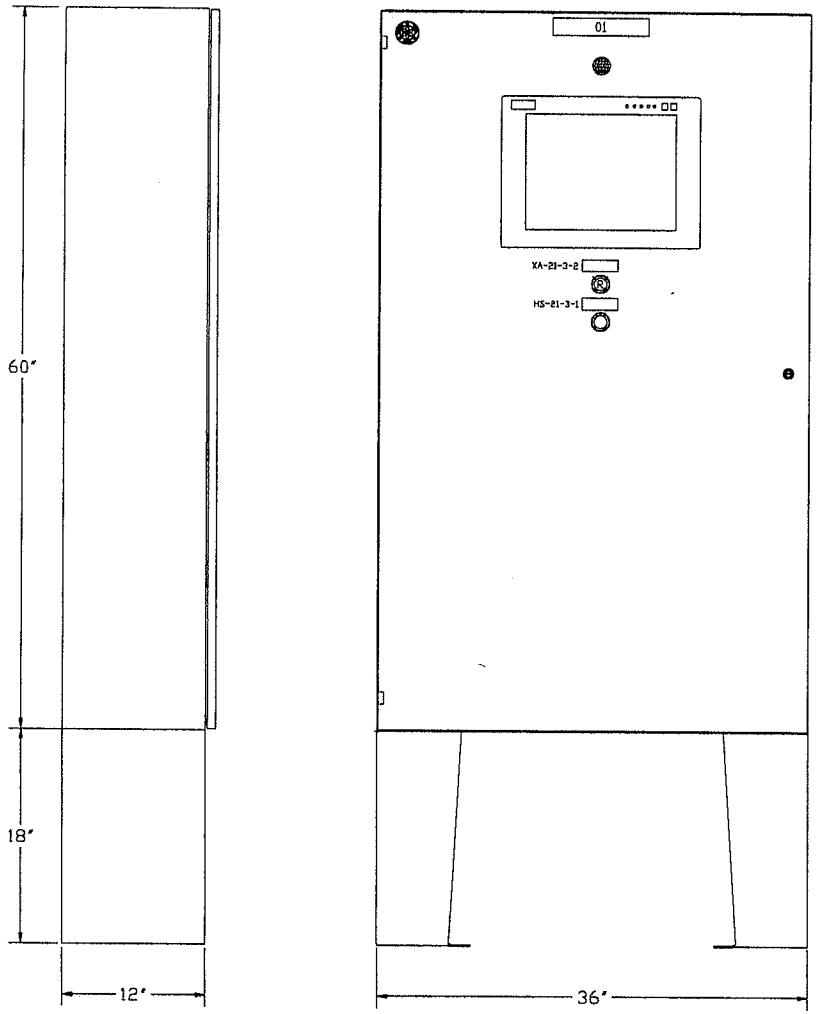
LCP-B
SPARE ANALOG OUTPUTS

PROJ. NO.
1520B

DWG. NO.
124

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NAMEPLATE SCHEDULE					
TAG	LINE 1	LINE 2	LINE 3	SIZE HxW	REMARKS
01	LCP-C			1.5x8	
HS-21-3-1	SILENCE			1x3	
XA-21-3-2	PLC FAIL			1x3	

NOTES:

1. ENCLOSURE IS A NEMA 4,12 WALL-MOUNT HOFFMAN CSD603612 WITH INNER PANEL HOFFMAN CP6036.
2. LEG STAND KIT HOFFMAN AFK1812.
3. FINISH IS ANSI 61 GRAY.
4. UL# BF-371414

SCALE

0 6" 12" 24"

DATE LAST EDITED: 11/17/2006

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

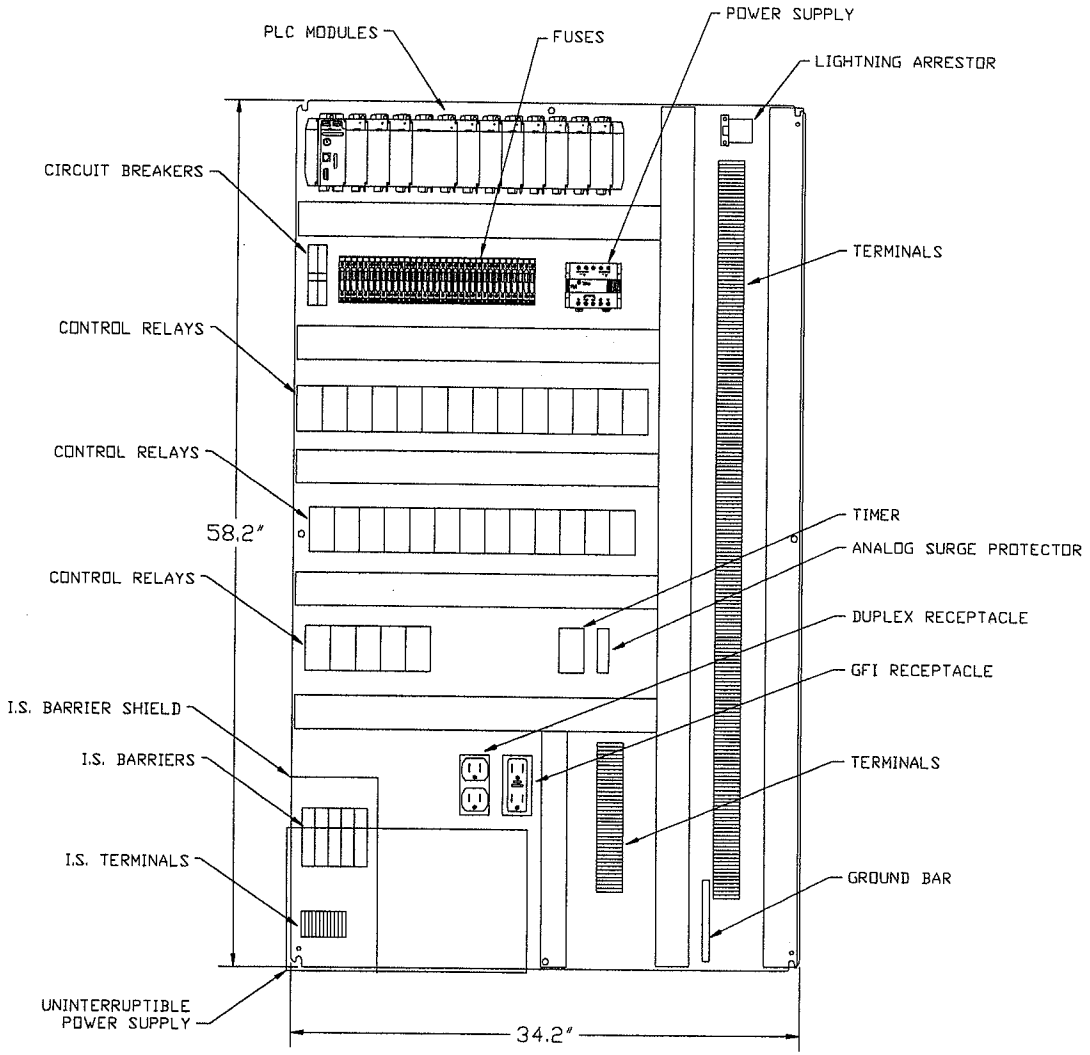
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ENGR.	JJ
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SHEET	1 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
ENCLOSURE DETAIL

PROJ. NO. 1520C

DWG. NO. 001



PANEL LAYOUT

SCALE

0 6" 12" 24"

DATE LAST EDITED: 11/17/2006

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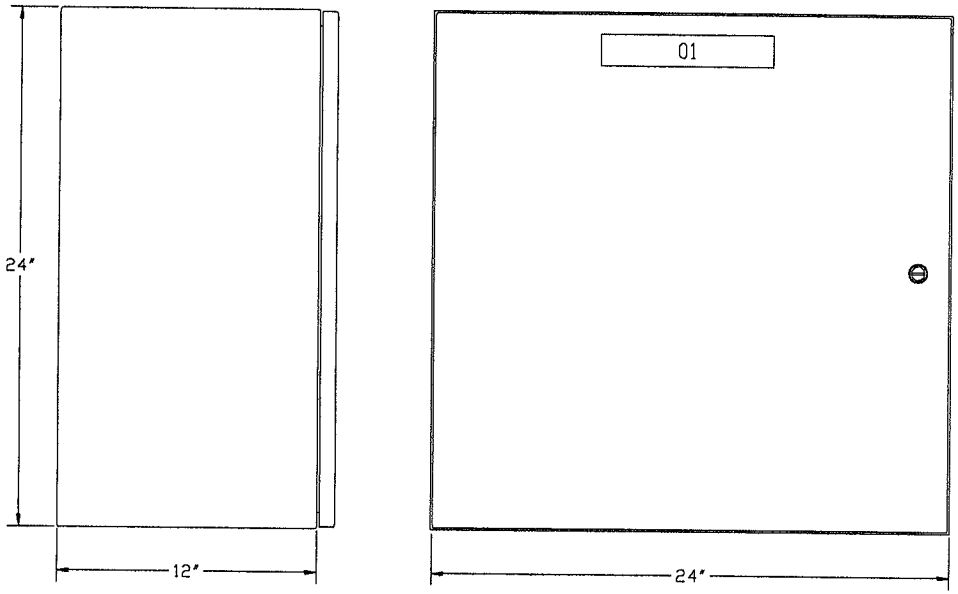
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	2 OF 63

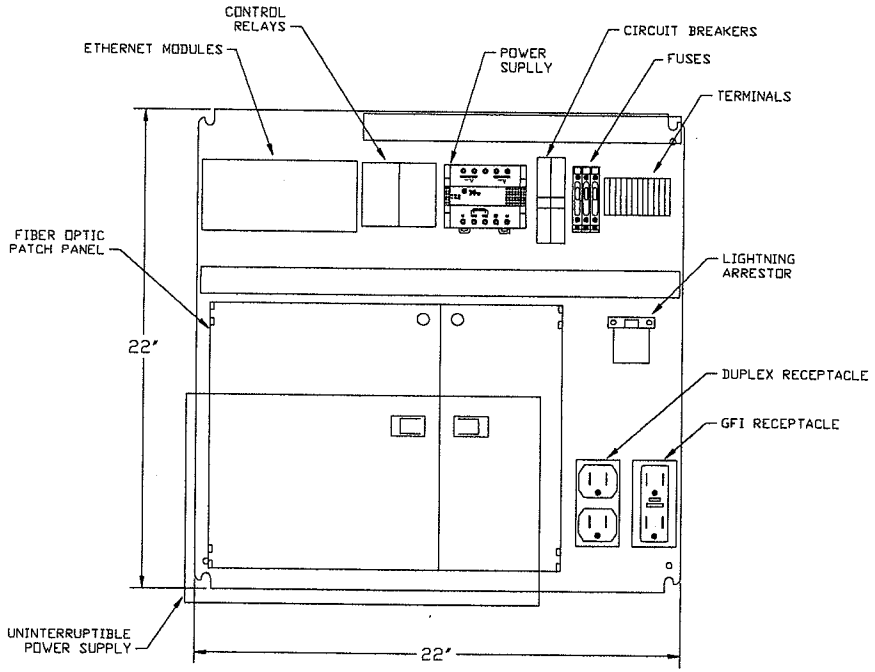
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
BACK PANEL LAYOUT

PROJ. NO. 1520C

DWG. NO. 002





PANEL LAYOUT

NAMEPLATE SCHEDULE					
TAG	LINE 1	LINE 2	LINE 3	SIZE HxW	REMARKS
01	FIP-C			1.5x8	

NOTES:

1. ENCLOSURE IS A NEMA TYPE 4, 12 WALL-MOUNT HOFFMAN CONCEPT CSD242412 WITH INNER PANEL HOFFMAN CP2424.
2. FINISH IS ANSI 61 GRAY.
3. UL# BF-371416

ENC2 EN HOFFMAN CP2424

ENC1 EN HOFFMAN CSD242412

SCALE

0 5" 10" 15"

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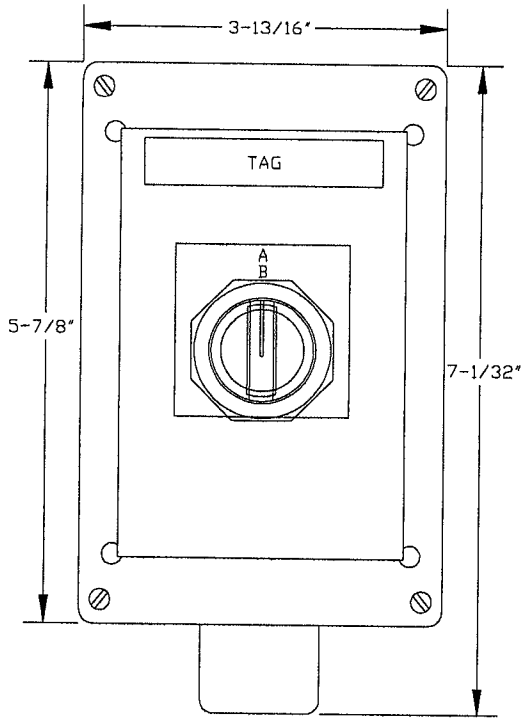
DATE	9/27/05
DWN	JA
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ENGR.	JJ
ASSEM.	
SHEET	3 OF 63

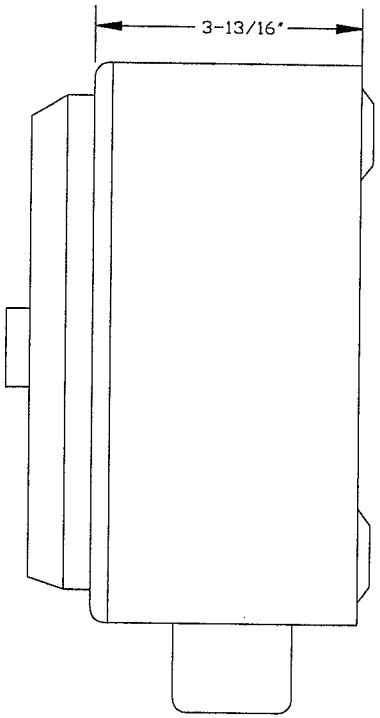
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
FIBER OPTIC NETWORK INTERFACE PANEL
ENCLOSURE DETAIL

PROJ. NO. 1520C

DWG. NO. 003





NAMEPLATE SCHEDULE					
	NAMEPLATE		LEGEND PLATE		
TAG	LINE 1	LINE 2	LINE A	LINE B	LEGEND NO.
HS-6-4-1-1	CHEMICAL FEED	PUMP NO.1	OFF	HAND AUTO	800H-W551
HS-6-4-2-1	CHEMICAL FEED	PUMP NO.2	OFF	HAND AUTO	800H-W551
HS-6-4-3-1	CHEMICAL FEED	PUMP NO.3	OFF	HAND AUTO	800H-W551
HS-6-4-4-1	CHEMICAL FEED	CARRIER VALVE	CLOSE	OPEN AUTO	800H-W500E
HS-7-1-1-1	FINAL CLARIFER NO.1		OFF	HAND AUTO	800H-W551
HS-7-1-2-1	FINAL CLARIFER NO.2		OFF	HAND AUTO	800H-W551
HS-7-1-3-1	FINAL CLARIFER NO.3		OFF	HAND AUTO	800H-W551
HS-7-1-4-1	FINAL CLARIFER NO.4		OFF	HAND AUTO	800H-W551
HS-7-2-1-1	SCUM PUMP NO.1		OFF	HAND AUTO	800H-W551
HS-7-2-2-1	SCUM PUMP NO.2		OFF	HAND AUTO	800H-W551
HS-7-2-3-1	SCUM PUMP NO.3		OFF	HAND AUTO	800H-W551
HS-10-2-1-1	RAS/WAS PUMP NO.1		OFF	HAND AUTO	800H-W551
HS-10-2-2-1	RAS/WAS PUMP NO.2		OFF	HAND AUTO	800H-W551
HS-10-2-3-1	RAS/WAS PUMP NO.3		OFF	HAND AUTO	800H-W551
HS-10-2-4-1	RAS/WAS PUMP NO.4		OFF	HAND AUTO	800H-W551
HS-11-2-1-1	MULTIPURPOSE	PUMP NO.1	OFF	HAND AUTO	800H-W551
HS-11-2-2-1	MULTIPURPOSE	PUMP NO.2	OFF	HAND AUTO	800H-W551
HS-12-2-1-1	DIGESTER BLOWER NO.1		OFF	HAND AUTO	800H-W551
HS-12-2-2-1	DIGESTER BLOWER NO.2		OFF	HAND AUTO	800H-W551
HS-12-2-3-1	DIGESTER BLOWER NO.3		OFF	HAND AUTO	800H-W551
HS-12-2-4-1	DIGESTER BLOWER NO.4		OFF	HAND AUTO	800H-W551
HS-12-3-1-1	CLARIFIER DRAIN PUMP		OFF	HAND AUTO	800H-W551
HS-12-3-2-1	HEAVY SOLIDS PUMP		OFF	HAND AUTO	800H-W551
HS-13-1-1-1	DIGESTED SLUDGE	PUMP NO.1	OFF	HAND AUTO	800H-W551
HS-13-1-2-1	DIGESTED SLUDGE	PUMP NO.2	OFF	HAND AUTO	800H-W551
HS-19-1-1-1	POTABLE WELL	PUMP	OFF	HAND AUTO	800H-W551
HS-EF8A	EXHAUST FAN	EF-8A	OFF	HIGH LOW	800H-W555
HS-EF8B	EXHAUST FAN	EF-8B	OFF	HIGH LOW	800H-W555

NAMEPLATES ARE 1/2"Hx2"W WHITE WITH BLACK 1/8" LETTERS

NOTES:

1. ONE HOLE ENCLOSURE IS NEMA 4X FIBERGLASS ALLEN BRADLEY 800H-R3HA4RL.
2. FINISH IS ROSITE GLASS POLYESTER.
3. QUANTITY (28)

SCALE

0 1" 2" 4"

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13005 16th Ave. North
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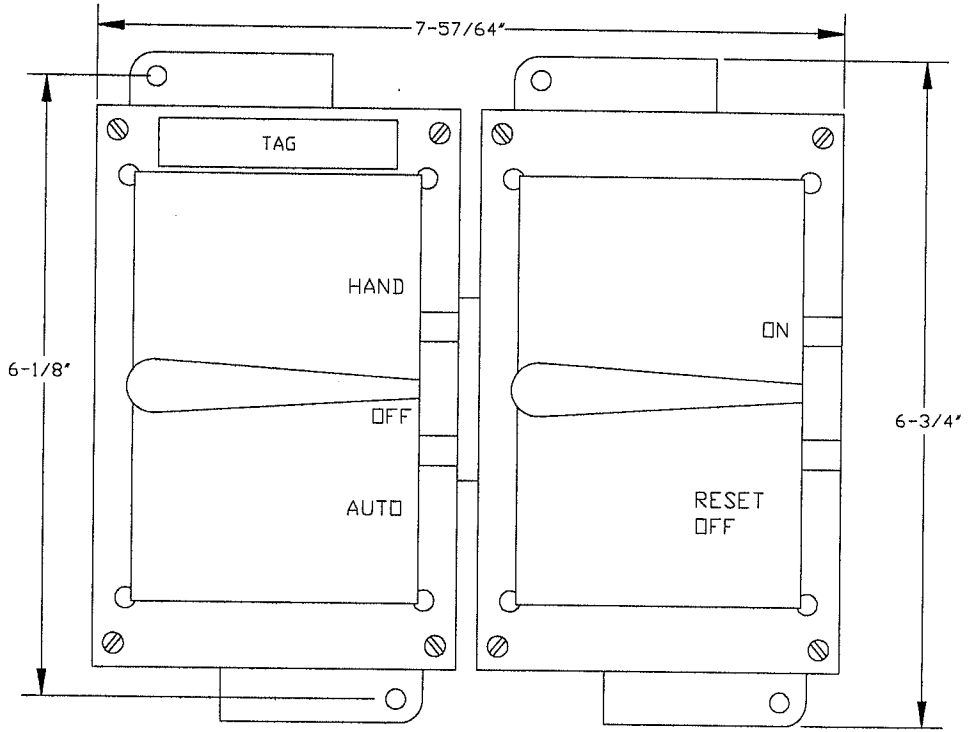
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	4 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LOCAL CONTROL STATIONS
SINGLE DEVICE STATIONS
ENCLOSURE DETAIL

PROJ. NO. 1520C

DWG. NO. 004A



NAMEPLATE SCHEDULE				
TAG	LINE 1	LINE 2	LINE 3	SIZE
HS-19-1-2	POTABLE	WATER SYSTEM	AIR COMPRESSOR	5/8"X1/4"

NAMEPLATE IS WHITE WITH BLACK LETTERS

NOTES:

1. MANUAL MOTOR SWITCH IS NEMA 4 ALLEN BRADLEY 600-TCX9.
2. THERMAL HEATER IS ALLEN BRADLEY P34.
3. QUANTITY (1)

SCALE

0 1" 2" 4"

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13005 16th Ave. North
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	3 OF 63

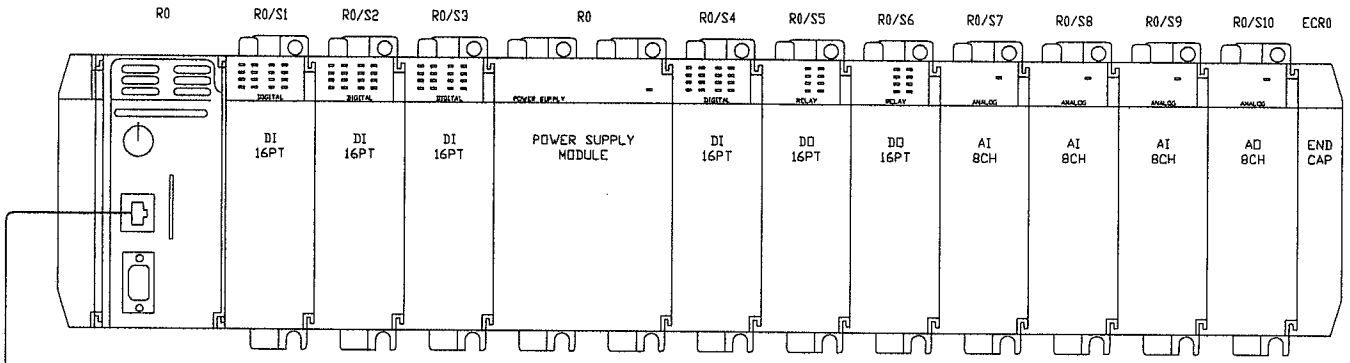
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

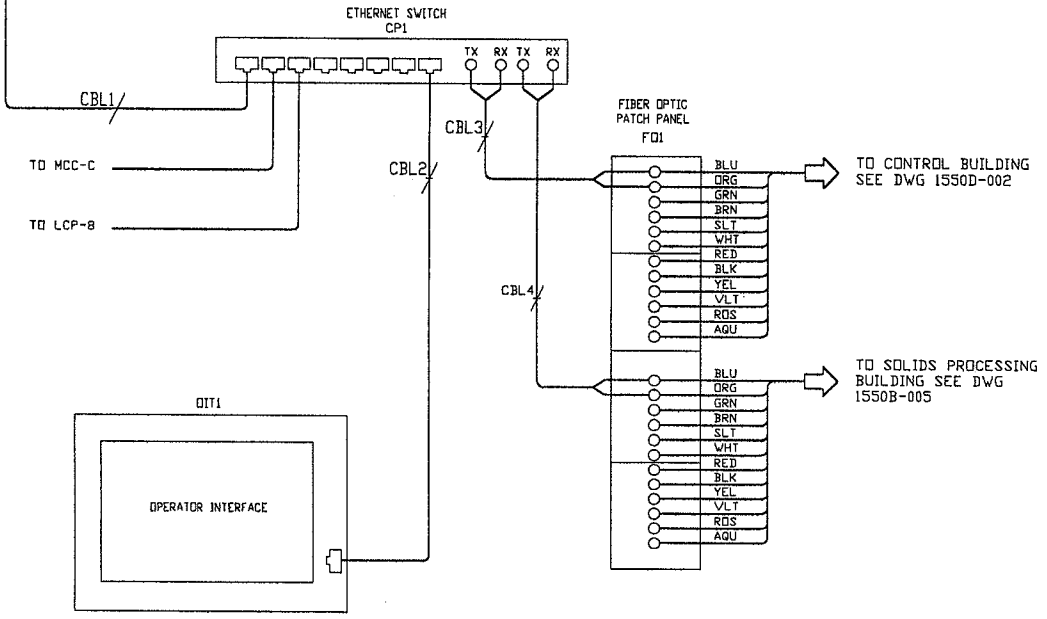
LOCAL CONTROL STATIONS
MANUAL MOTOR SWITCH
ENCLOSURE DETAIL

PROJ. NO. 15200

DWG. NO. 004B

CONTROL LOGIX I/O SCHEDULE





QTY	TAGS	DESCRIPTION	MFG	CATALOG
1	ECR0	EXPANDABLE RACK RIGHT SIDE END CAP	ALLEN BRADLEY	1769-ECR
1	R0	CPU, CPACT LGX 1.5MB MEM CPU CPACT LGX, 1.5MB MEMORY 120V AC	ALLEN BRADLEY	1769-L35E
4	R0/S1 R0/S2 R0/S3 R0/S4	PLC DIGITAL I/O MODULE 16 POINT INPUT - GENERAL PURPOSE 85-132V AC (INPUTS)	ALLEN BRADLEY	1769-IA16
1	R0	COMPACTLOGIX POWER SUPPLY 120V AC	ALLEN BRADLEY	1769-PA4
2	R0/S5 R0/S6	PLC DIGITAL I/O MODULE 16 POINT RELAY CONTACT OUTPUT (N.O.) 1.5A @ 120V AC	ALLEN BRADLEY	1769-OW16
3	R0/S7 R0/S8 R0/S9	PLC ANALOG I/O MODULE 8 ANALOG INPUTS (+/-10VDC; +/-20mA) 14 BIT RESOLUTION	ALLEN BRADLEY	1769-IF8
1	R0/S10	PLC ANALOG I/O MODULE 1769-OF8C 16 BIT RESOLUTION 8 4-20MA	ALLEN BRADLEY	1769-OF8C
2	CBL1 CBL2	ETHERNET CABLE CAT 5E ETHERNET CABLE CUT TO LENGTH	GENERIC	CAT5E
2	CBL3 CBL4	FIBER OPTIC PATCH CABLE, SC-SC, MM 1 METER (1 PAIR) (2) FIBERS	PANDUIT	F6D3-3M1
1	CP1	INDUSTRIAL ETHERNET SWITCH	N-TRON	~~508FX2-SC-C~~
1	FO1	FIBER OPTIC PATCH PANEL OPTICOM 24/48 FIBER (4 FAPS)	PANDUIT	FWME4
1	OIT1	OPERATOR INTERFACE TOUCHSCREEN 15" DISPLAY 120VAC DISPLAY	XYCOM	3715T
4	FO1	FIBER ADAPTER PANELS WITH 3 DUAL SC CONNECTORS	PANDUIT	FAP3WBUDSCZ

706FX

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
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ENGR.	JJ
ASSEM.	
SHEET	6 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
PLC I/O SCHEDULE
PROJ. NO. 1520C
DWG. NO. 005

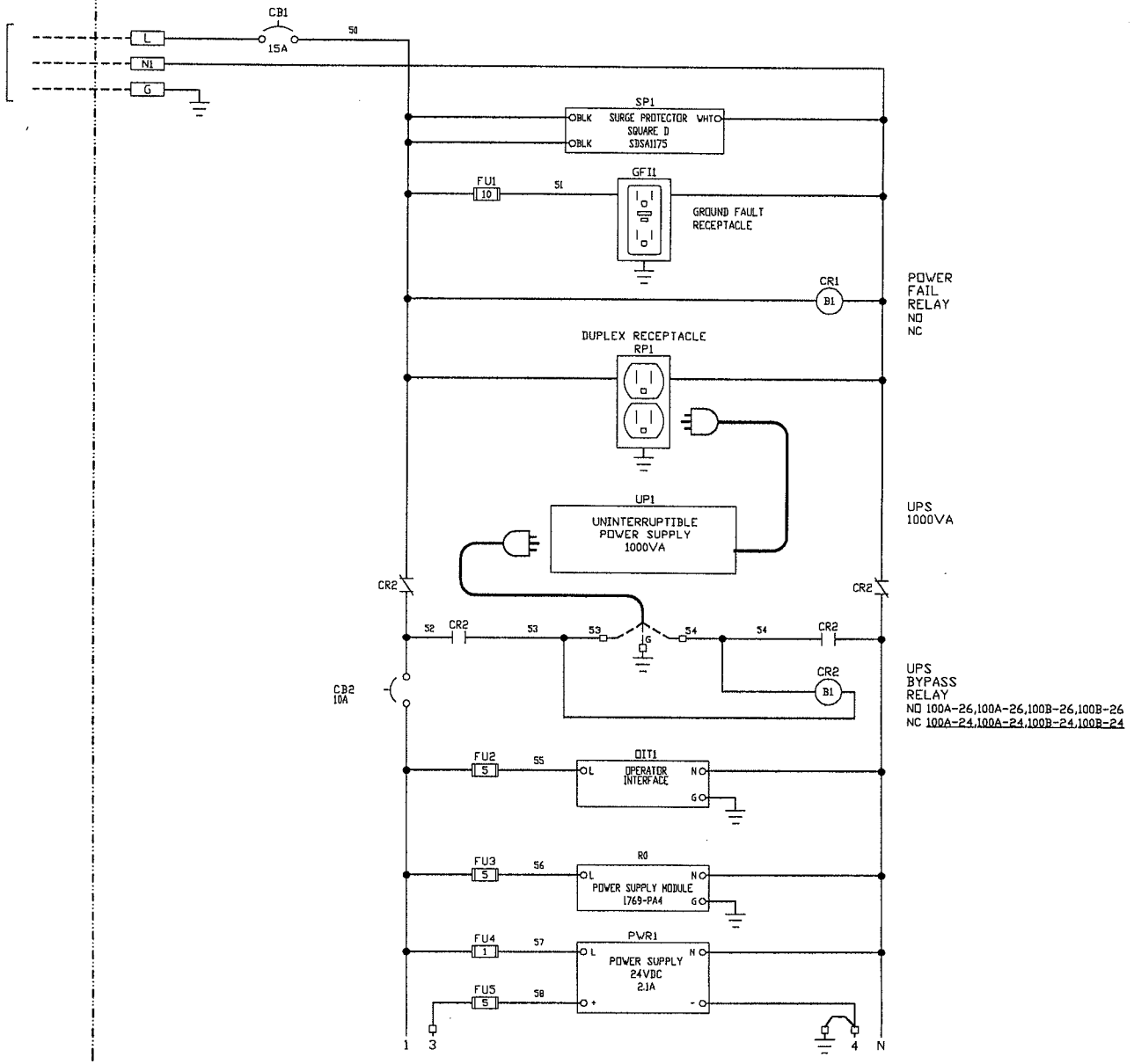
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LCP-C

120VAC, 1Ø, 60HZ
POWER FROM
LIGHTING PANEL: LC1
CIRCUIT: 9



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INSTRUMENT CONTROL SYSTEMS
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ENGR.	JJ
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SHEET	7 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
CONTROL POWER
PROJ. NO. 1520C
DWG. NO. 100A

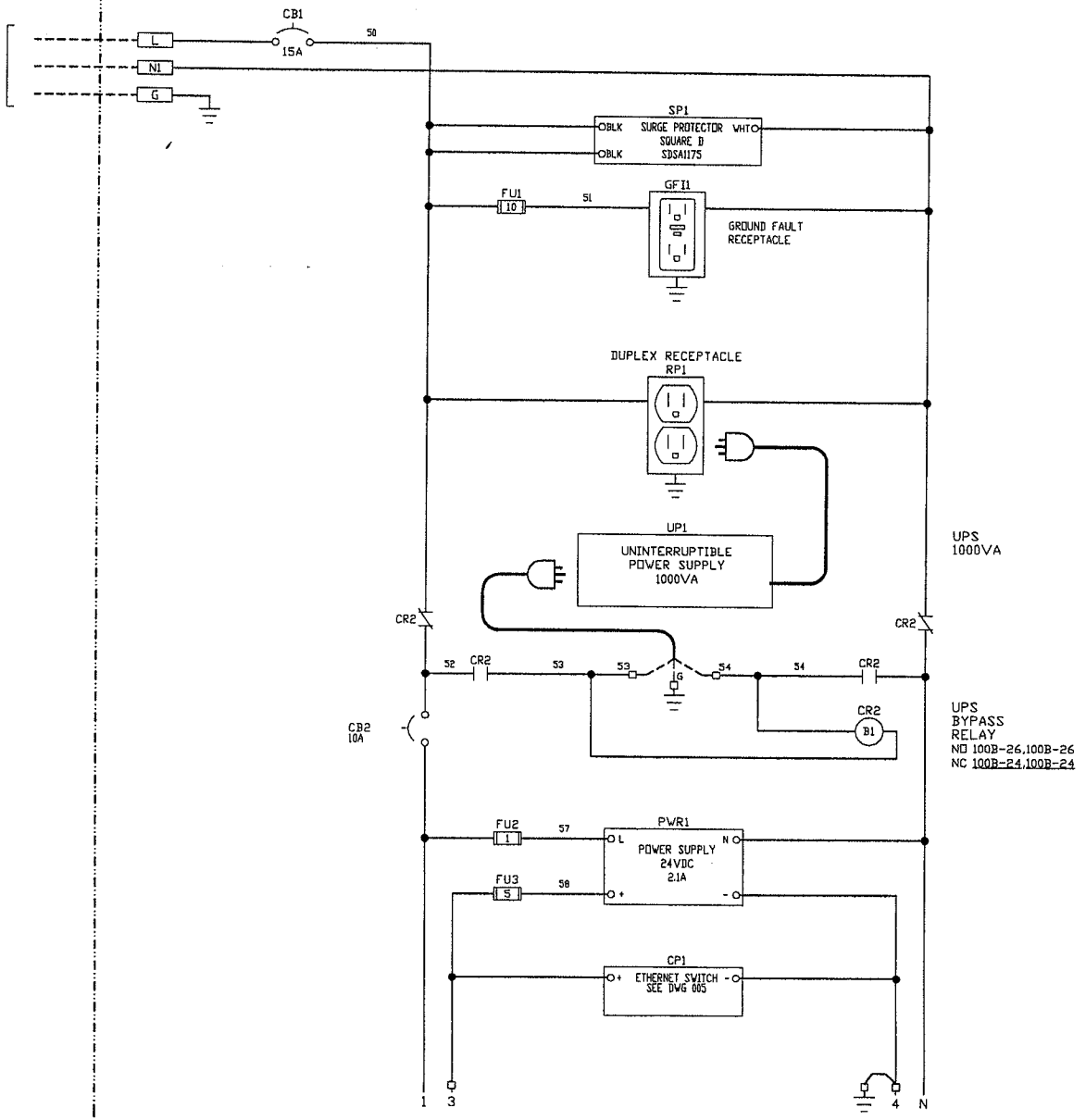
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FIELD OR AS NOTED

FIP-C

120VAC, 1Ø, 60HZ
POWER FROM
LIGHTING PANEL: LC1
CIRCUIT: 13



REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

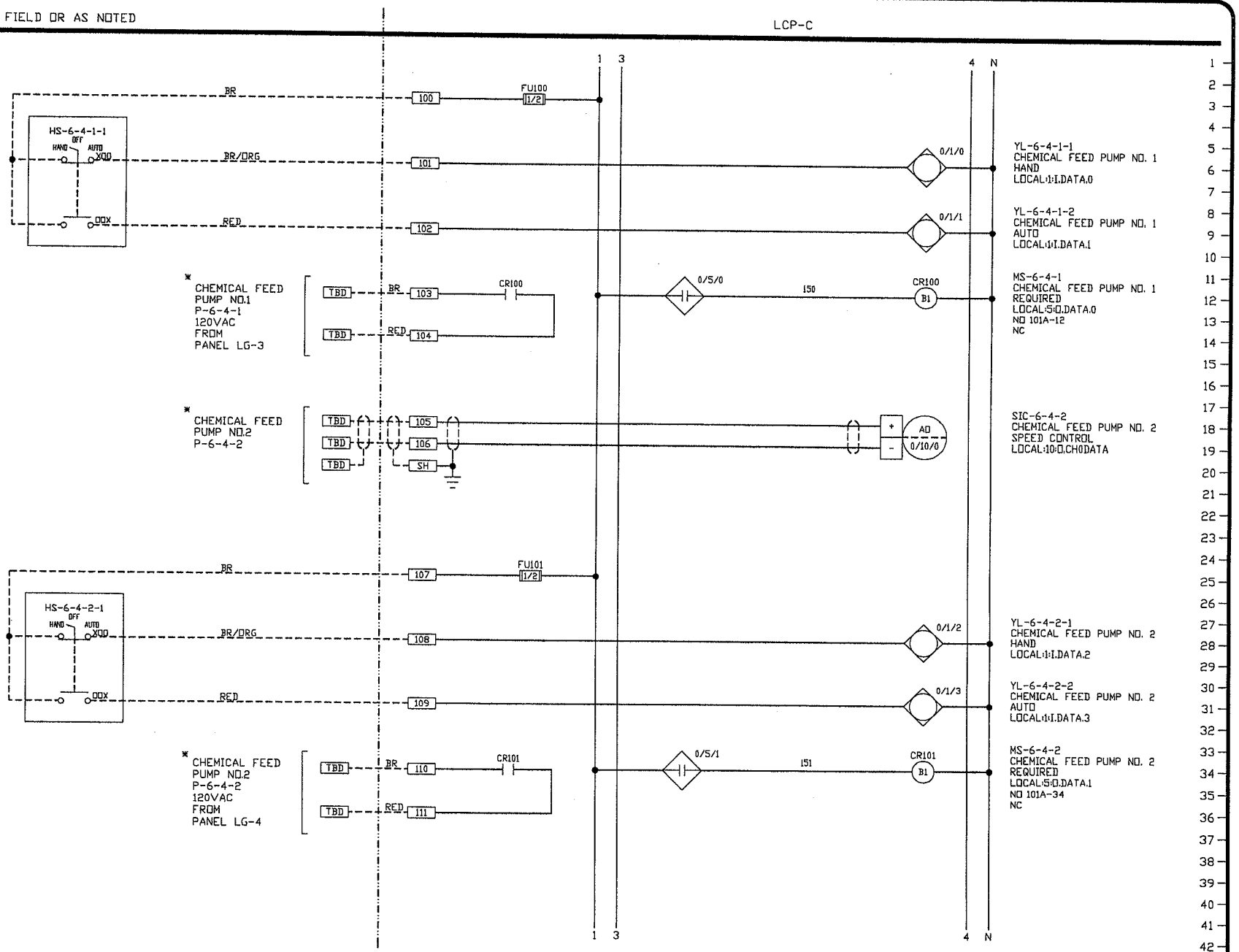
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DWN	JA
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PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
CONTROL POWER
PROJ. NO. 1520C1
DWG. NO. 100B

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ASSEM.	
SHEET	9 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

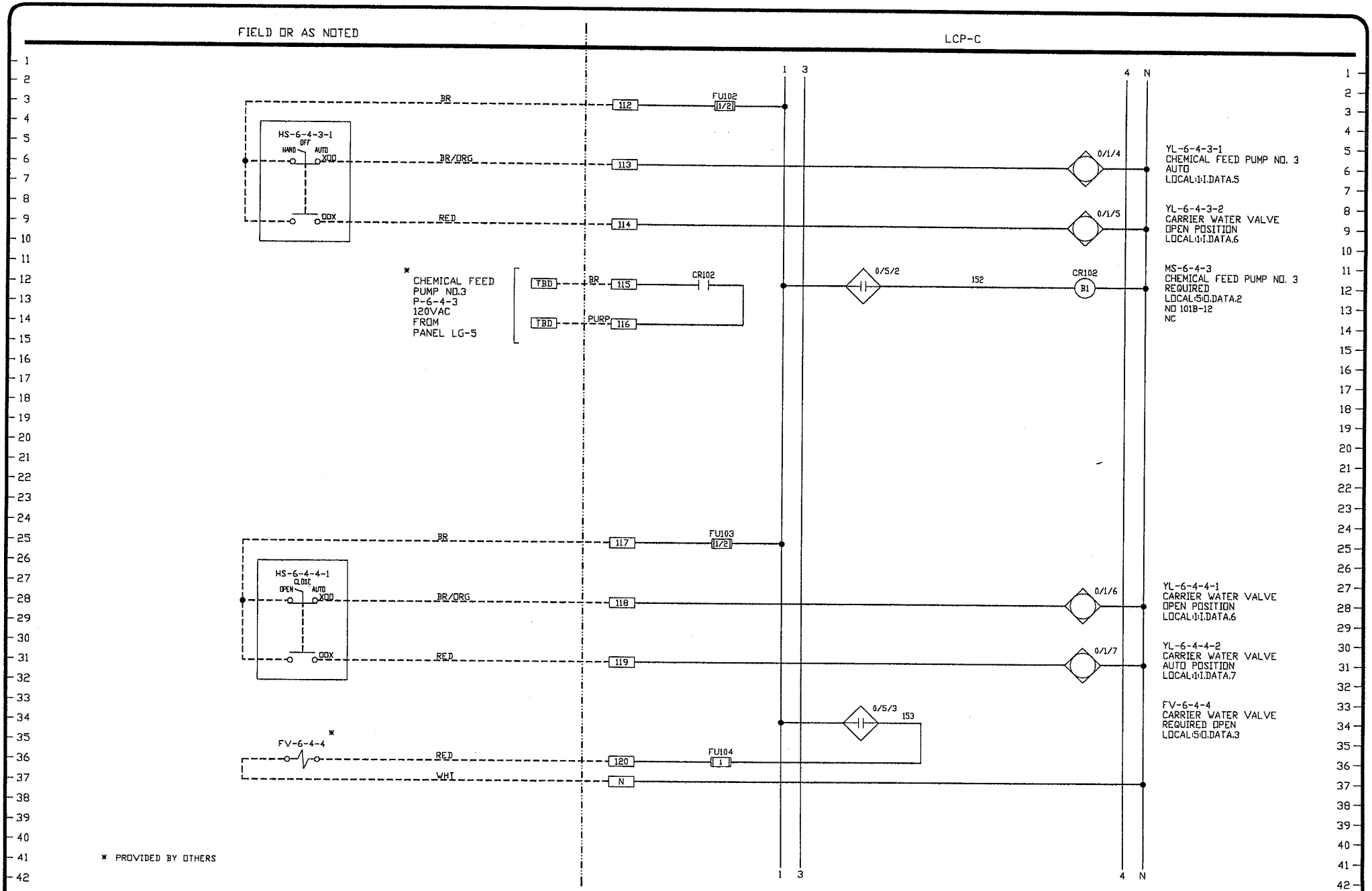
LCP-C
CHEMICAL FEED SYSTEM

PROJ. NO. 1520C

DWG. NO. 101A

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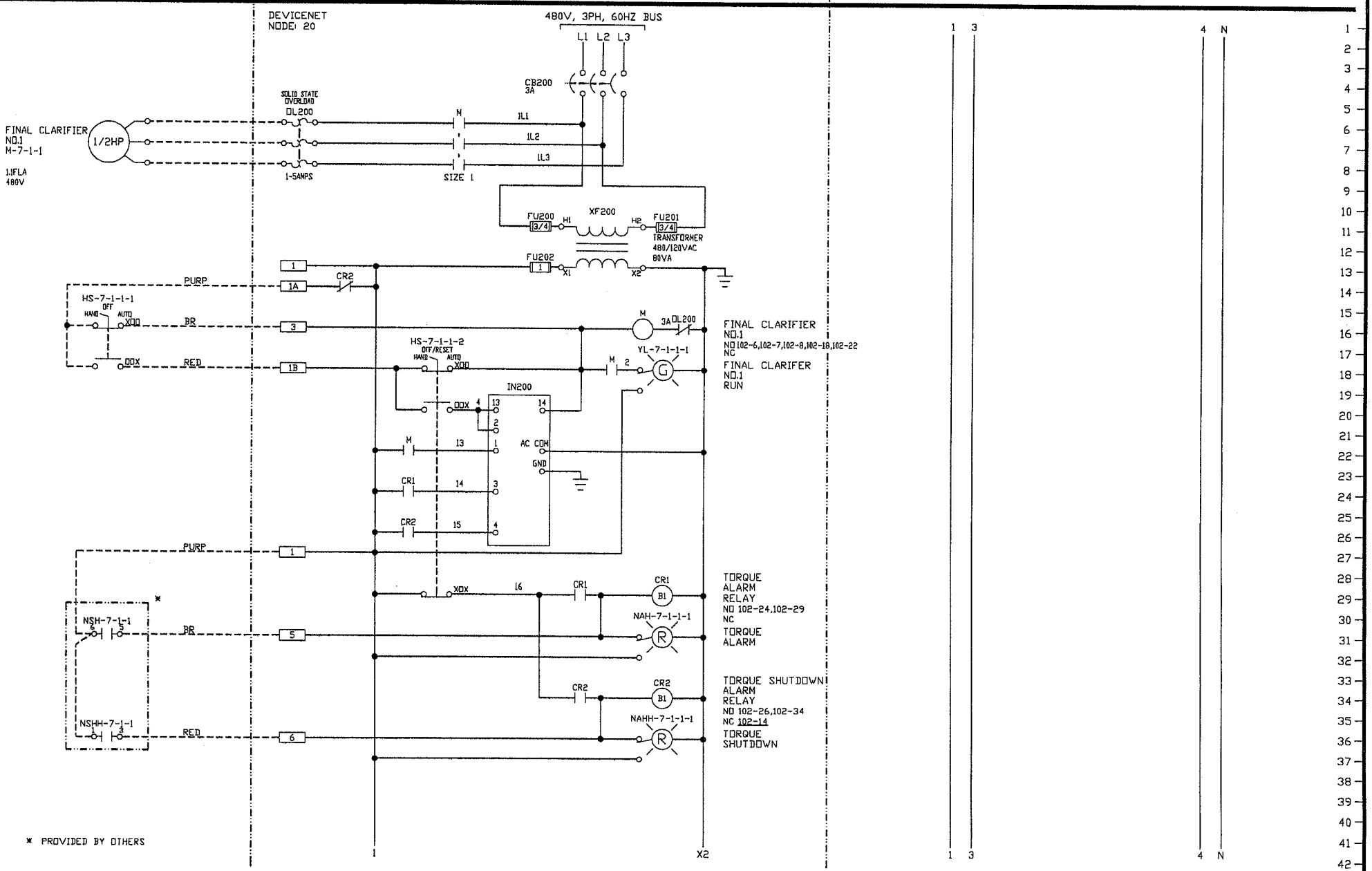
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ASSEM.	
SHEET	10 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
CHEMICAL FEED SYSTEM
PROJ. NO. 1520C
DWG. NO. 101B

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ENGR.	JJ
ASSEM.	
SHEET	11 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
FINAL CLARIFIER NO.1

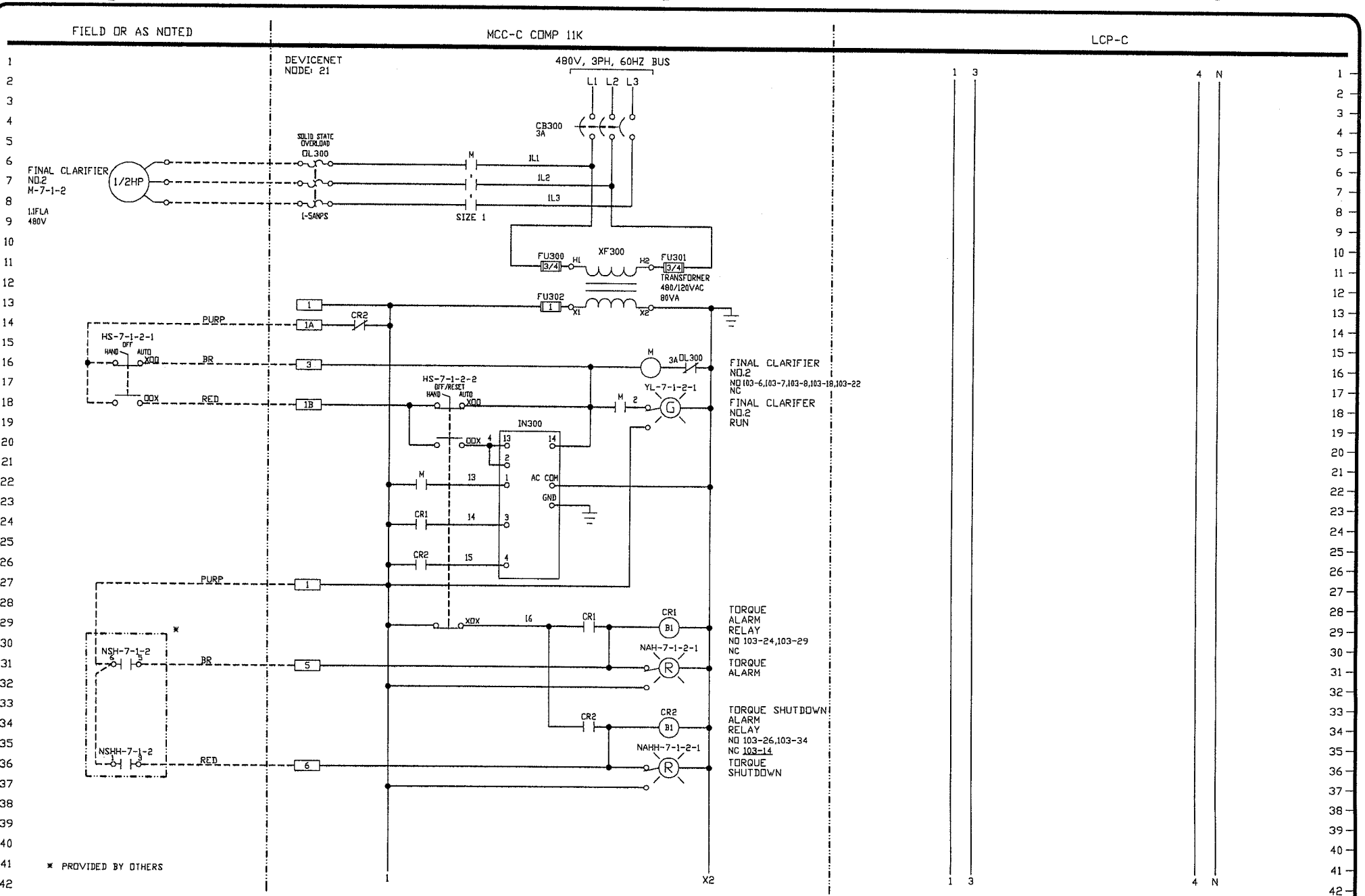
PROJ. NO. 1520C

DWG. NO. 102

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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

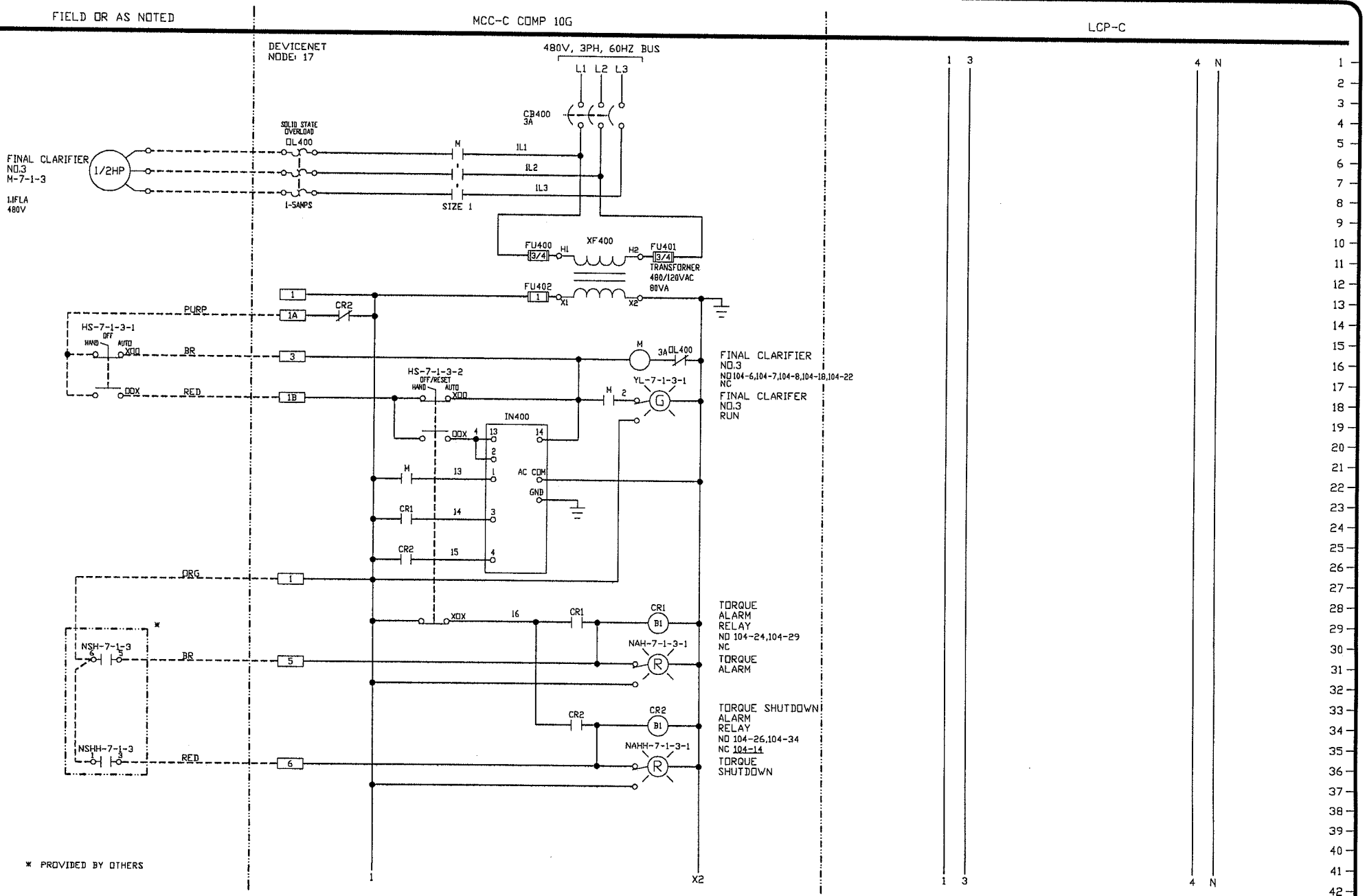
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	12 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
FINAL CLARIFIER NO.2
PROJ. NO. 15200
DWG. NO. 103

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DATE	DESCRIPTION
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	13 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
FINAL CLARIFIER NO.3

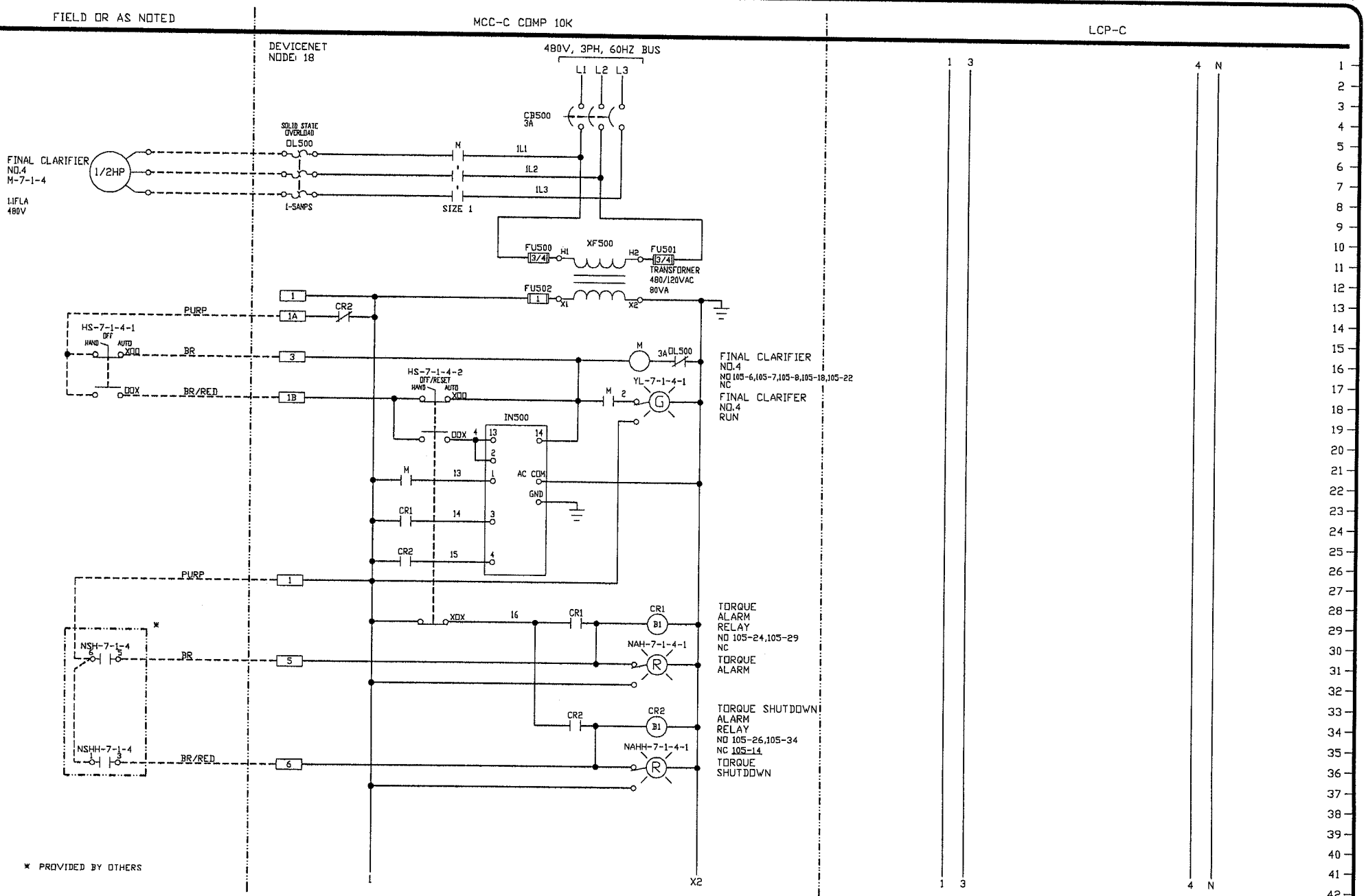
PROJ. NO. 1520C

DWG. NO. 104

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DATE	DESCRIPTION
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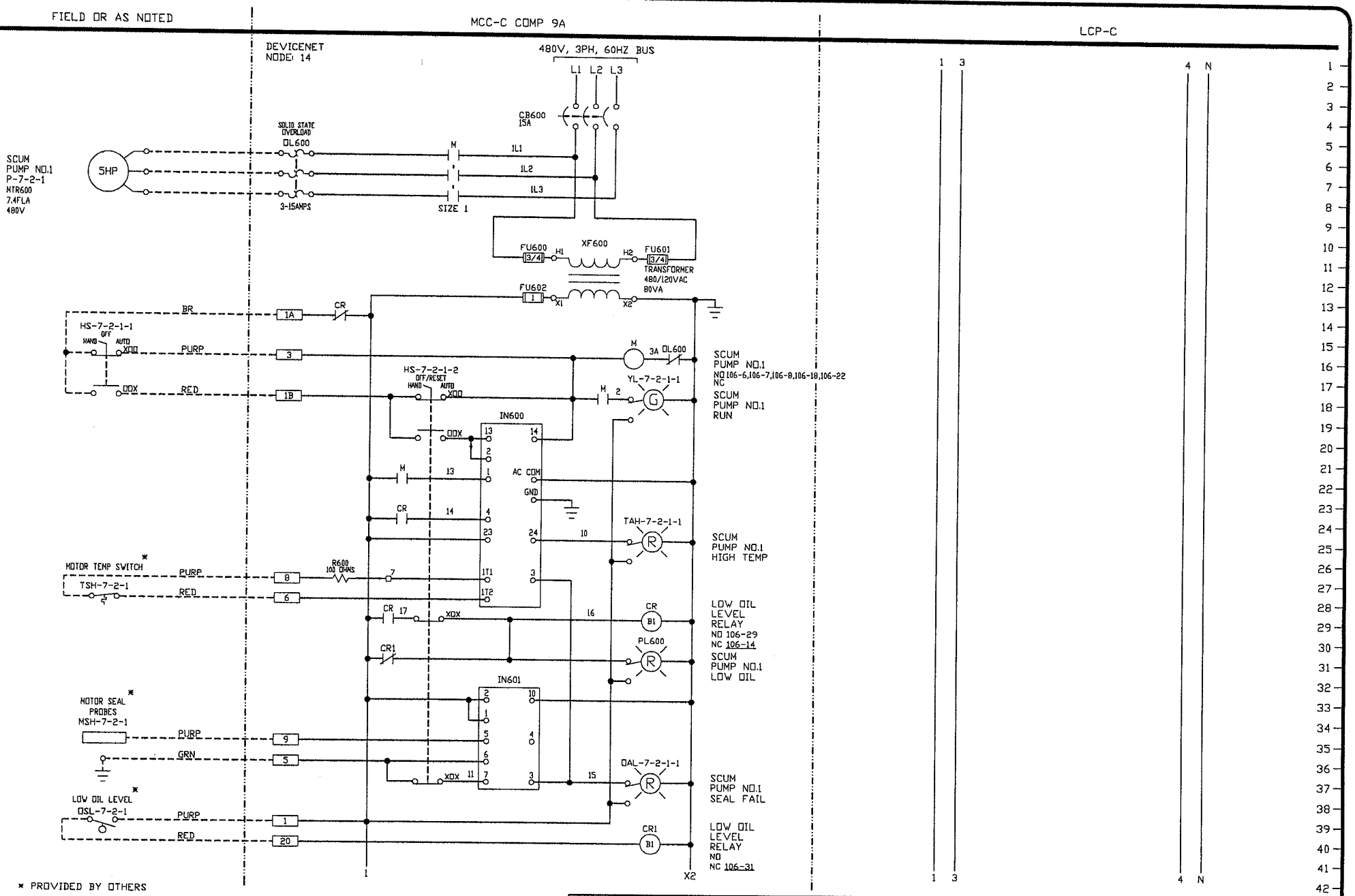
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	14 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
FINAL CLARIFIER NO.4
PROJ. NO. 1520C
DWG. NO. 105

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13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	15 OF 63

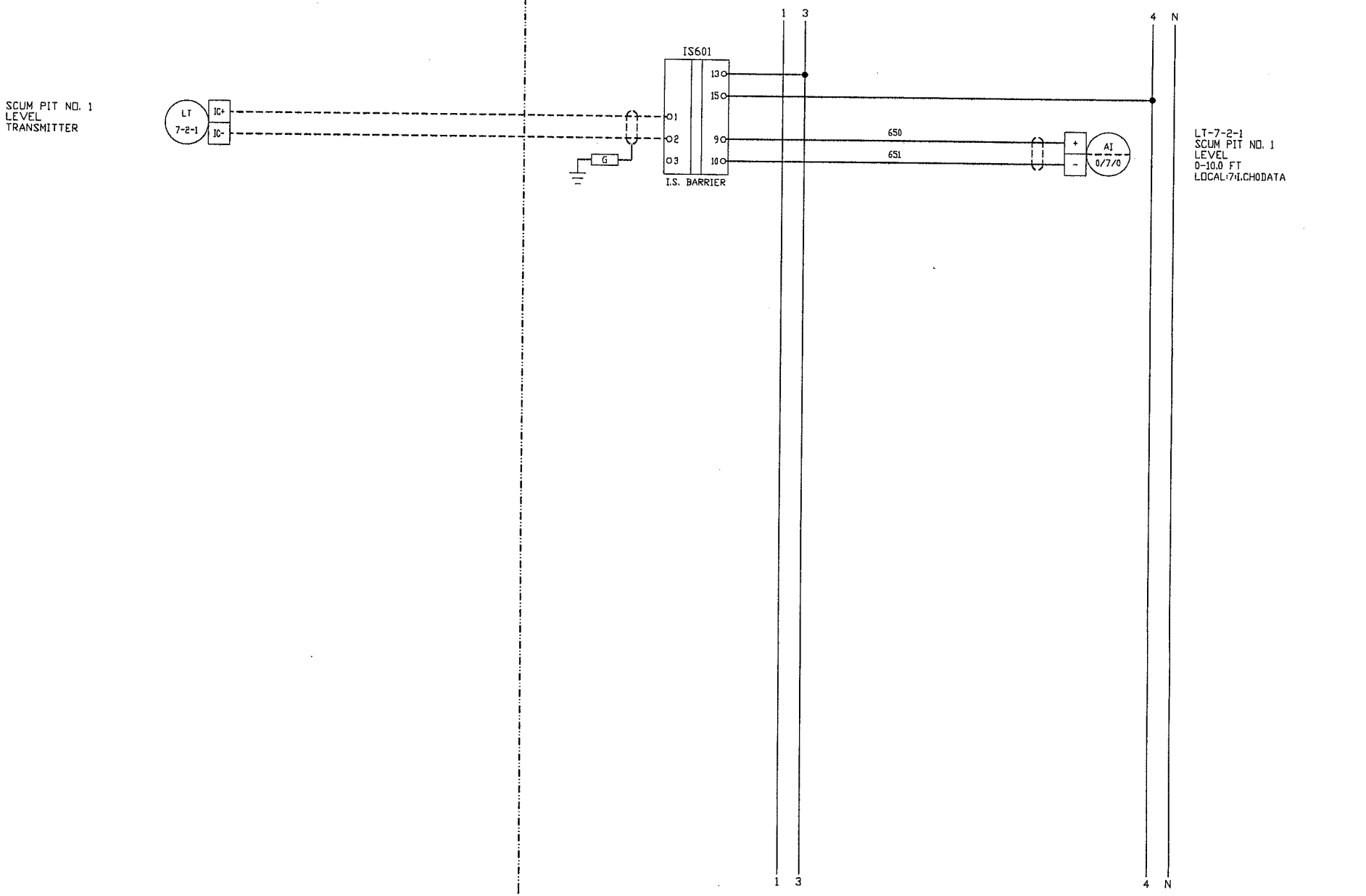
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
SCUM PUMP NO.1
PROJ. NO. 1520C
DWG. NO. 106A

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	16 OF 63

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

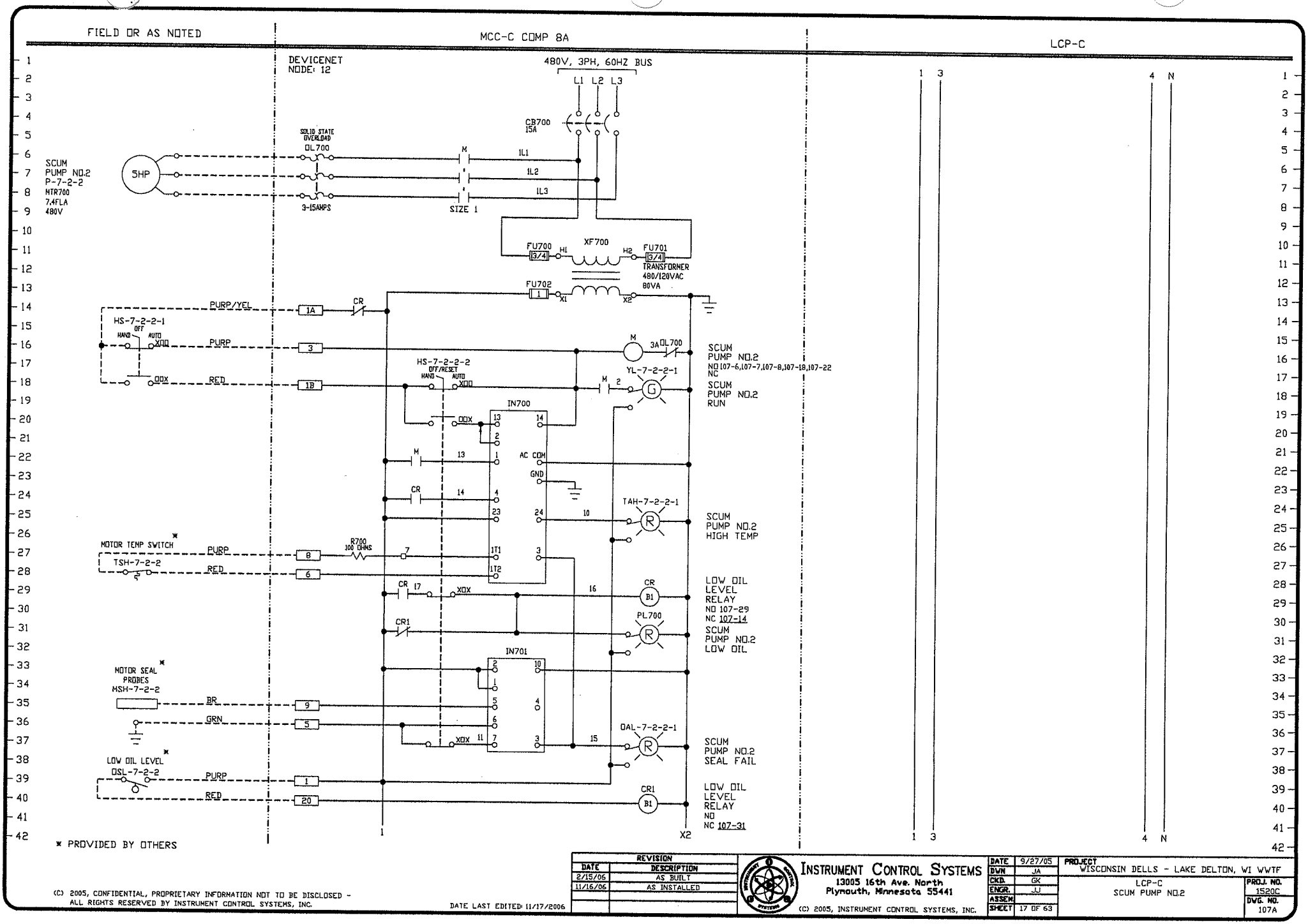
LCP-C
SCUM PIT NO. 1
LEVEL

PROJ. NO. 1520C

DWG. NO. 106B

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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	17 OF 63

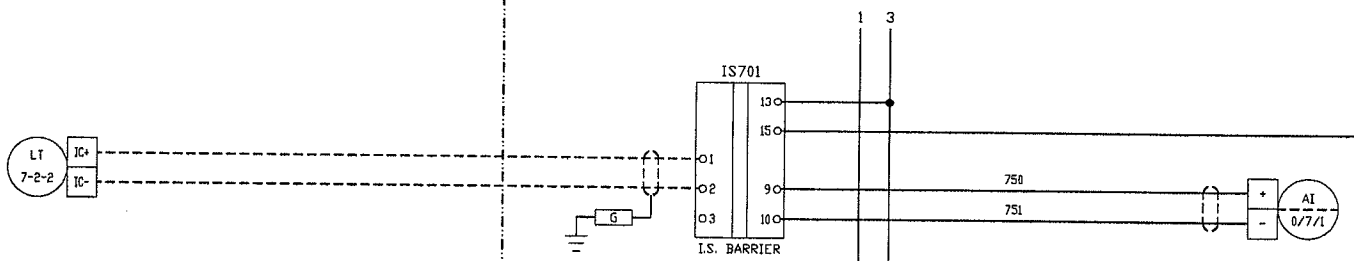
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
SCUM PUMP NO.2
PROJ. NO. 1520C
DWG. NO. 107A

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LCP-C



LT-7-2-2
SCUM PIT NO. 2
LEVEL
0-10.0 FT
LOCAL:7:I.CH1DATA

REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
BVN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	18 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

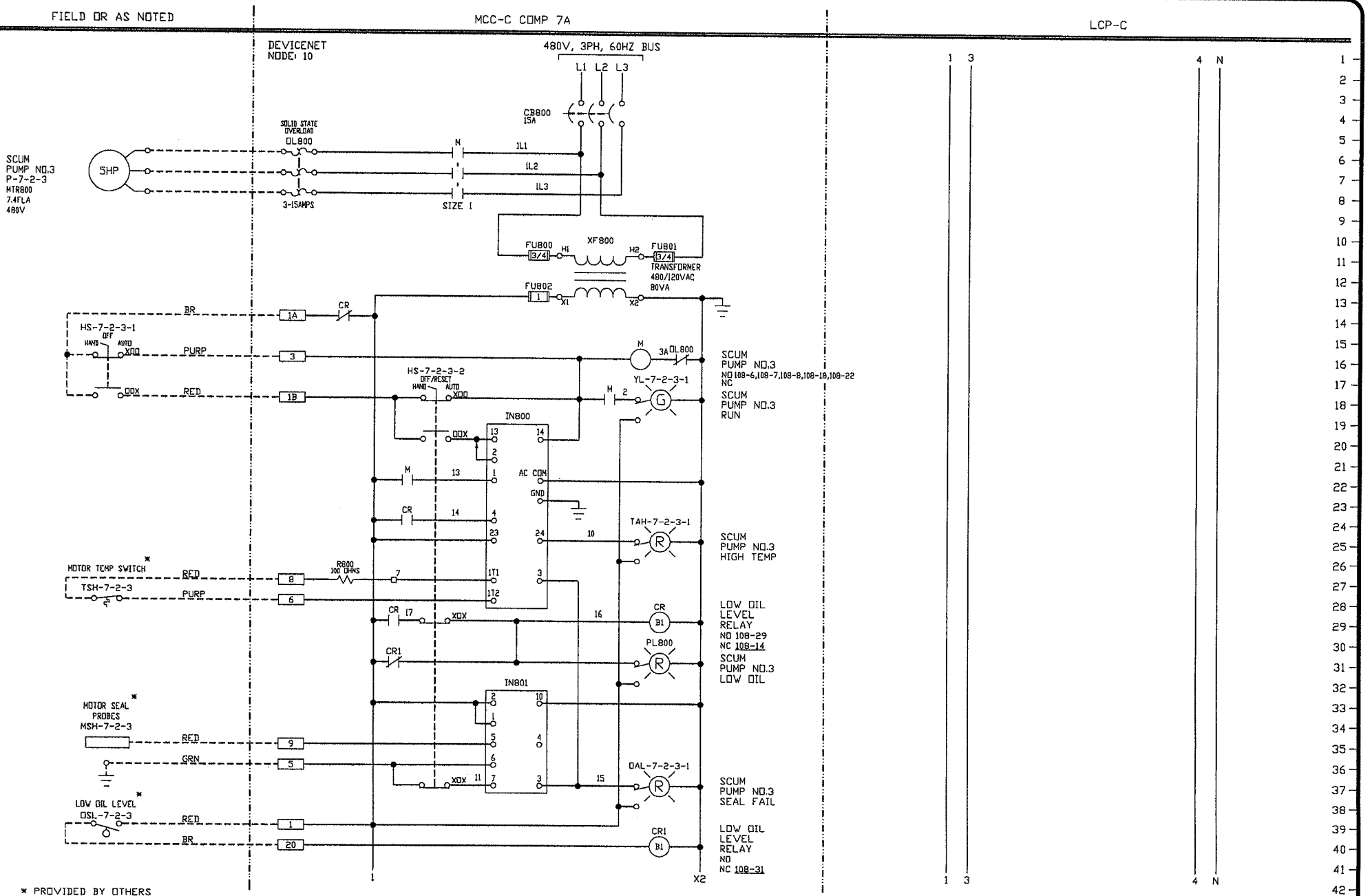
LCP-C
SCUM PIT NO. 2
LEVEL

PROJ. NO. 1520C
DWG. NO. 107B

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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13003 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	19 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
SCUM PUMP NO.3
PROJ. NO. 1520C
DWG. NO. 108A

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FIELD OR AS NOTED

LCP-C

SCUM PIT NO. 3
LEVEL
TRANSMITTER

LT
7-2-3

IC+
IC-

IS801

1
2
3

G

I.S. BARRIER

13
15
9
10

1 3

850
851

+
-

AI
0/7/2

4 N

LT-7-2-3
SCUM PIT NO. 3
LEVEL
0-10.0 FT
LOCAL:7:I.CH2DATA

1 3

4 N

REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	20 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SCUM PIT NO. 3
LEVEL

PROJ. NO. 1520C

DWG. NO. 108B

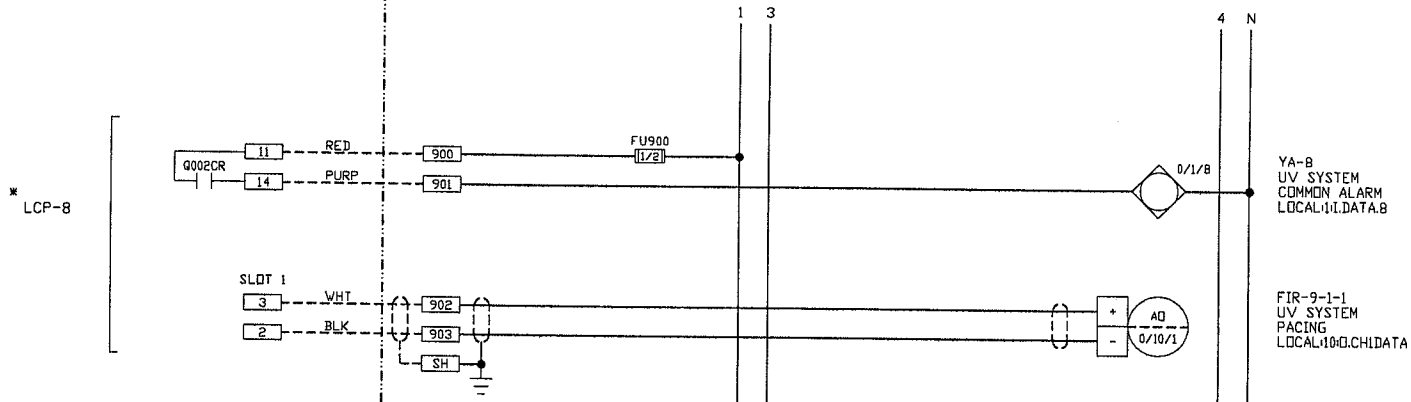
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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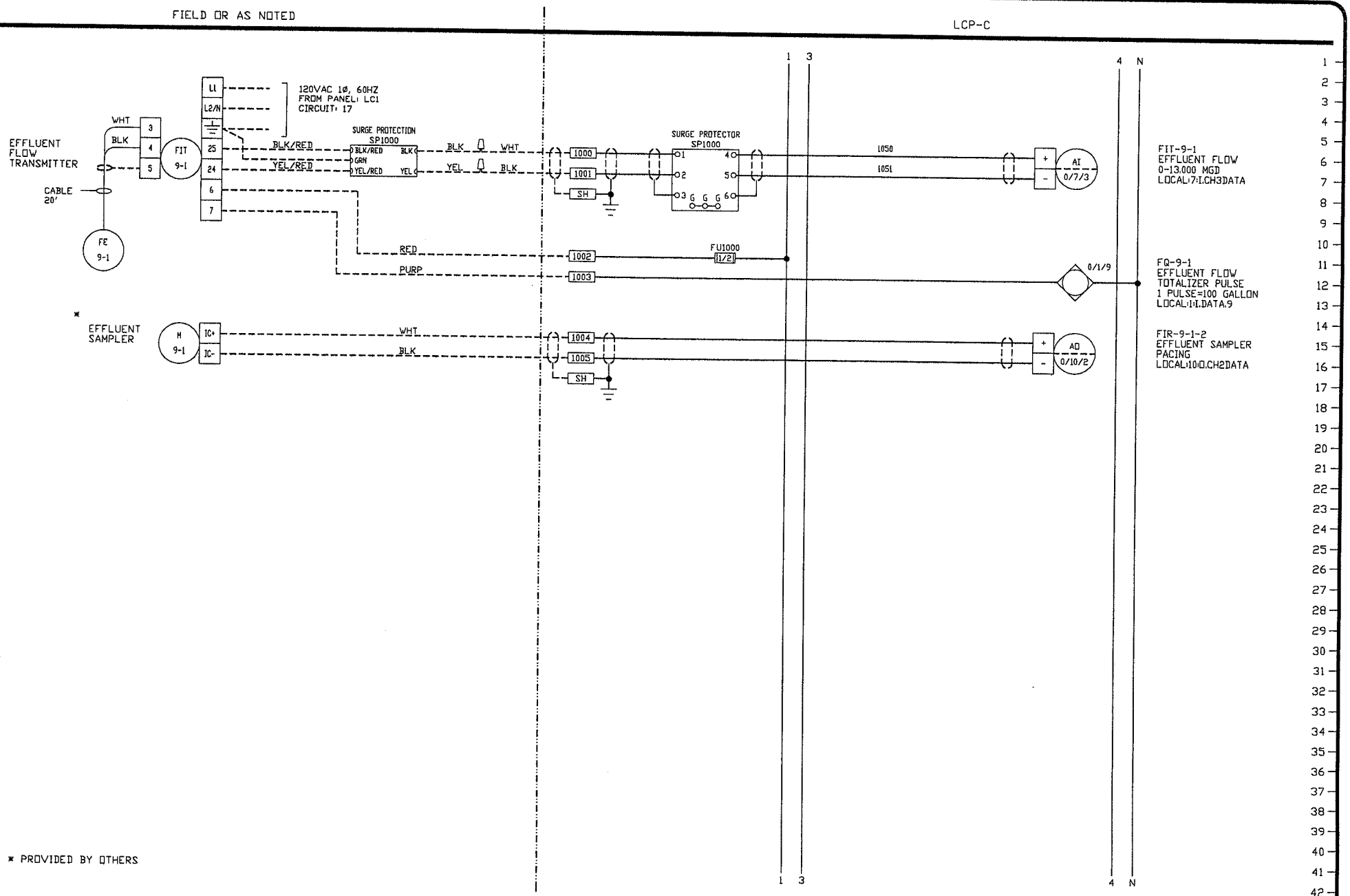
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	21 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
UV SYSTEM

PROJ. NO. 1520C

DWG. NO. 109



REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

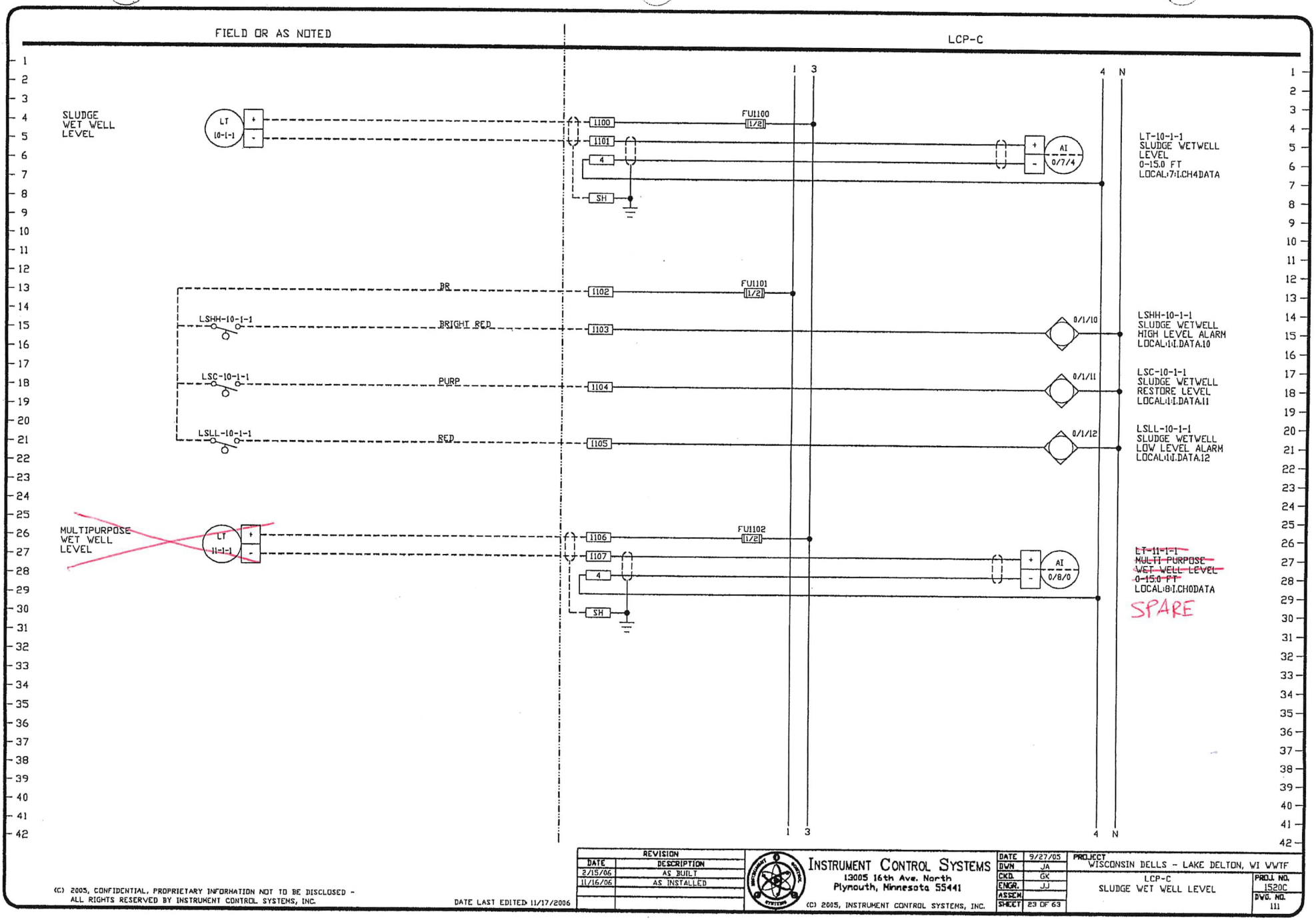
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	22 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
EFFLUENT FLOW
PROJ. NO. 1520C
DWG. NO. 110

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DATE LAST EDITED: 11/17/2006



REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

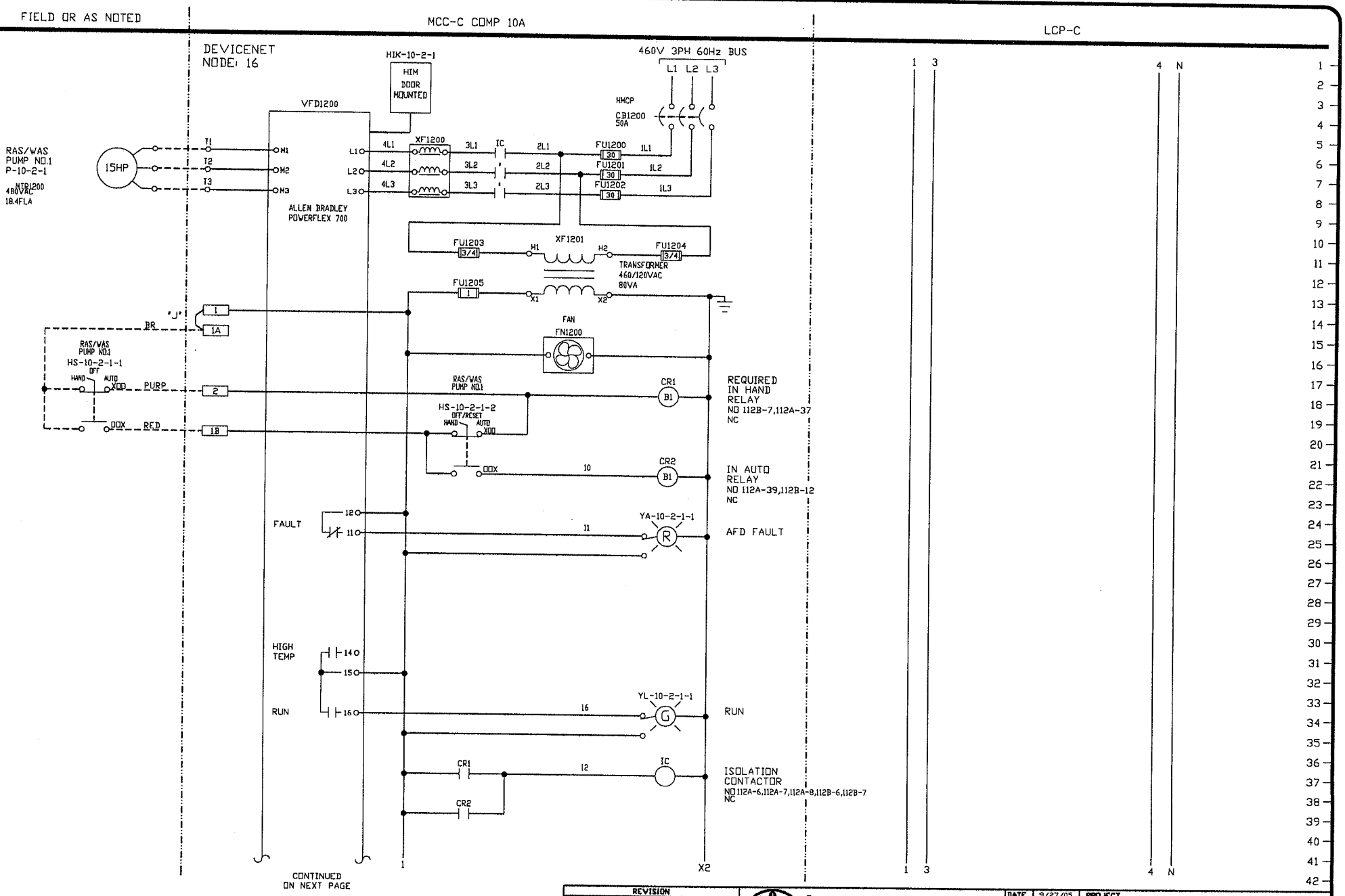
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	23 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
SLUDGE WET WELL LEVEL
PROJ. NO. 1520C
DWG. NO. 111

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REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	24 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
RAS/WAS PUMP NO.1

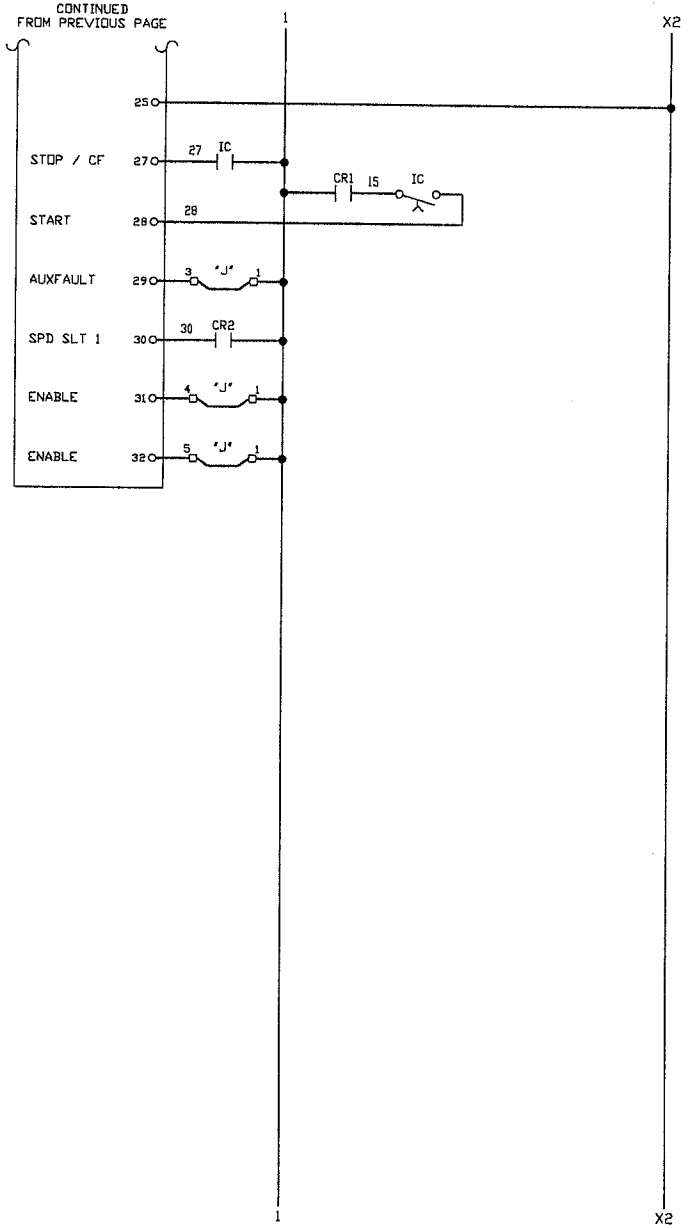
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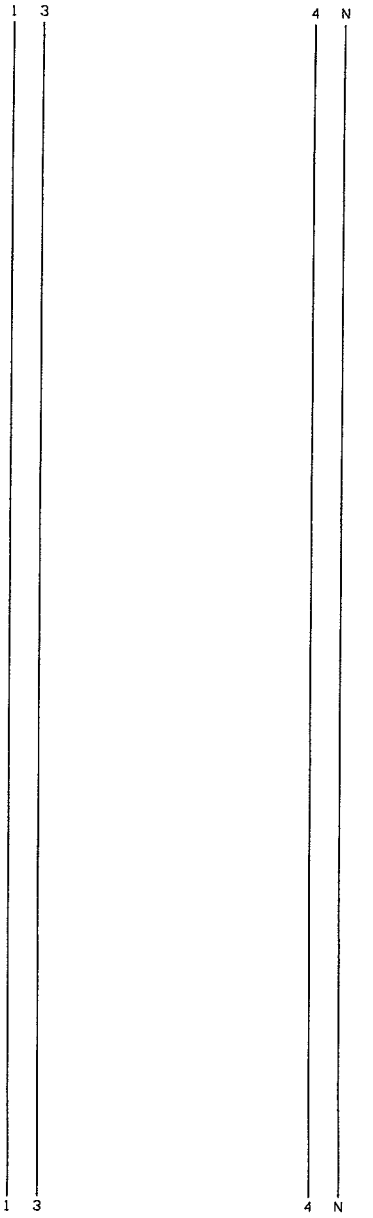
DWG. NO. 112A

FIELD OR AS NOTED

MCC-C COMP 10A

LCP-C





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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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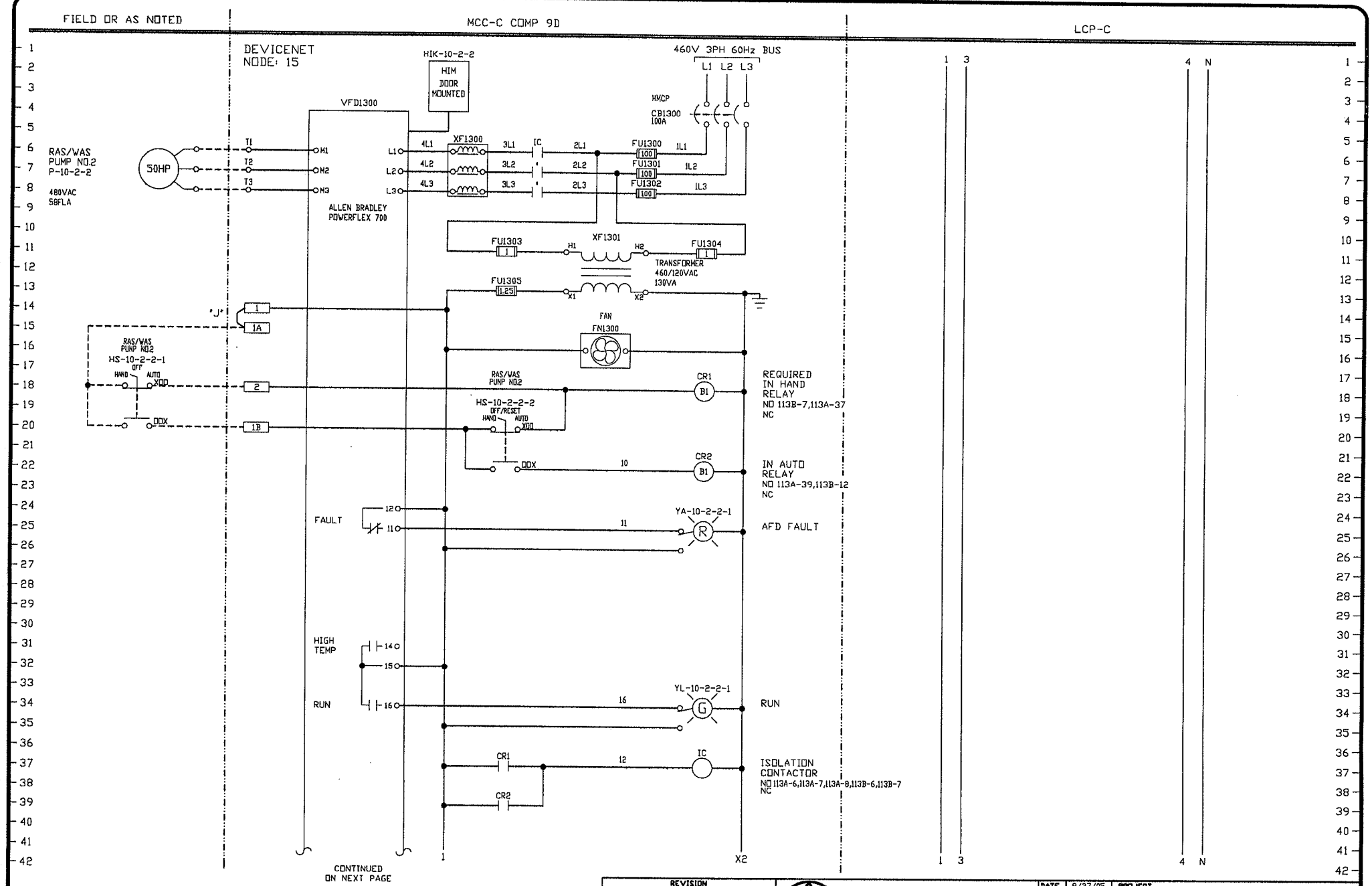
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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	25 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
RAS/WAS PUMP NO.1

PROJ. NO. 1520C

DWG. NO. 112B



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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	26 OF 63

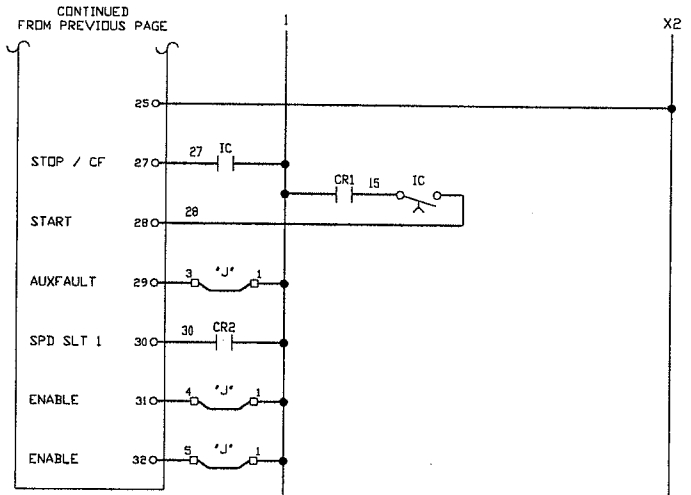
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

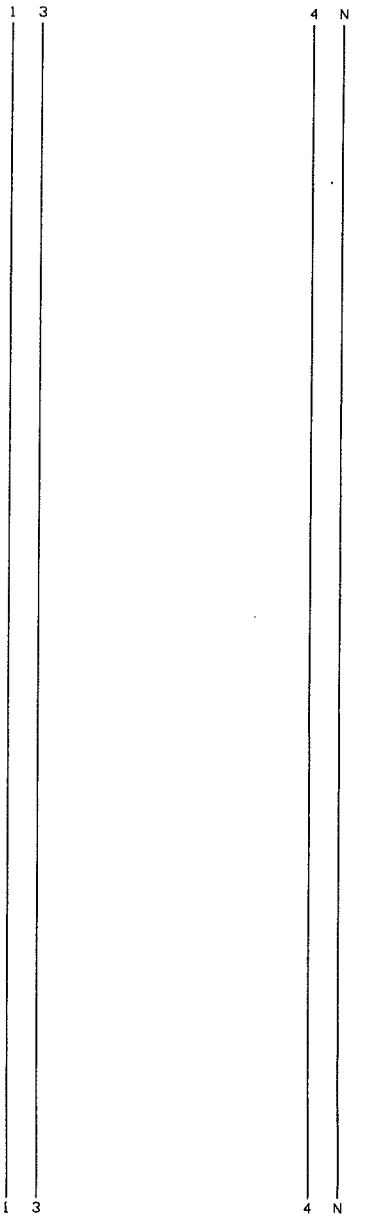
LCP-C
RAS/WAS PUMP NO.2

PROJ. NO. 1520C

DWG. NO. 113A

FIELD OR AS NOTED | MCC-C COMP 9D | LCP-C





REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

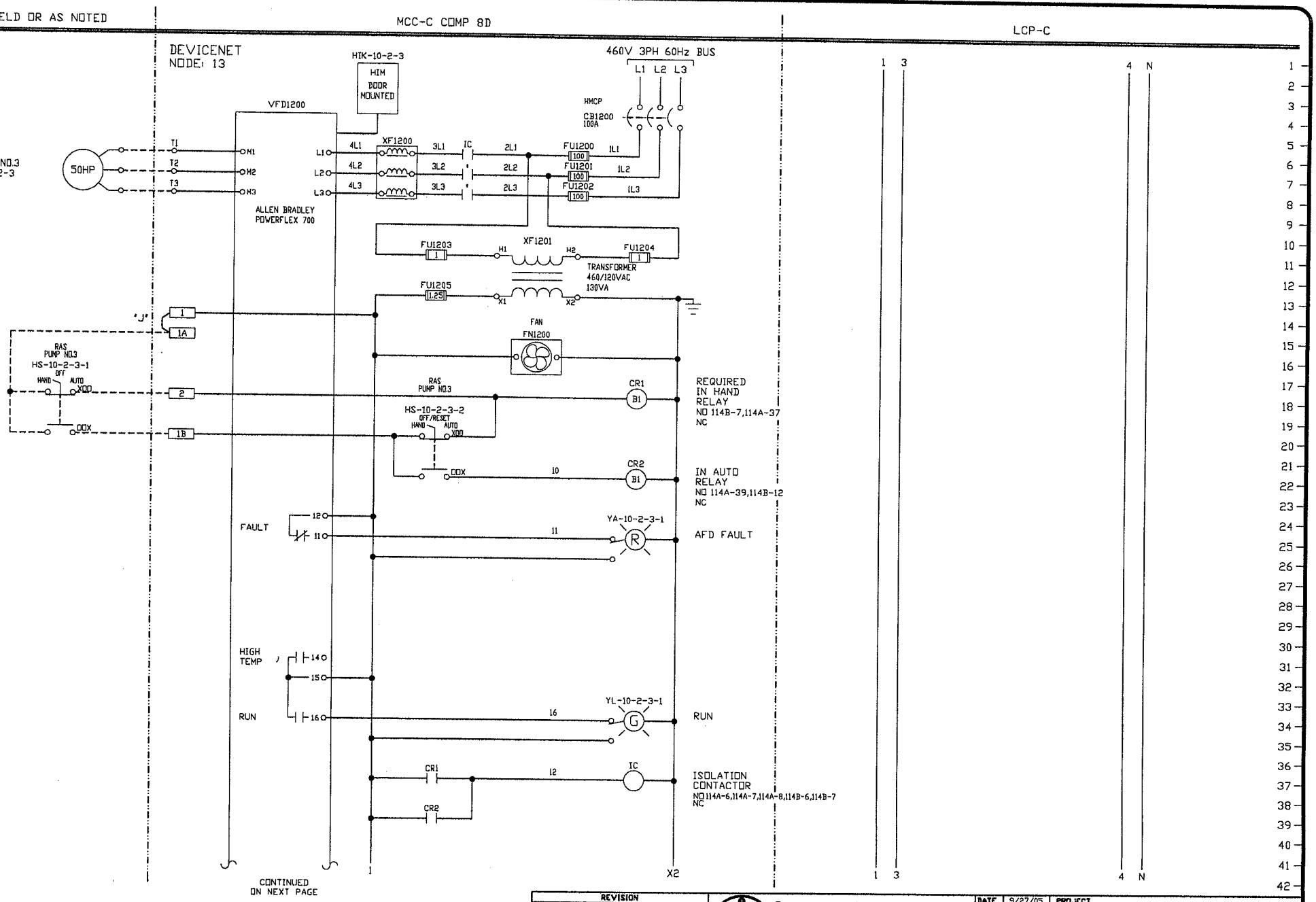
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	27 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
RAS/WAS PUMP NO.2
PROJ. NO. 1520C
DWG. NO. 113B

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DATE	DESCRIPTION
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	28 OF 63

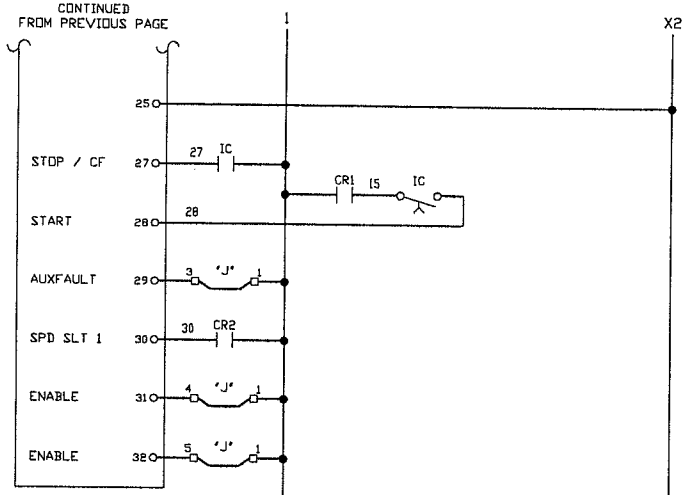
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

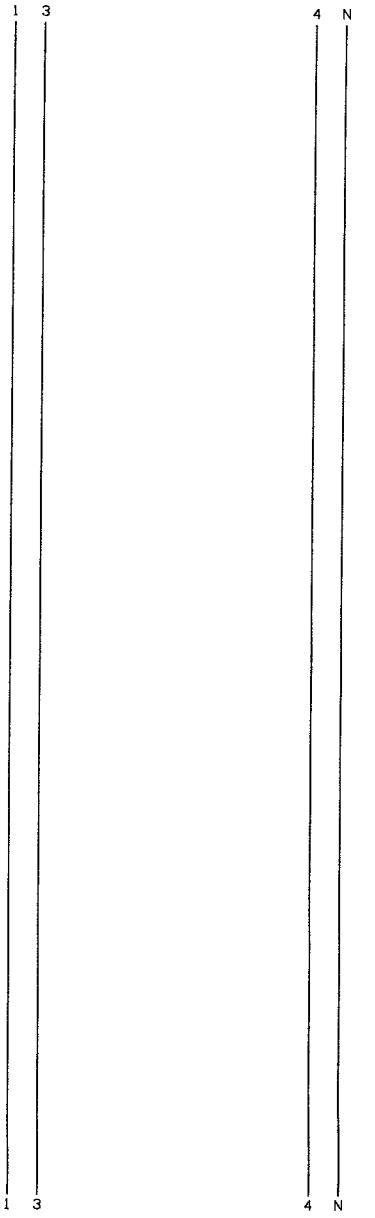
LCP-C
RAS PUMP NO.3

PROJ. NO. 1520C

DWG. NO. 114A

FIELD OR AS NOTED | MCC-C COMP 8D | LCP-C





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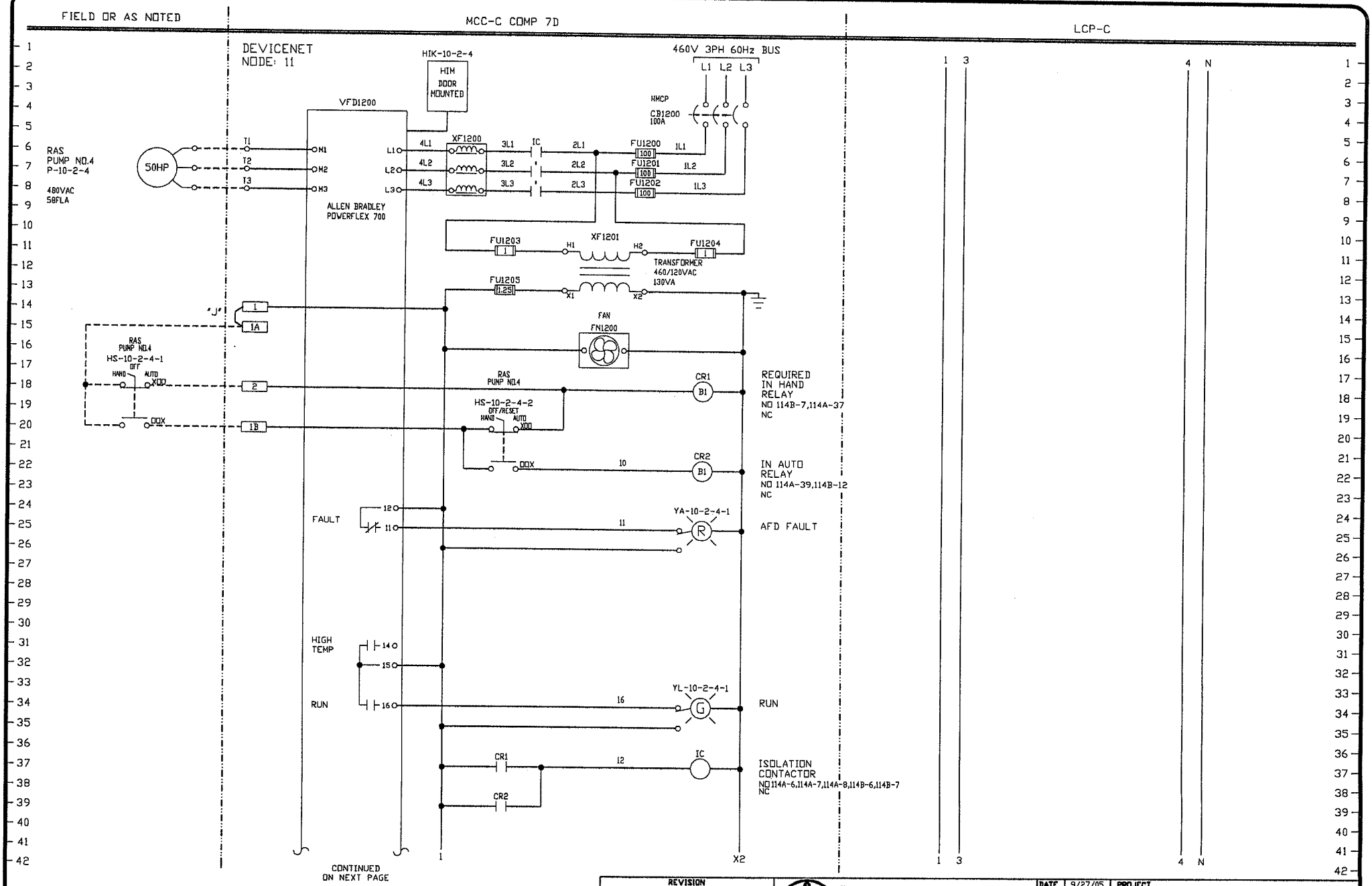
REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	29 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
RAS PUMP NO.3
PROJ. NO. 1520C
DWG. NO. 114B



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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	30 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
RAS PUMP NO.4

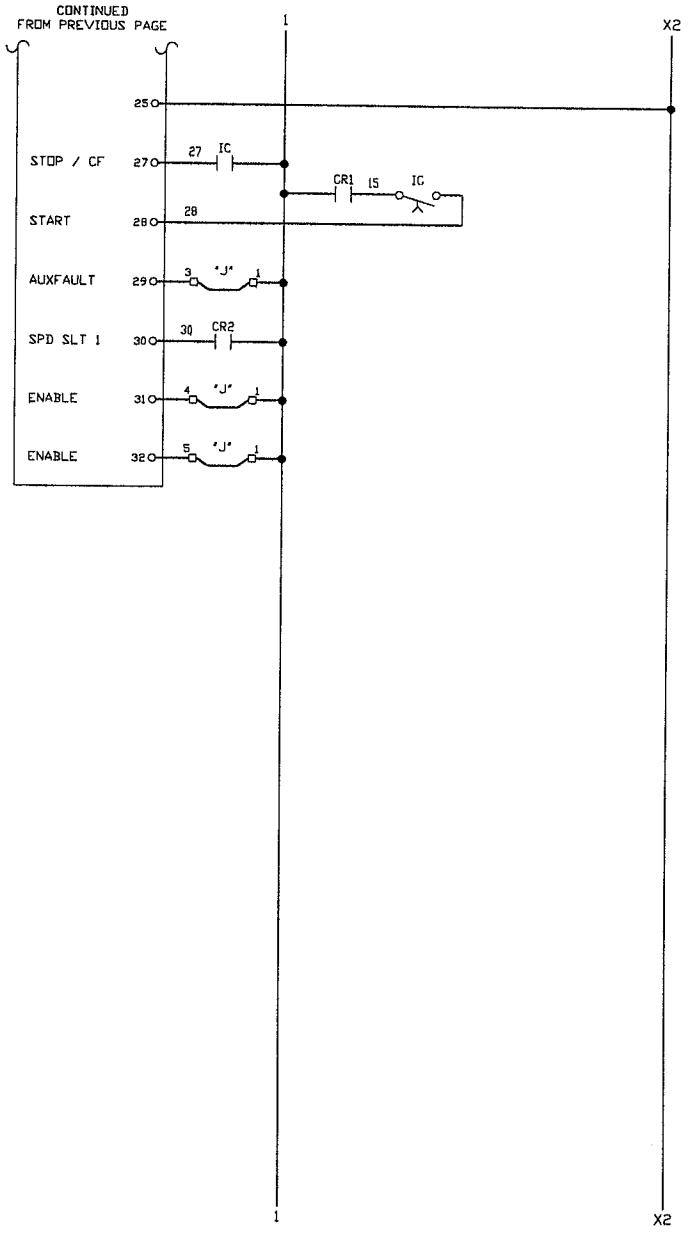
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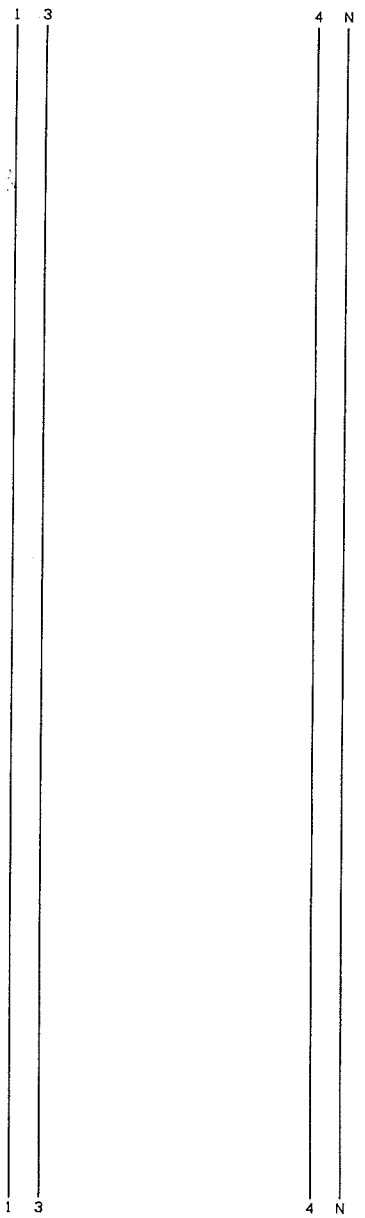
DWG. NO. 115A

FIELD OR AS NOTED

MCC-C COMP 7D

LCP-C





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11/16/06	AS INSTALLED

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Plymouth, Minnesota 55441

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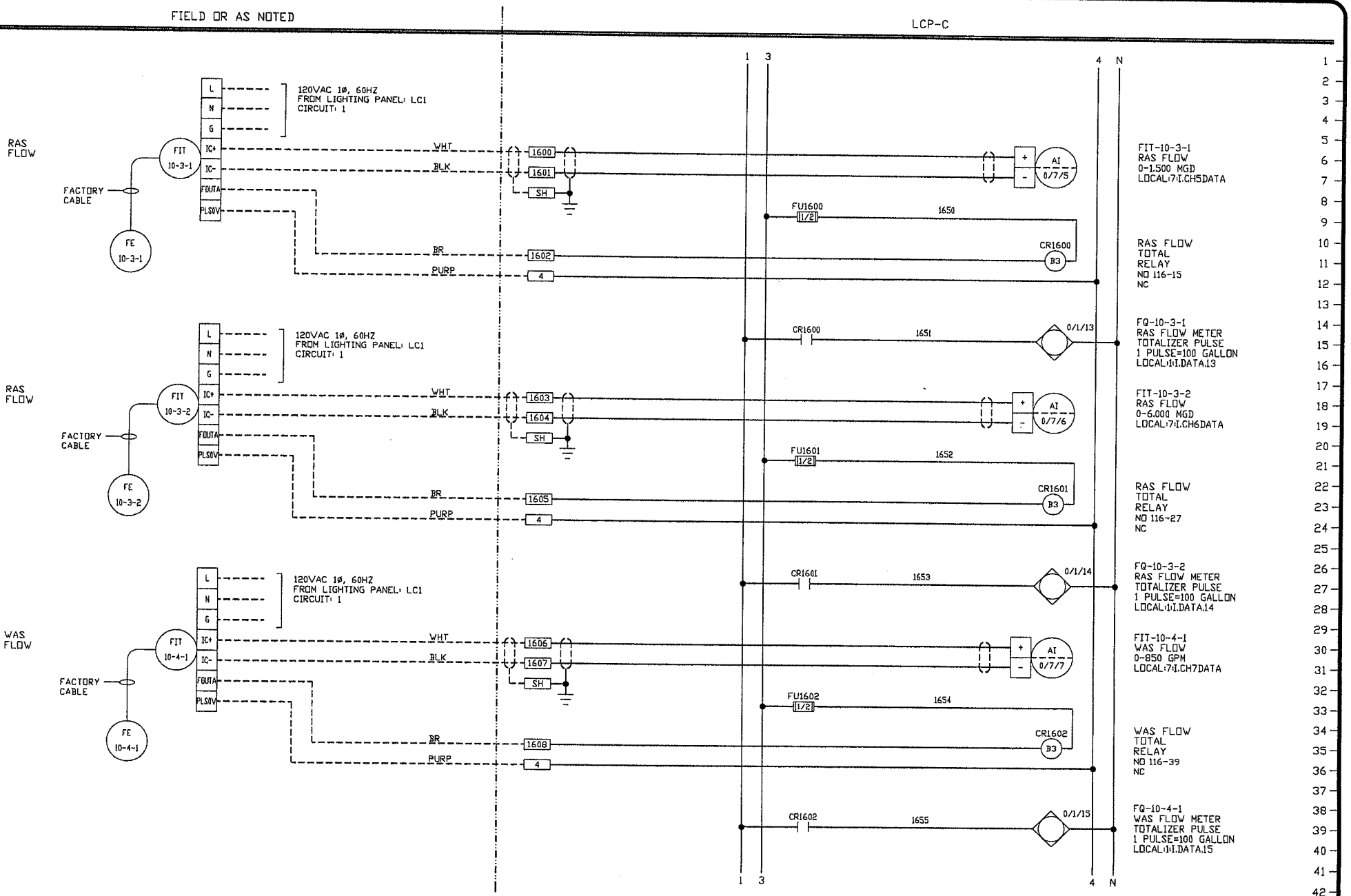
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	31 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
RAS/WAS PUMP NO.4

PROJ. NO. 1520C

DWG. NO. 115B



REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

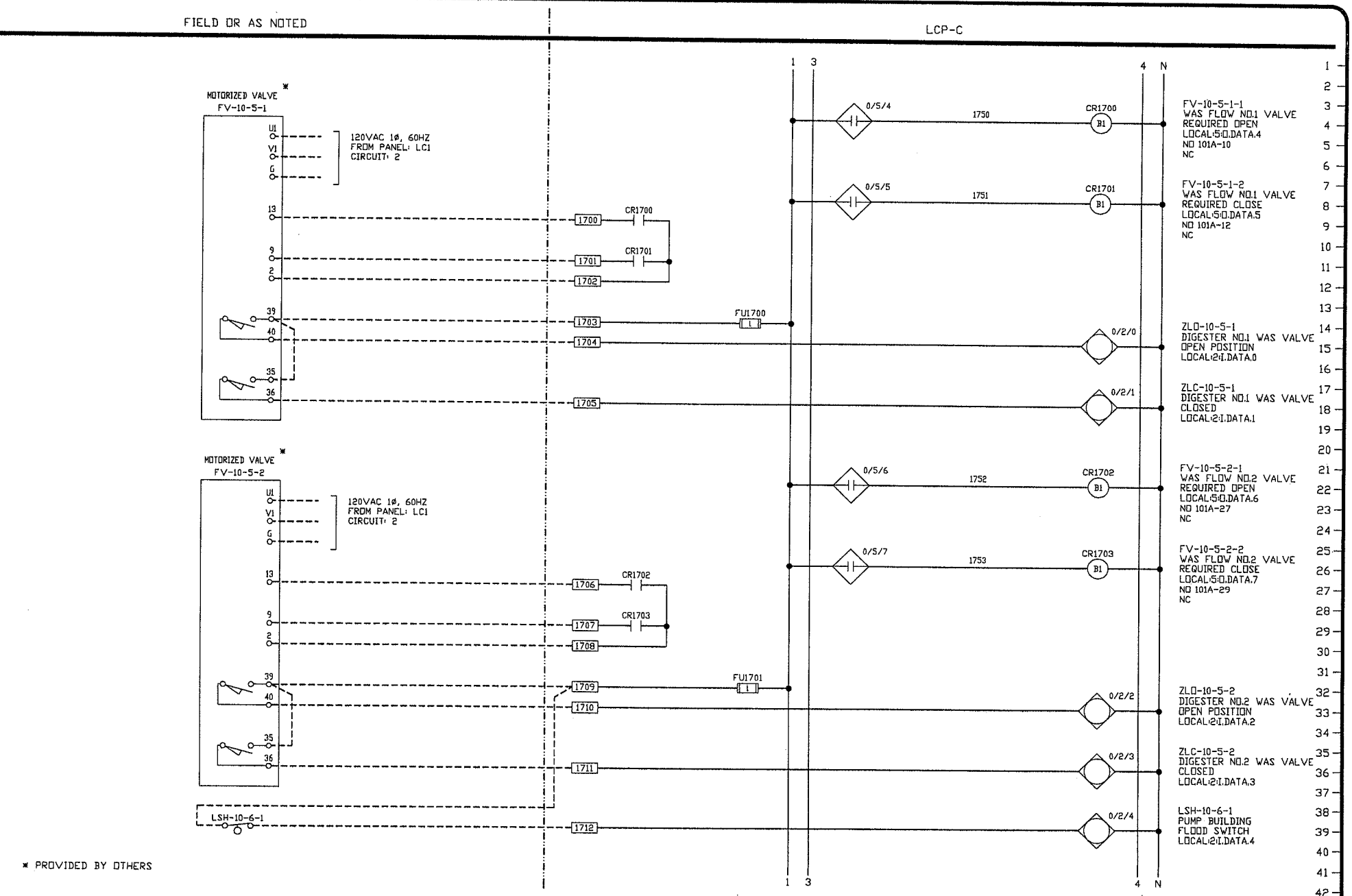
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	32 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
RAS/WAS FLOW METERING
PROJ. NO. 1520C
DWG. NO. 116

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11/16/06	AS INSTALLED

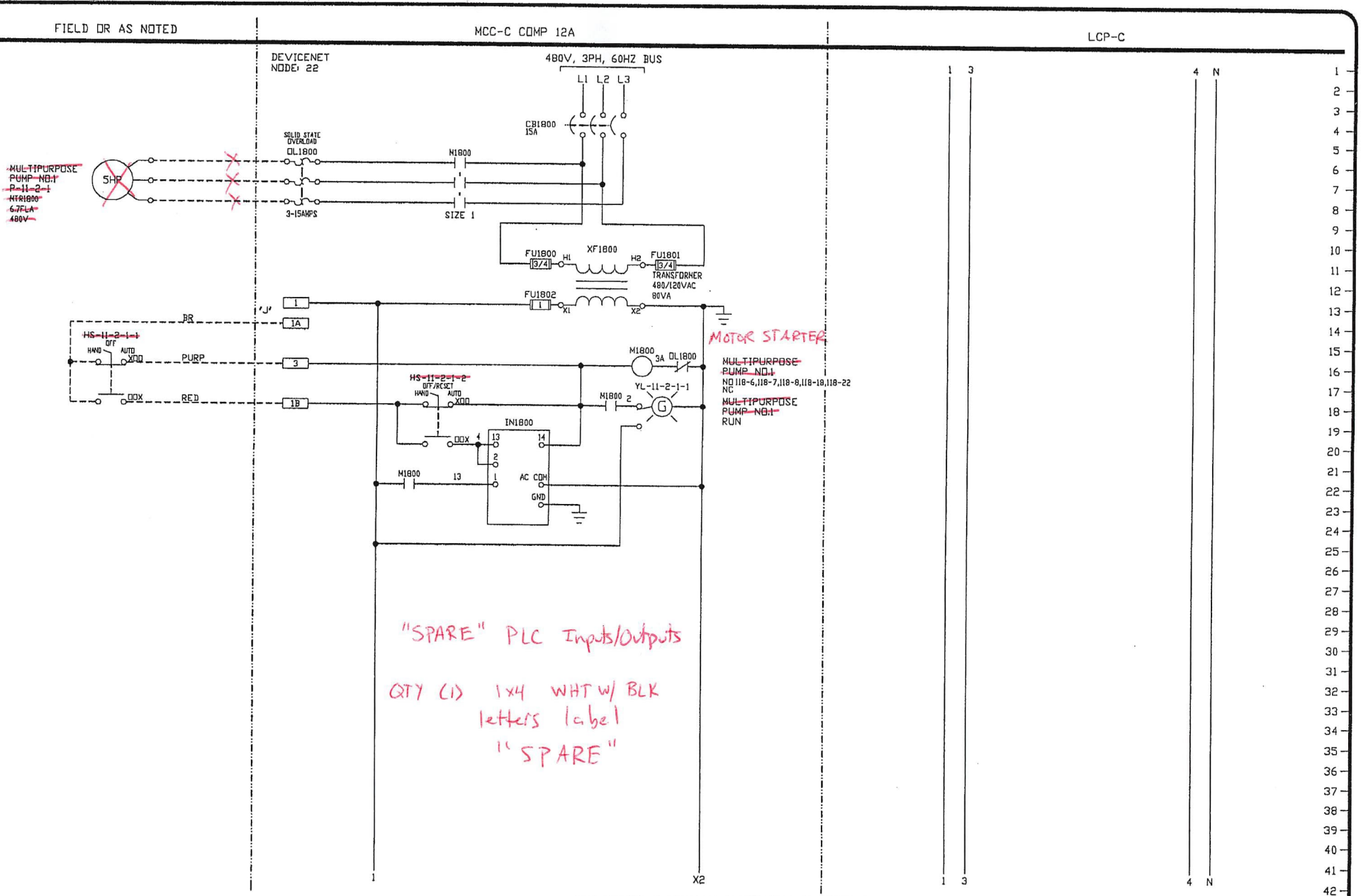
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	33 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
WAS VALVES
PROJ. NO. 1520C
DWG. NO. 117

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DATE	9/27/05
DWN.	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	34 OF 63

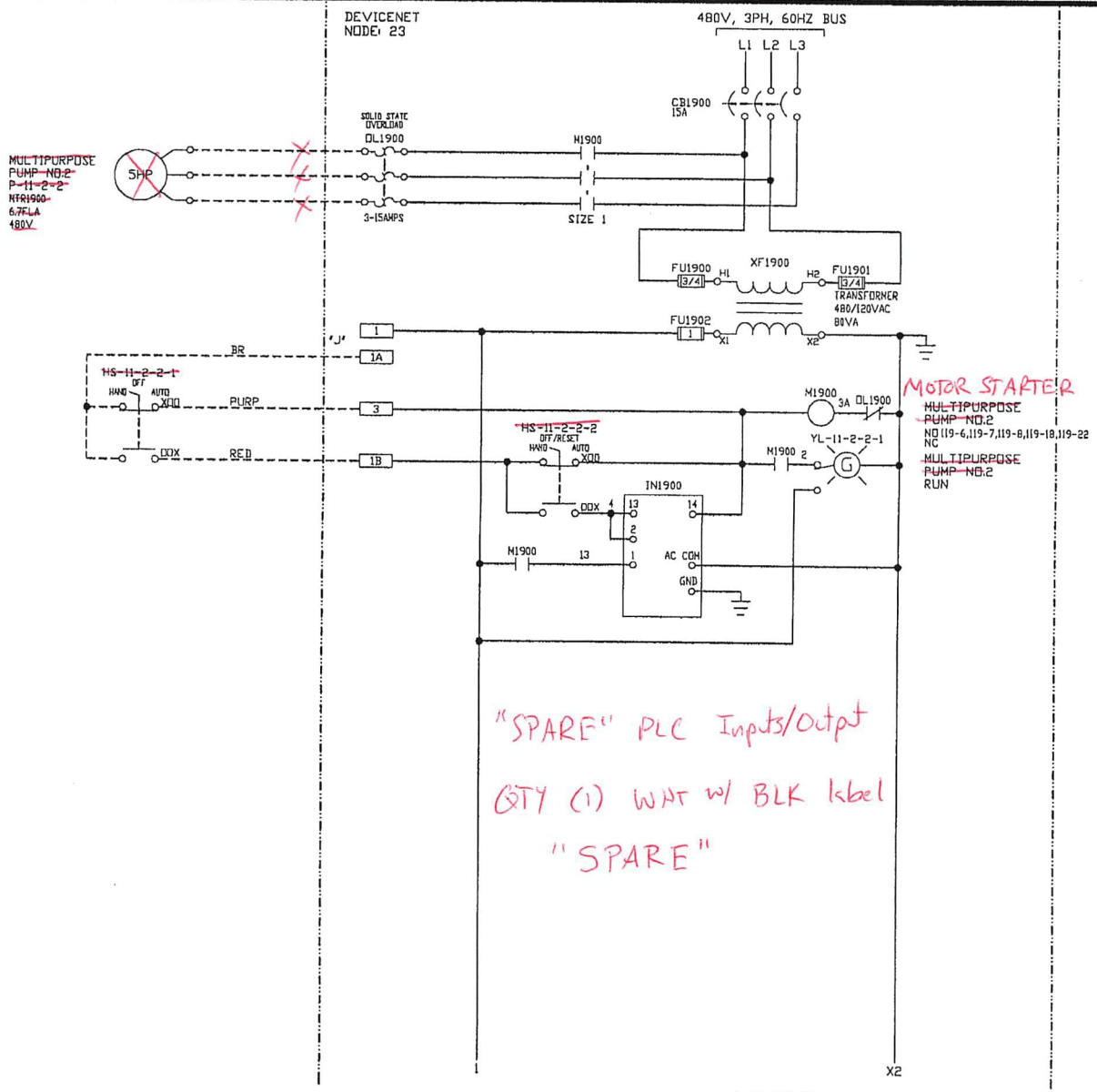
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
MULTIPURPOSE PUMP NO.1

PROJ. NO. 1520C

DWG. NO. 118

FIELD OR AS NOTED | MCC-C COMP 12C | LCP-C



REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

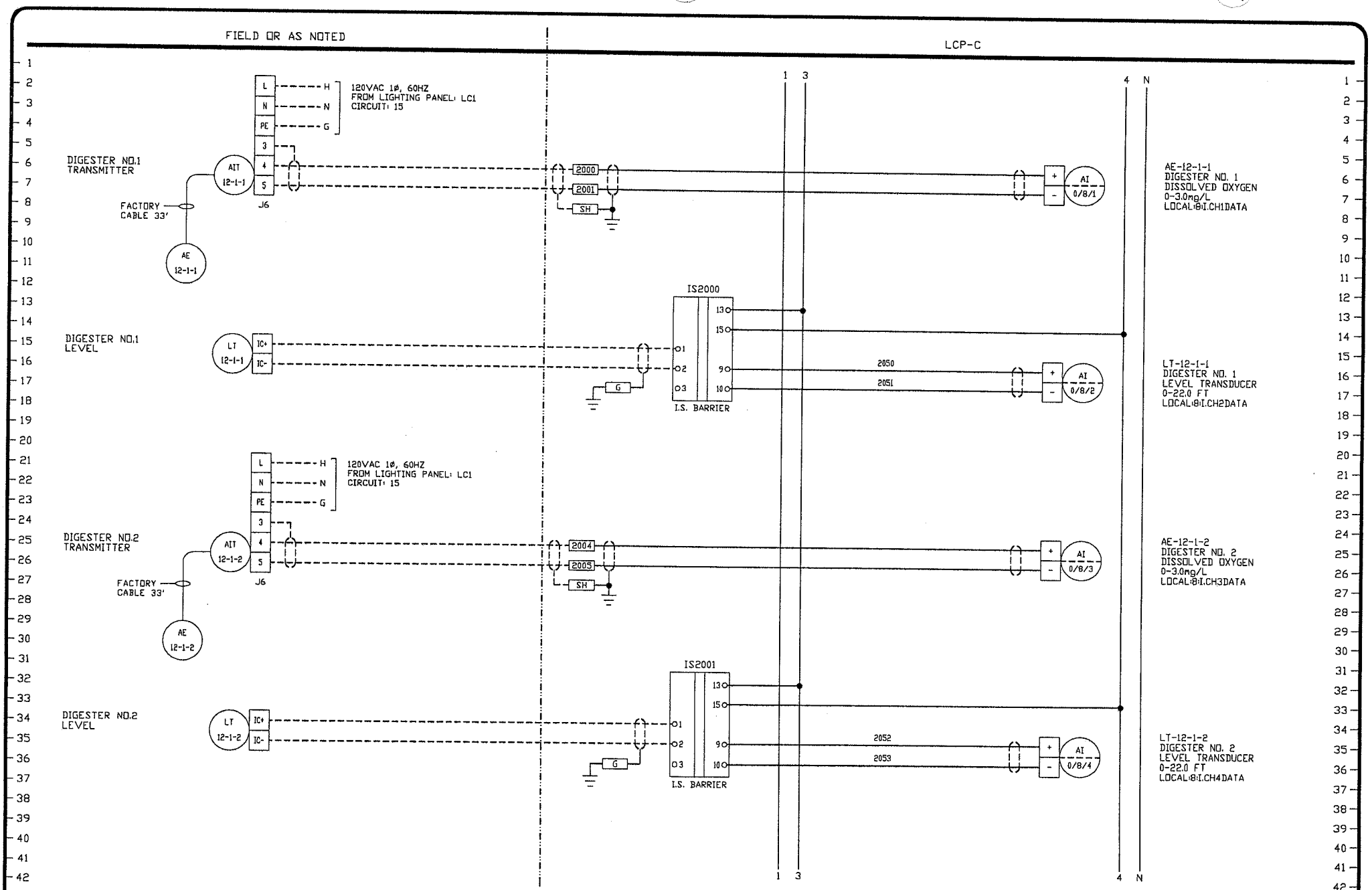
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD	GK
ENGR.	JJ
ASSEM.	
SHEET	35 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
MULTIPURPOSE PUMP NO.2
PROJ. NO. 1520C
DWG. NO. 119

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11/16/06	AS INSTALLED

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13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	36 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

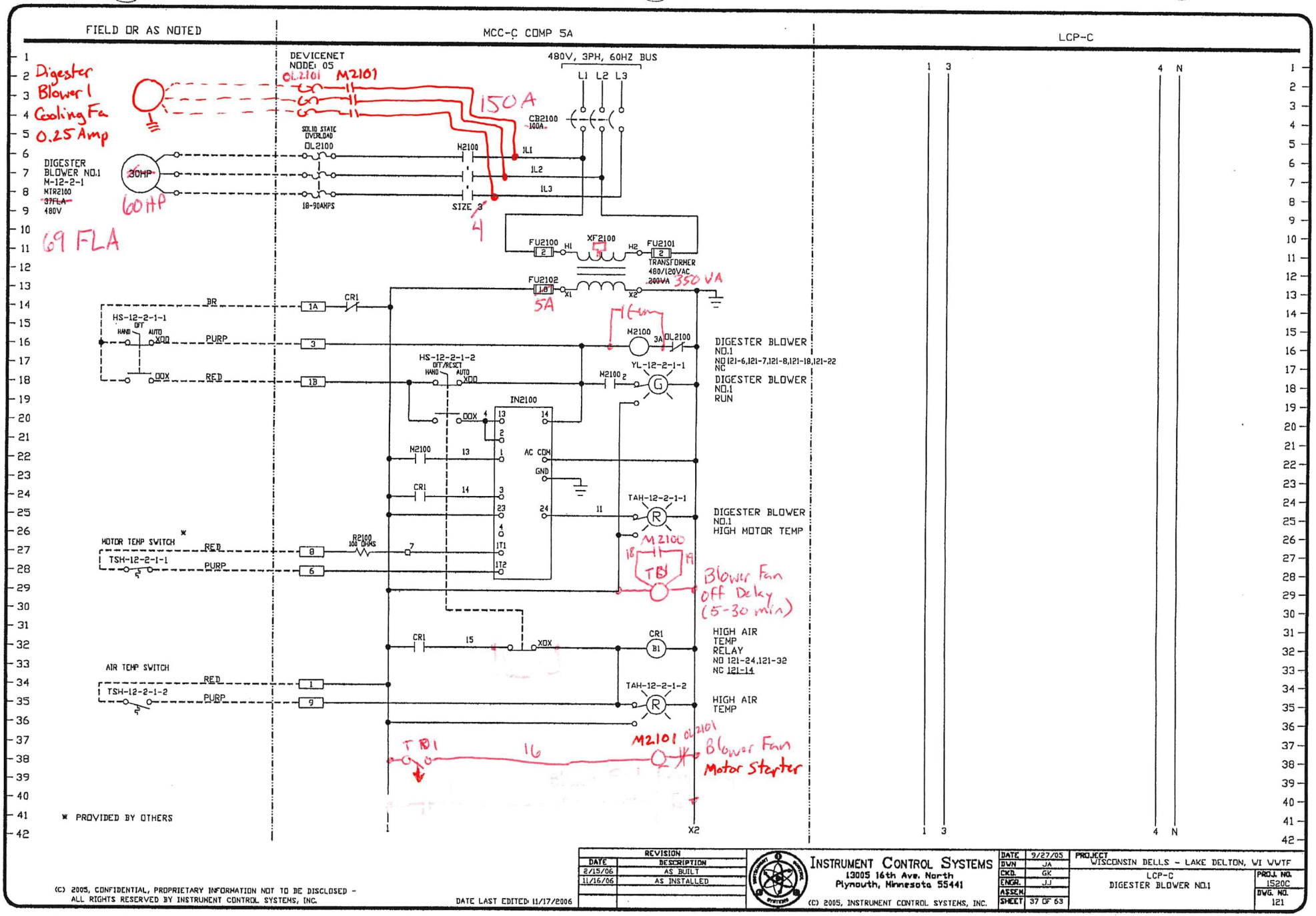
LCP-C
DIGESTER LEVEL AND
DISSOLVED OXYGEN TRANSMITTERS

PROJ. NO. 1520C

DWG. NO. 120

DATE LAST EDITED: 11/17/2006

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REVISION	
DATE	DESCRIPTION
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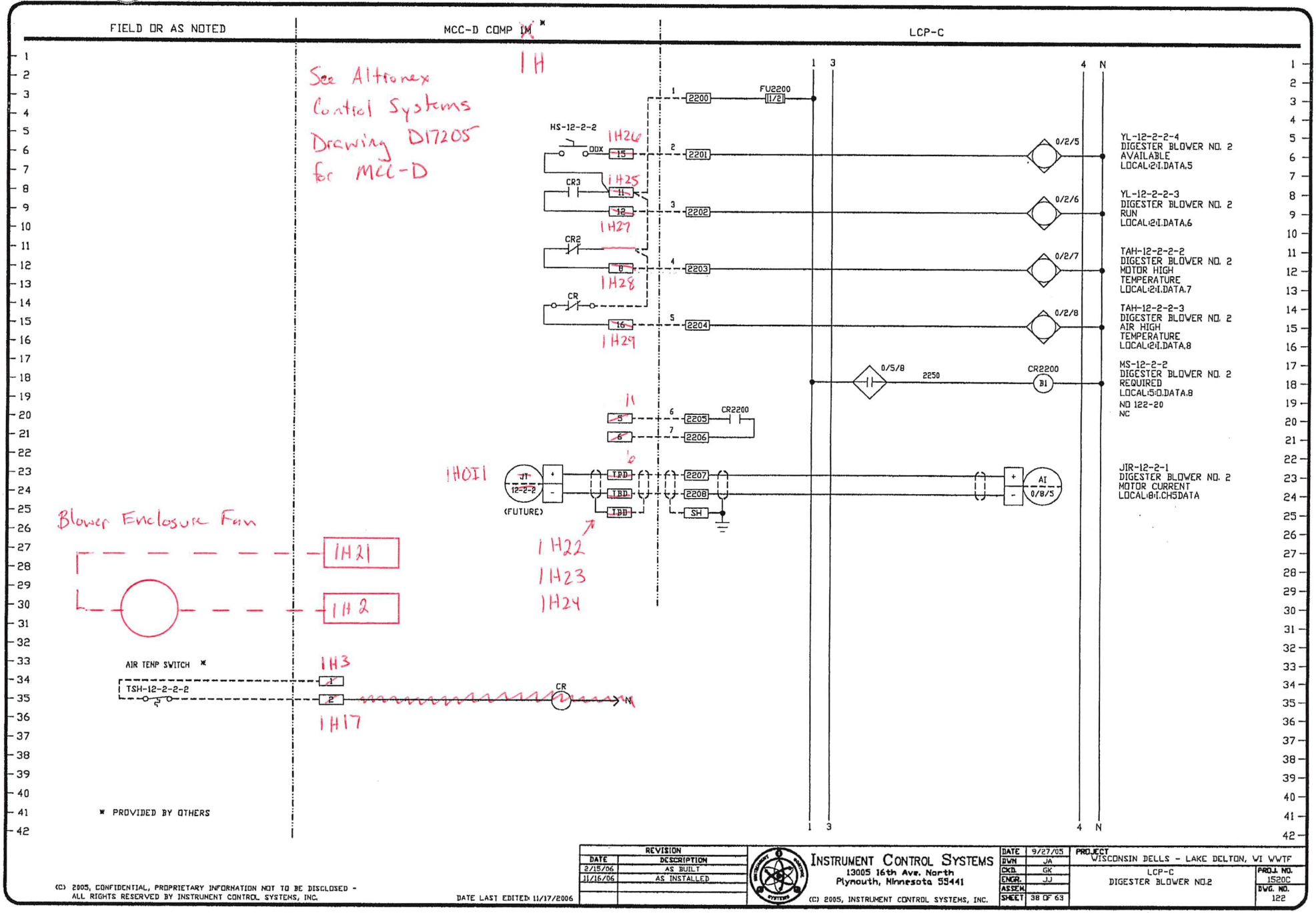
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	37 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
DIGESTER BLOWER NO.1
PROJ. NO. 1520C
DWG. NO. 121

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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

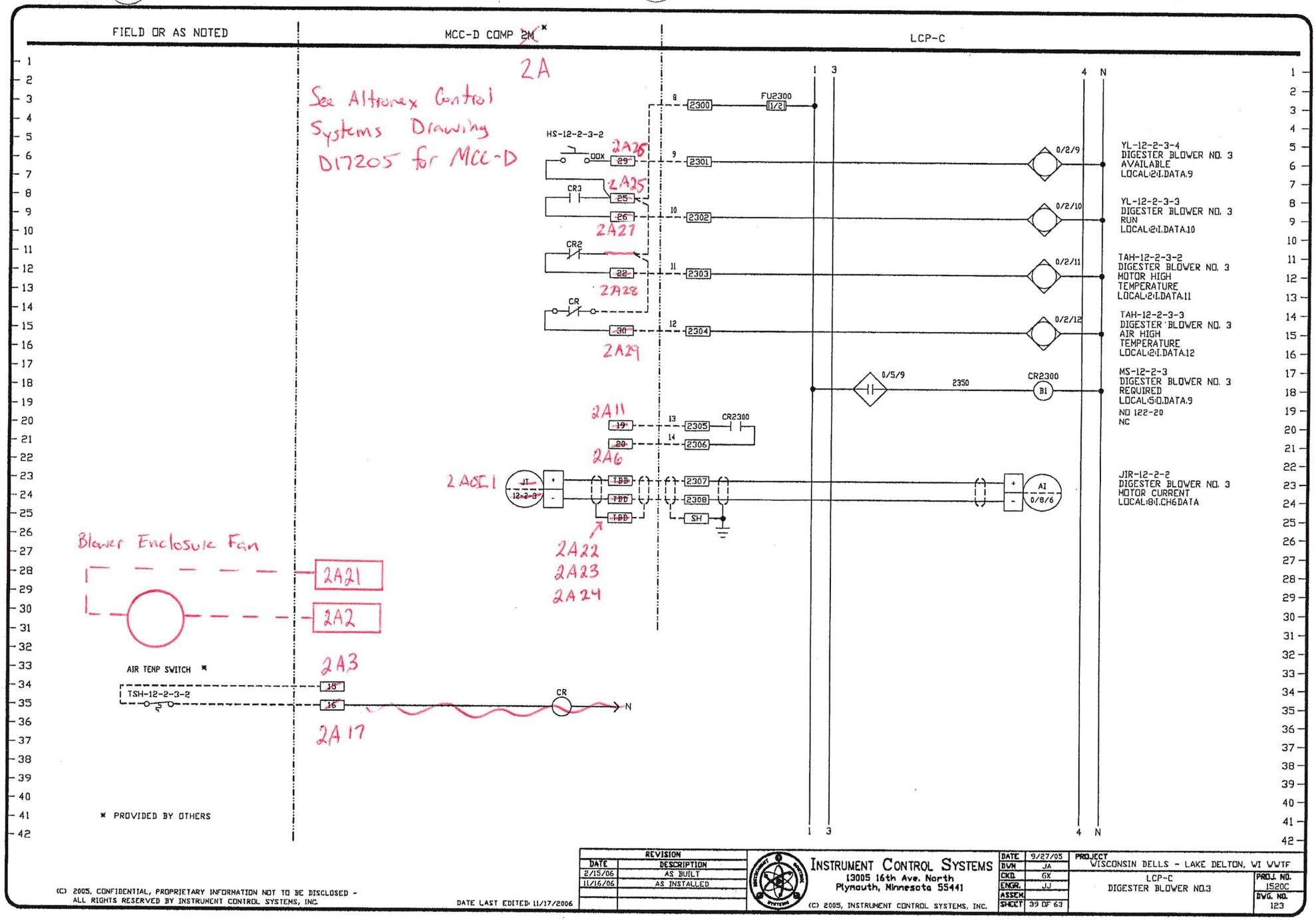
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	38 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
DIGESTER BLOWER NO.2
PROJ. NO. 1520C
DWG. NO. 122

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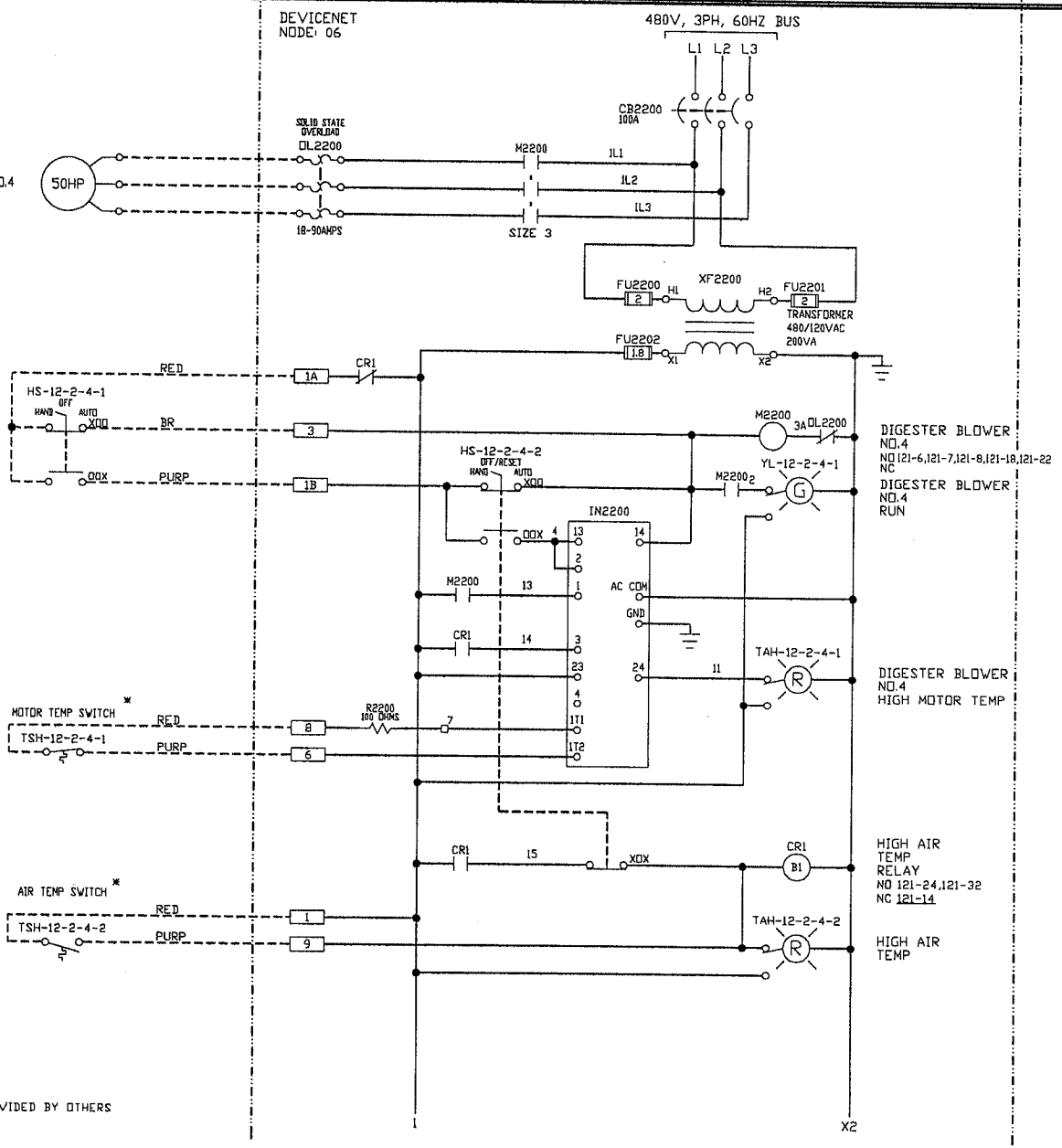
REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD	GK
ENGR.	JJ
ASSEM	
SHEET	39 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
DIGESTER BLOWER NO.3
PROJ. NO. 1520C
DWG. NO. 123



REVISION	
DATE	DESCRIPTION
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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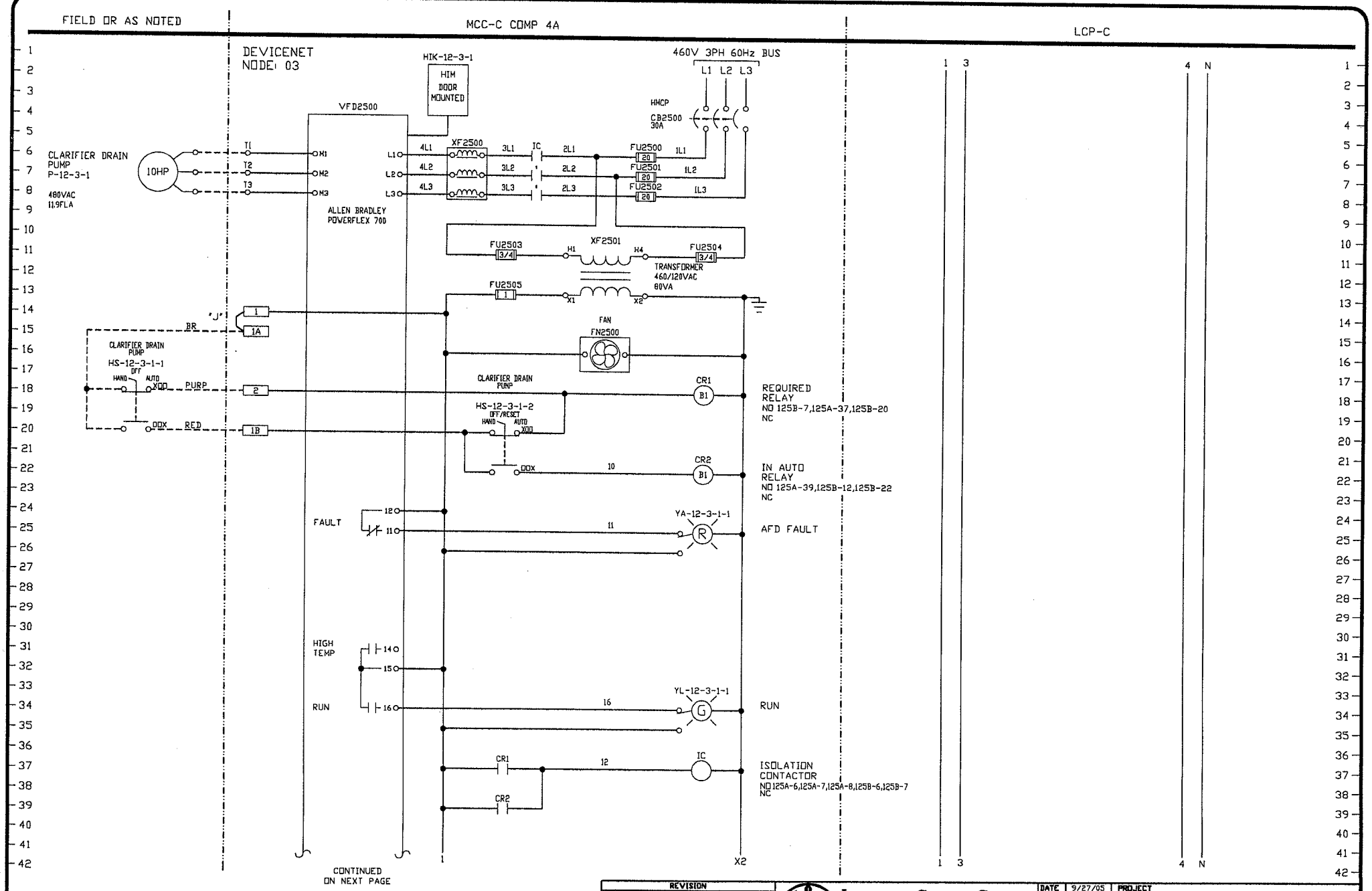
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	40 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
DIGESTER BLOWER NO.4

PROJ. NO. 1520C

DWG. NO. 124



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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
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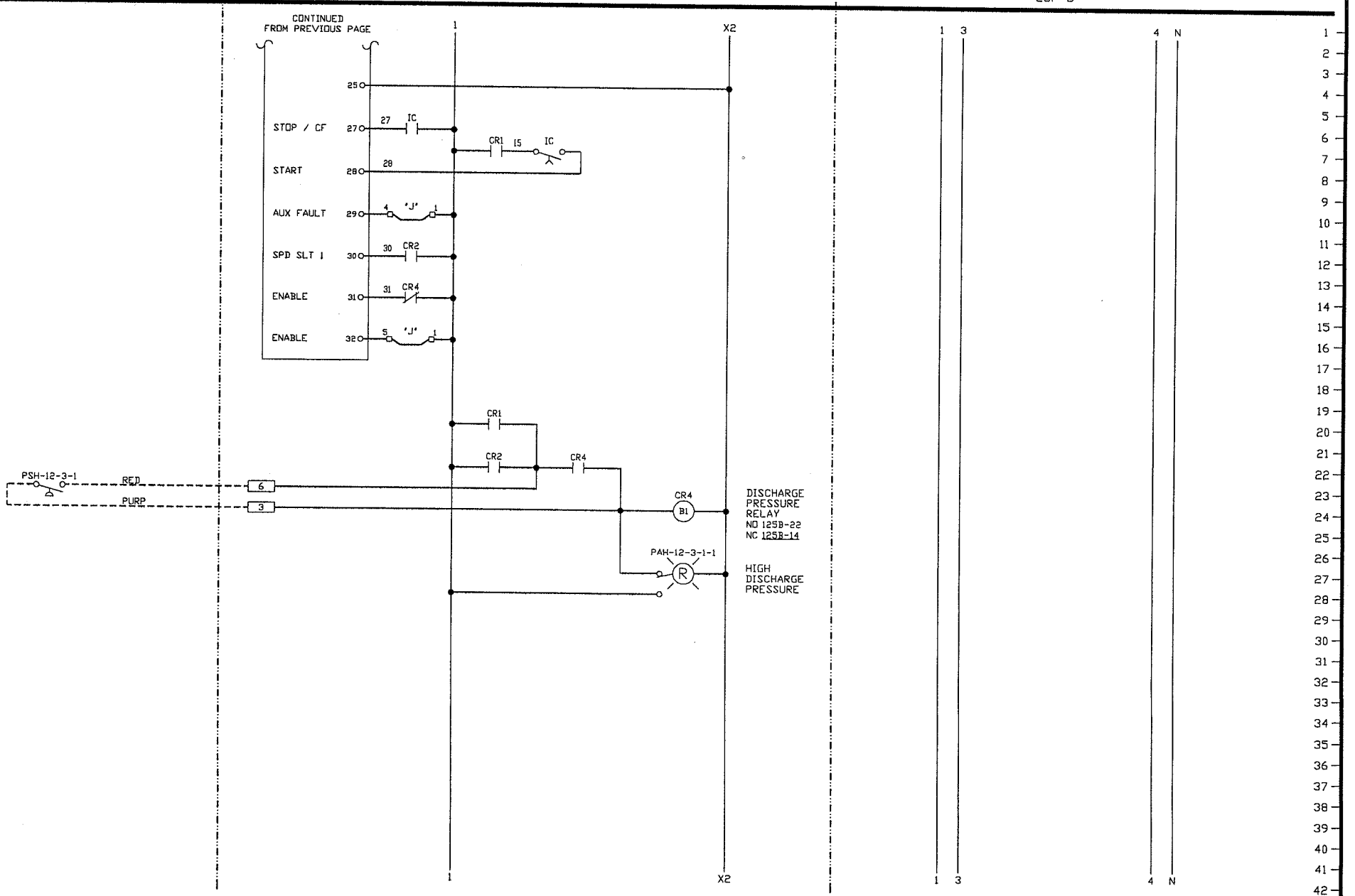
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	41 OF 69

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
CLARIFIER DRAIN PUMP

PROJ. NO. 1520C

DWG. NO. 125A



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REVISION	
DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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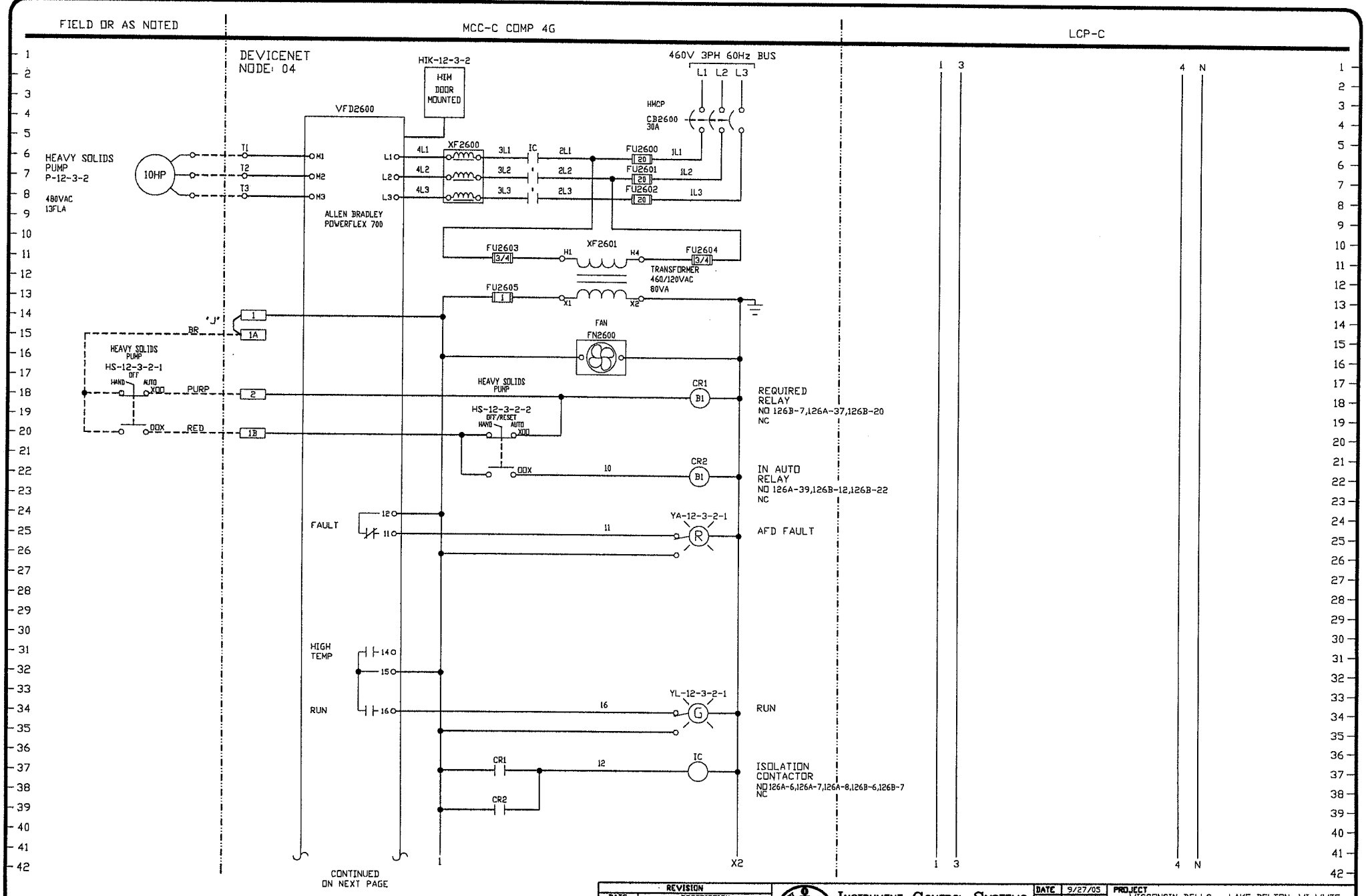
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	42 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
CLARIFIER DRAIN PUMP

PROJ. NO. 1520C

DWG. NO. 125B



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REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	43 OF 63

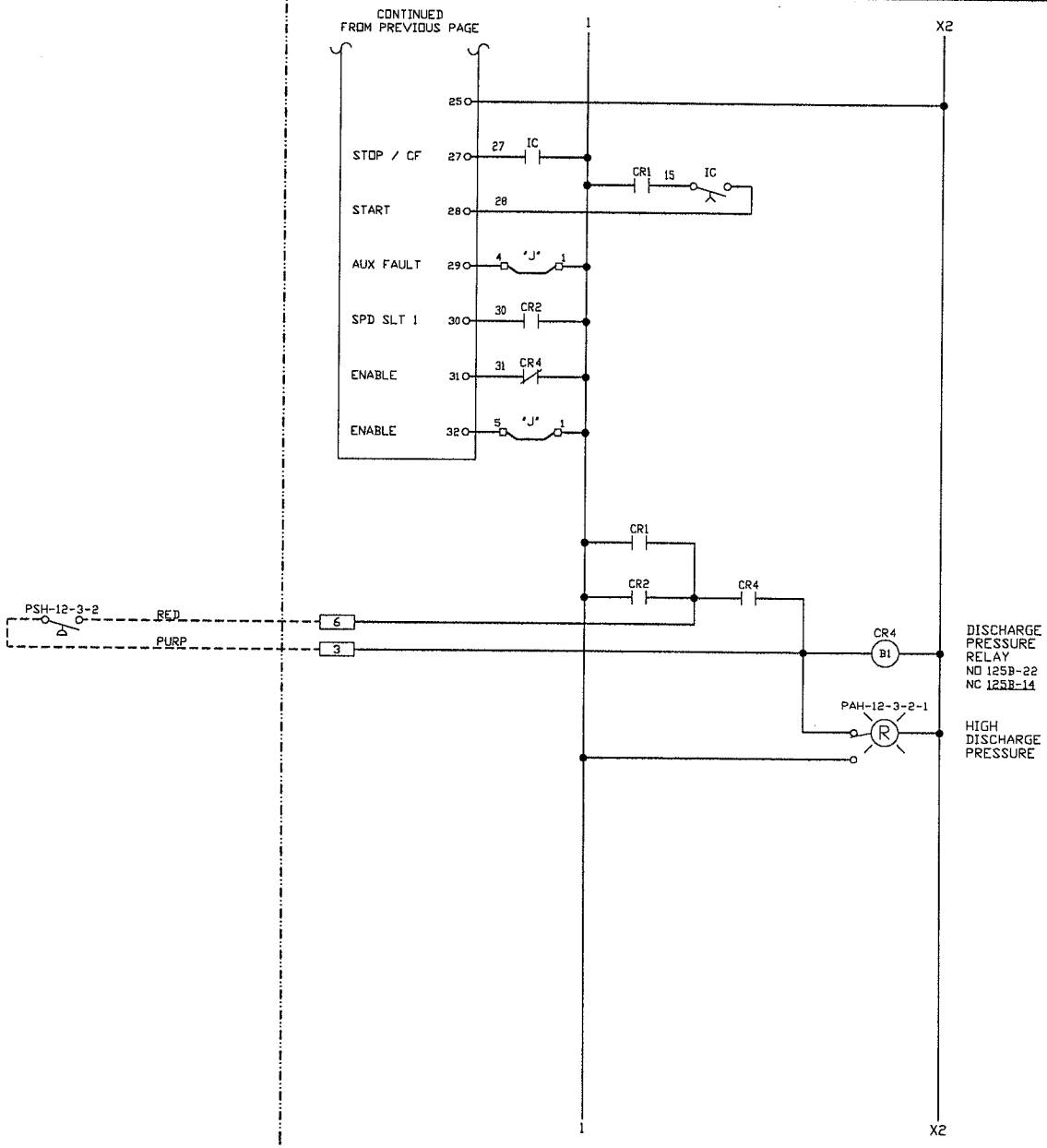
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

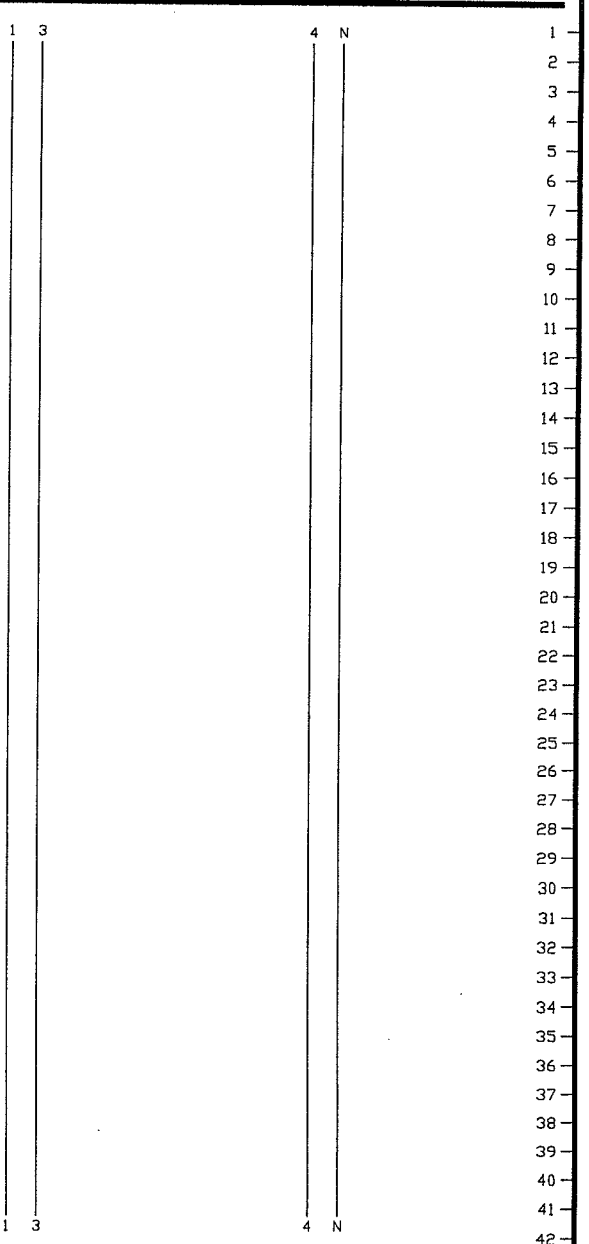
LCP-C
HEAVY SOLIDS PUMP

PROJ. NO. 1520C

DWG. NO. 126A

FIELD OR AS NOTED | MCC-C COMP 4G | LCP-C





REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	44 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
HEAVY SOLIDS PUMP

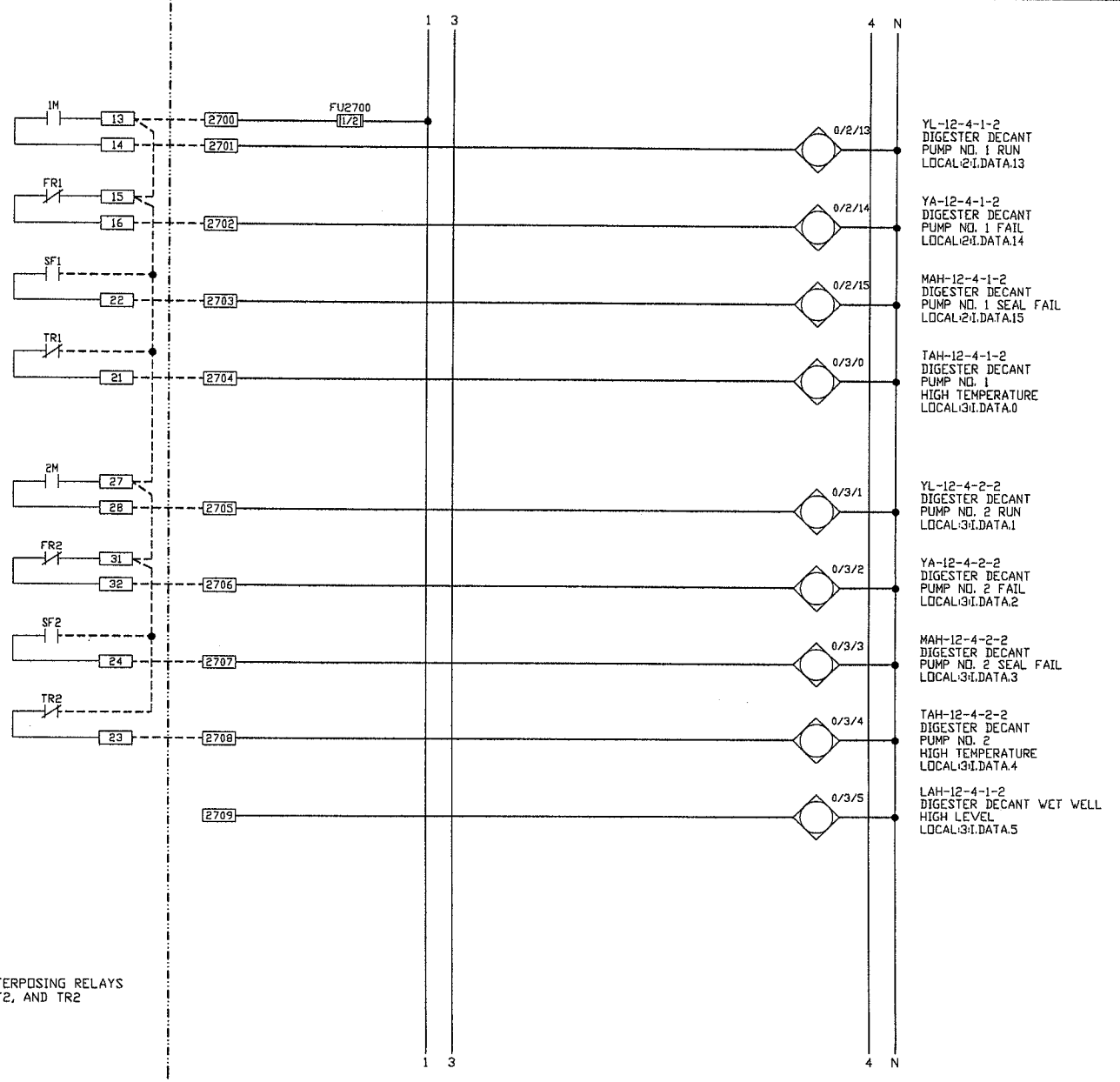
PROJ. NO. 1520C
DWG. NO. 126B

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FIELD OR AS NOTED | LCP-12-4-1 * | LCP-C



NOTE: INSTALL INTERPOSING RELAYS SF1, TR1, SF2, AND TR2

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DATE	DESCRIPTION
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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	45 OF 63

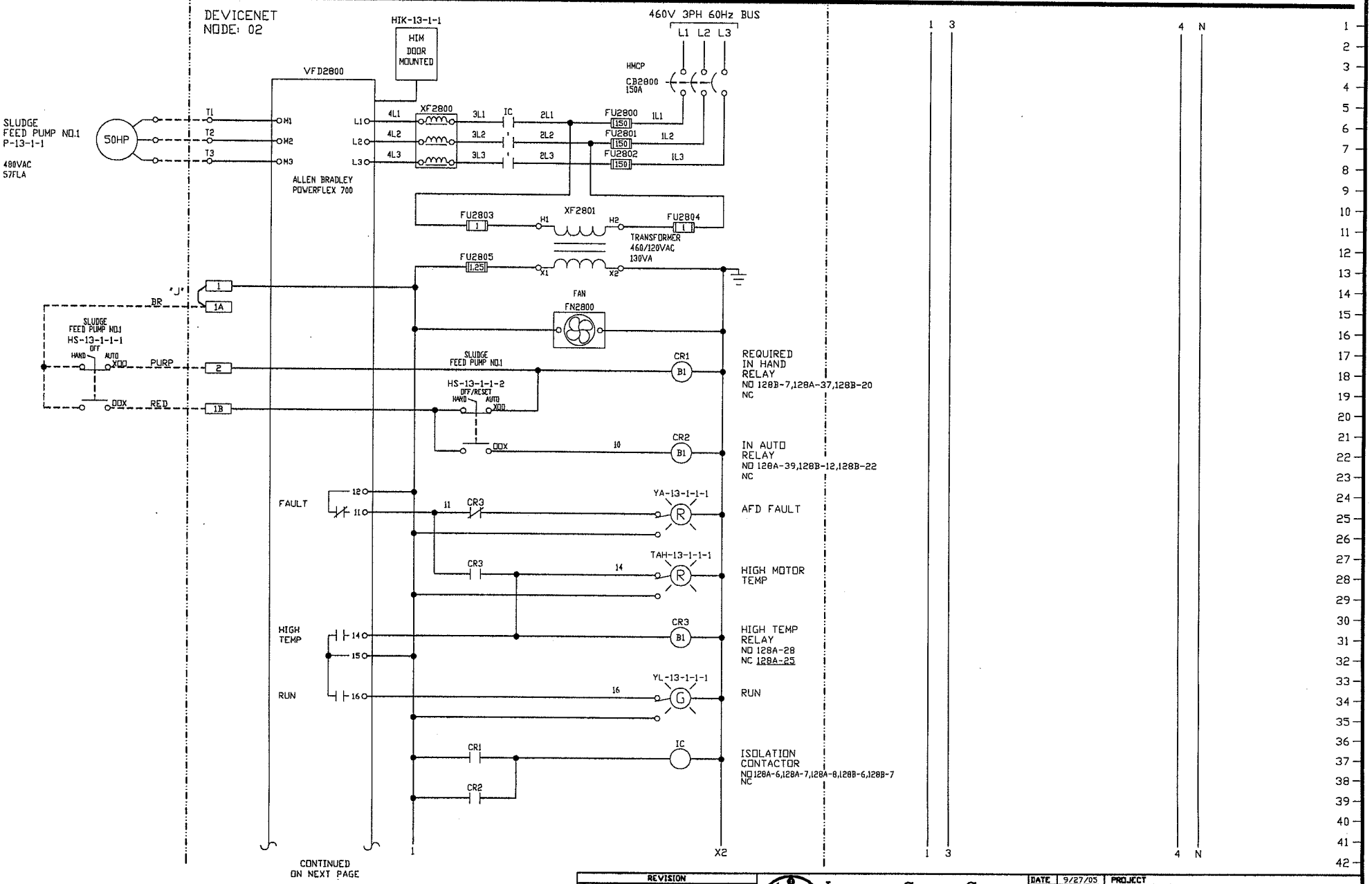
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
DIGESTER DECANT PUMP STATION

PROJ. NO. 1520C
DWG. NO. 127

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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
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Plymouth, Minnesota 55441

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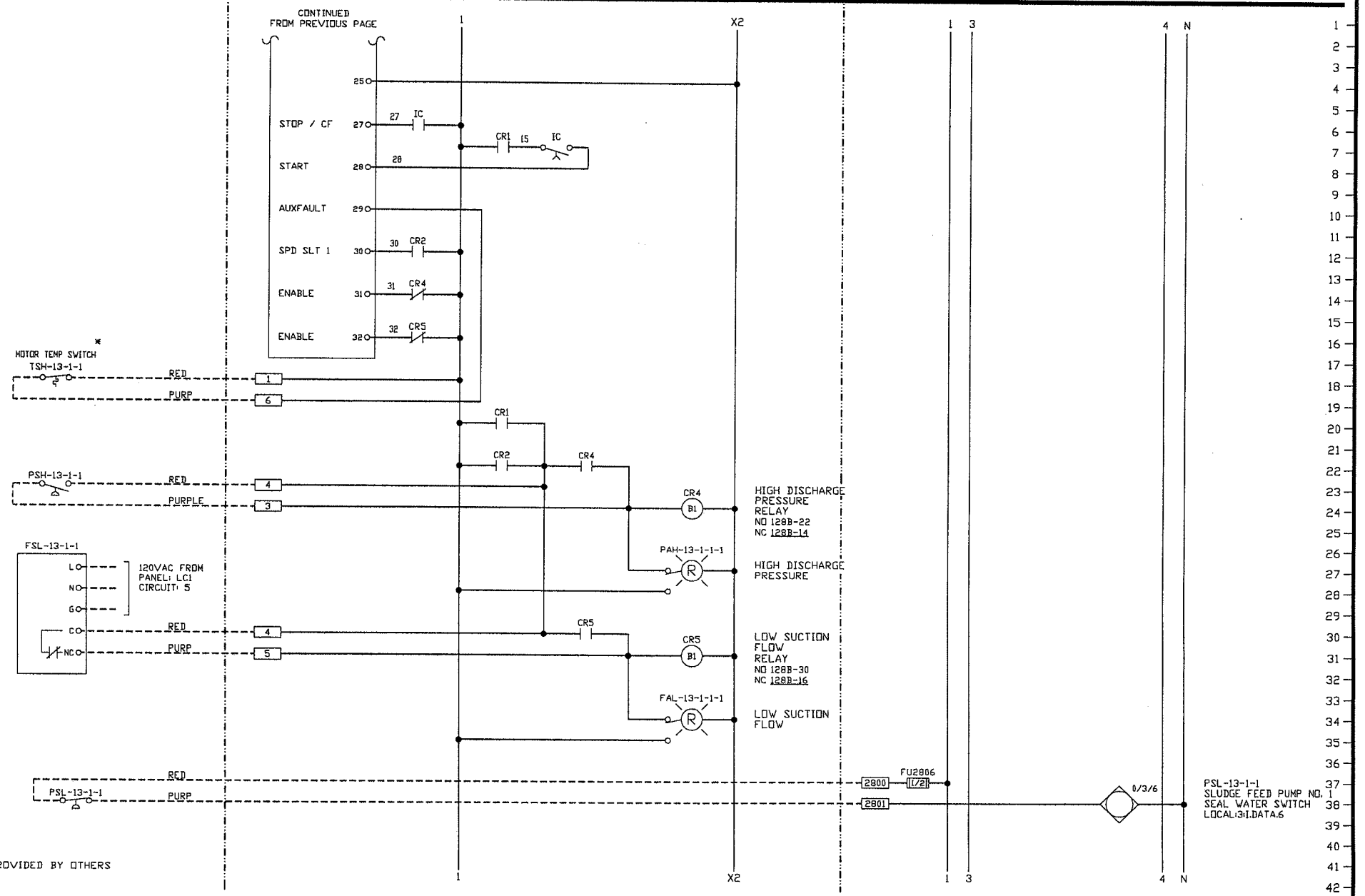
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	46 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SLUDGE FEED PUMP NO.1

PROJ. NO. 1520C

DWG. NO. 128A



REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

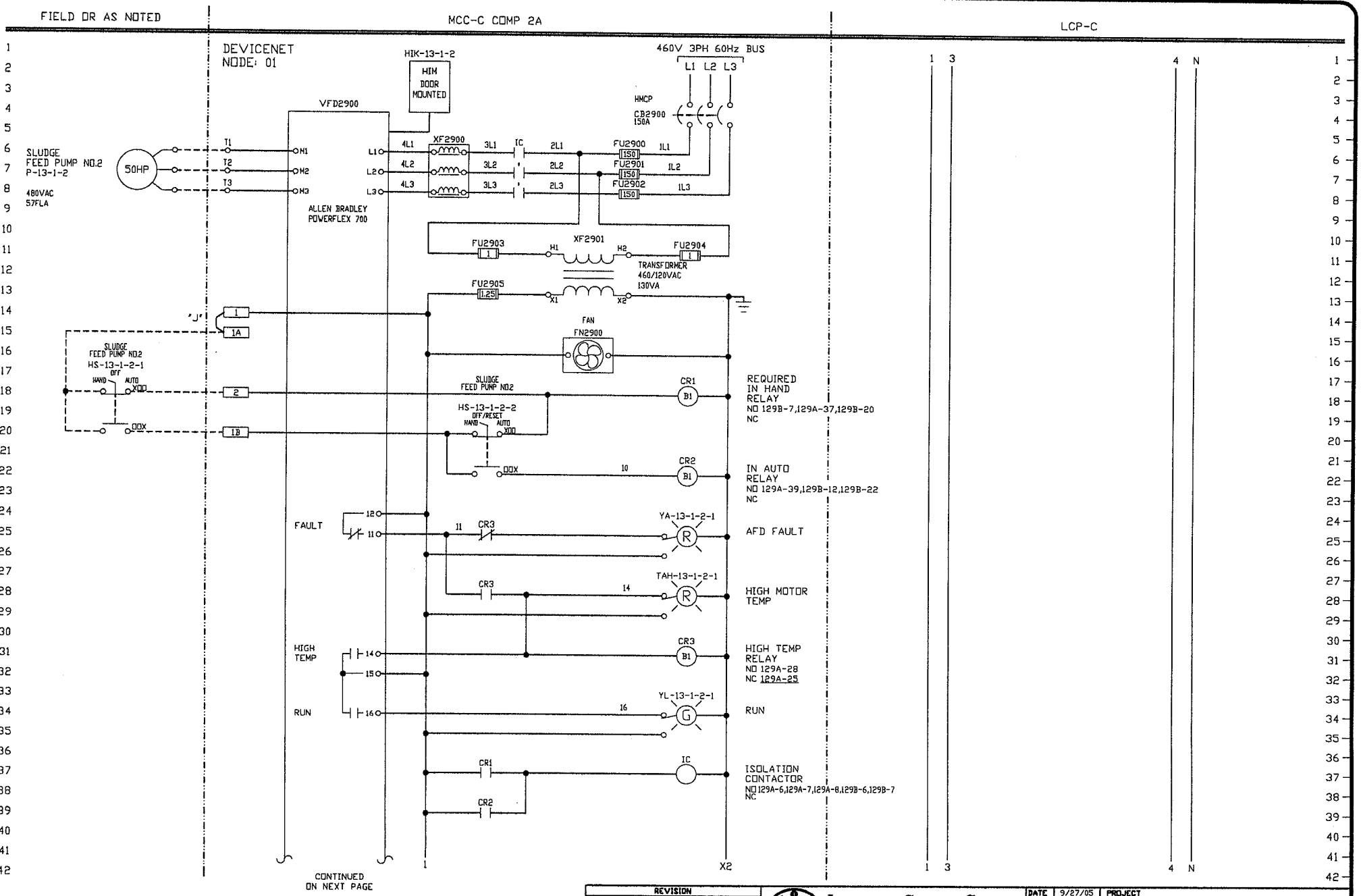
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	47 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
SLUDGE FEED PUMP NO.1
PROJ. NO. 1520C
DWG. NO. 128B

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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
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Plymouth, Minnesota 55441

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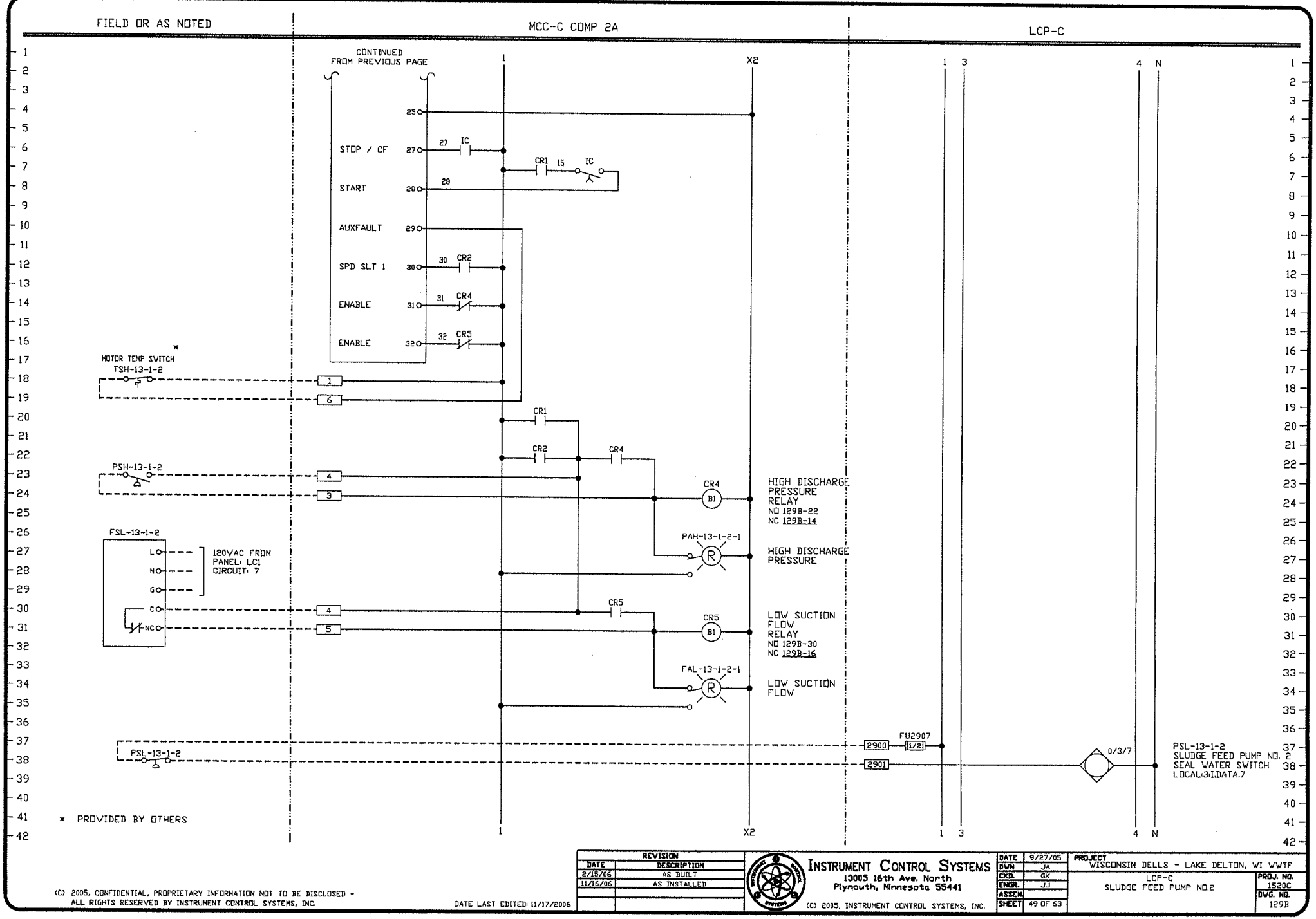
DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	48 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SLUDGE FEED PUMP NO.2

PROJ. NO. 1520C

DWG. NO. 129A



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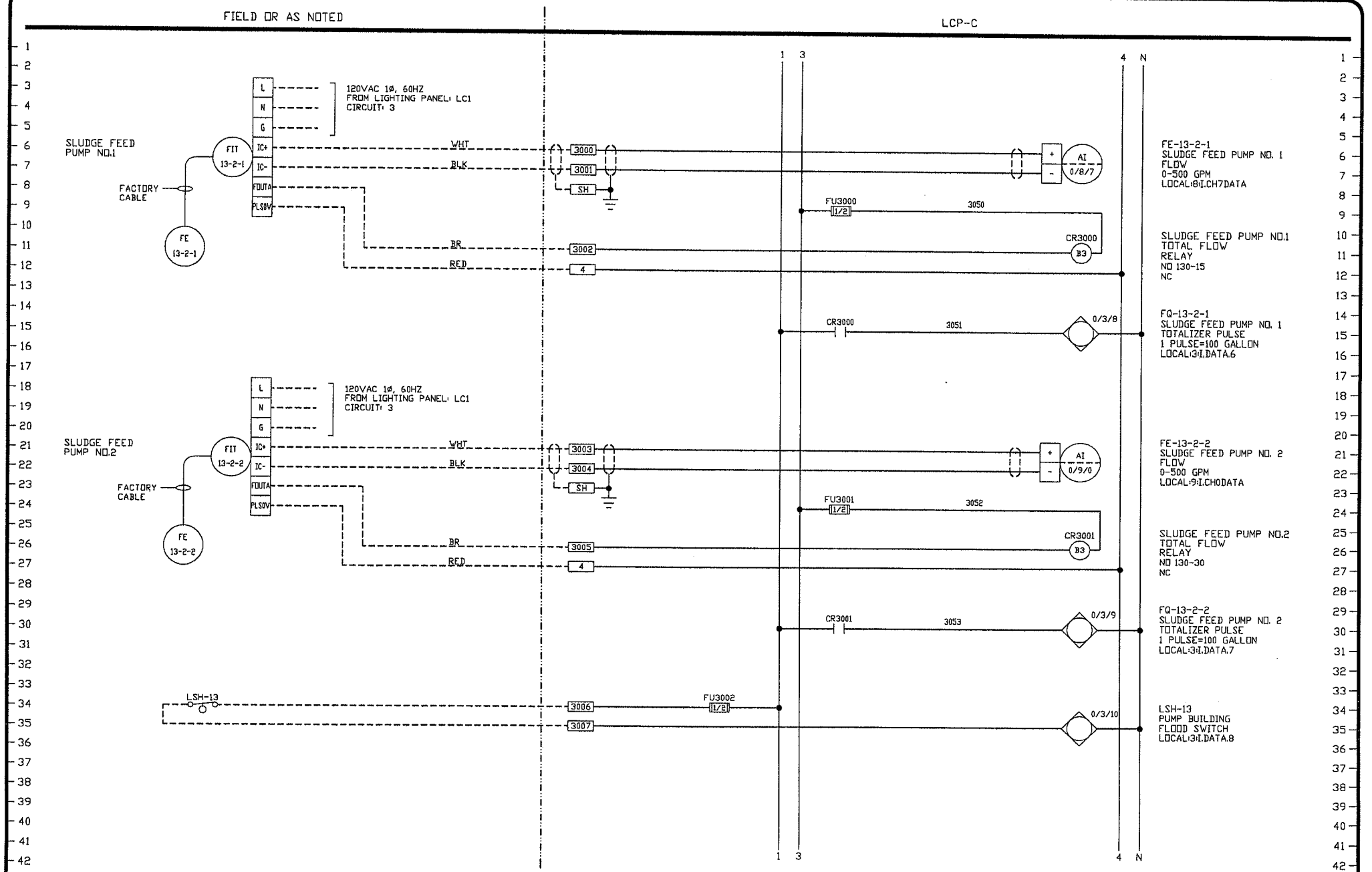
REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	49 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
SLUDGE FEED PUMP NO.2
PROJ. NO. 1520C
DWG. NO. 129B



REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

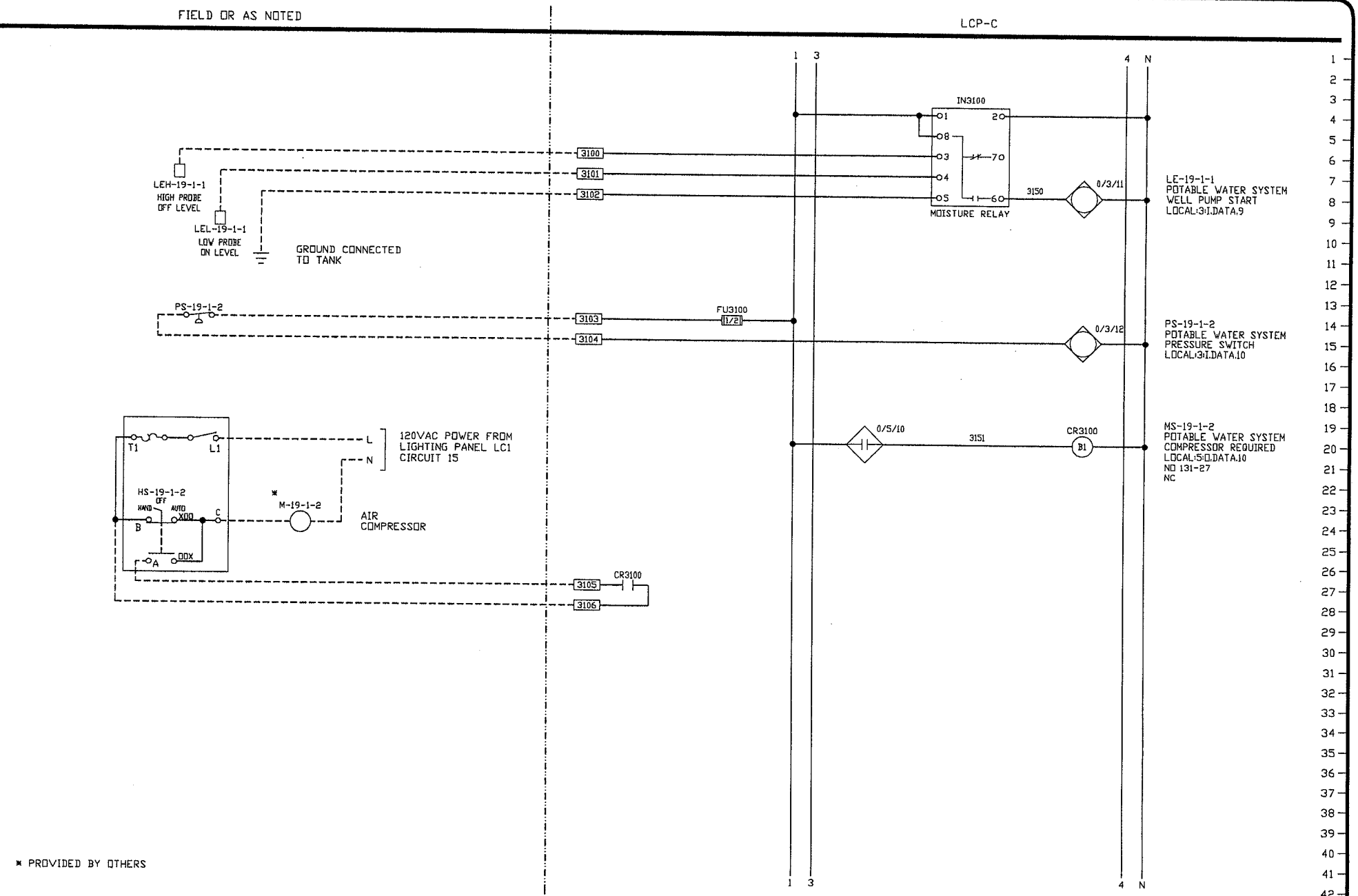
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	30 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
BELT PRESS FLOW METERING AND PUMP BULIDING FLOOD SWITCH
PROJ. NO. 1520C
DWG. NO. 130

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DATE	DESCRIPTION
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11/16/06	AS INSTALLED

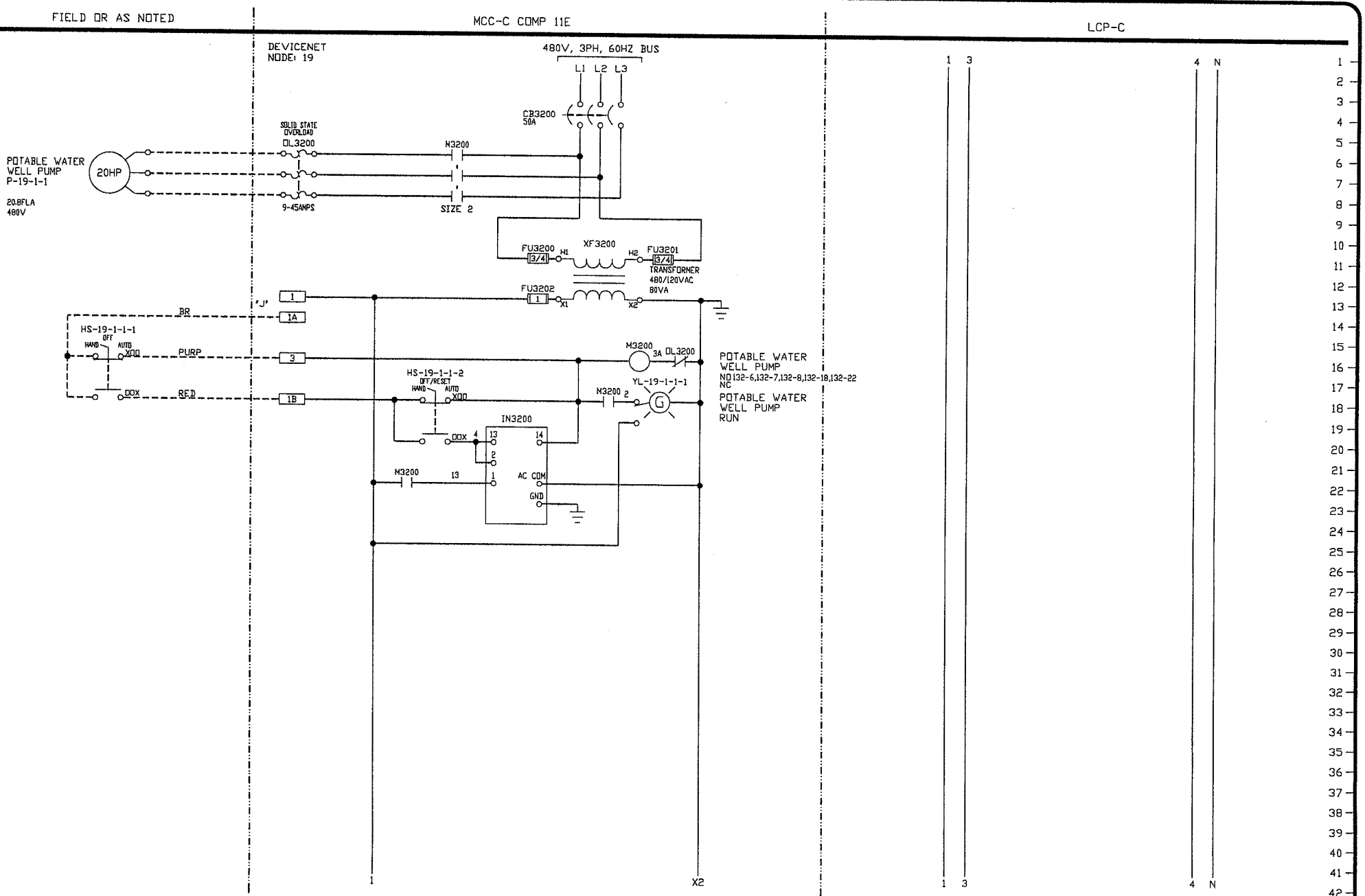
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	31 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
POTABLE WATER SYSTEM
PROJ. NO. 1520C
DWG. NO. 131

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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	52 OF 63

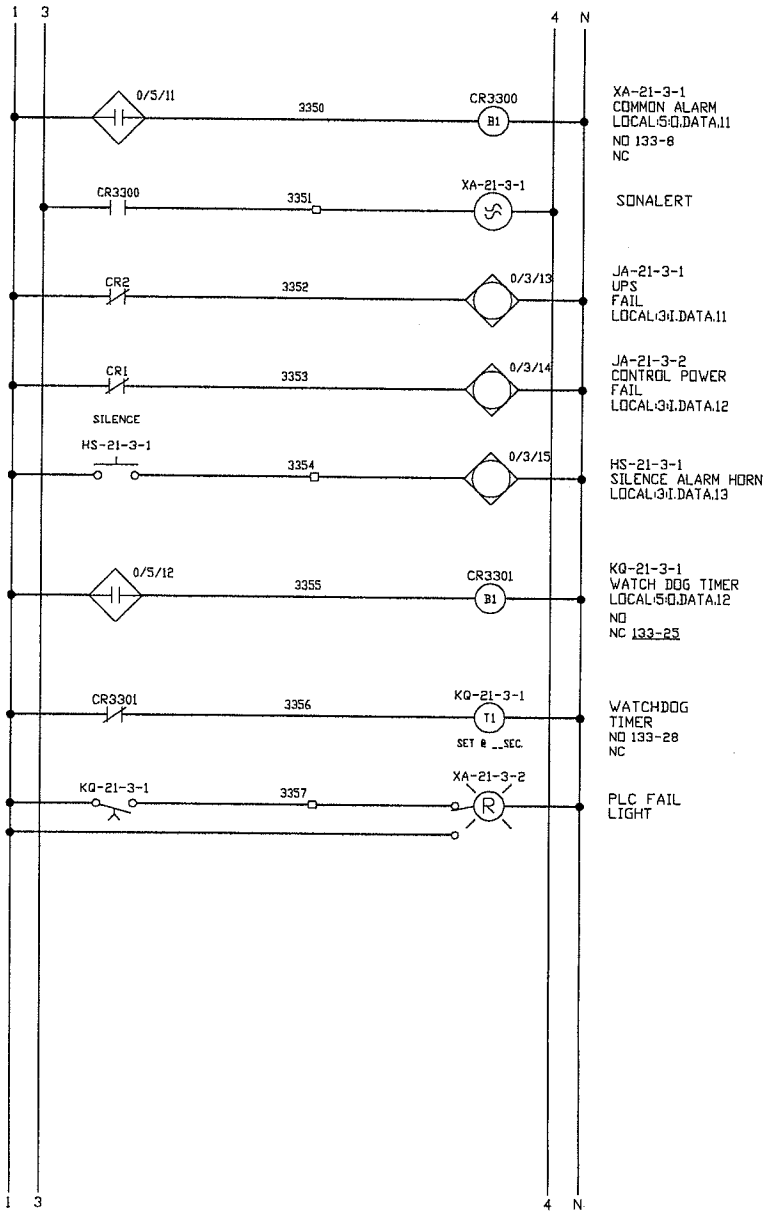
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
POTABLE WATER WELL PUMP
PROJ. NO. 1520C
DWG. NO. 132

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11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	53 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
ALARM MONITORING

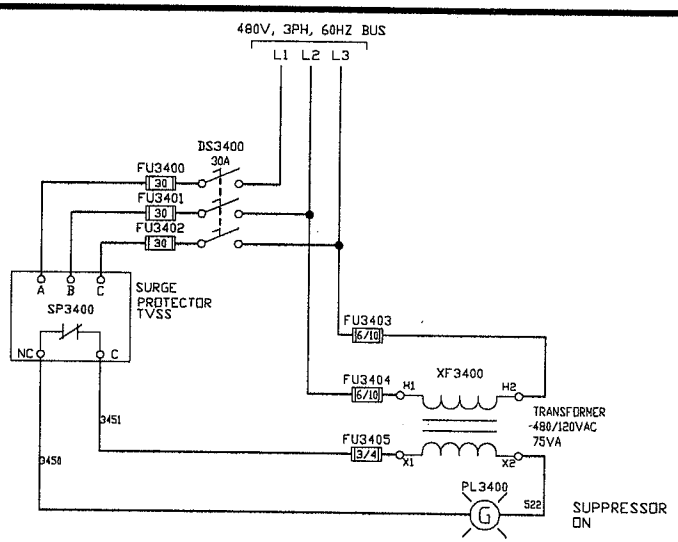
PROJ. NO. 1520C

DWG. NO. 133

FIELD OR AS NOTED

MCC-C COMP 12E

FIELD OR AS NOTED



REVISION	
DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	54 OF 63

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

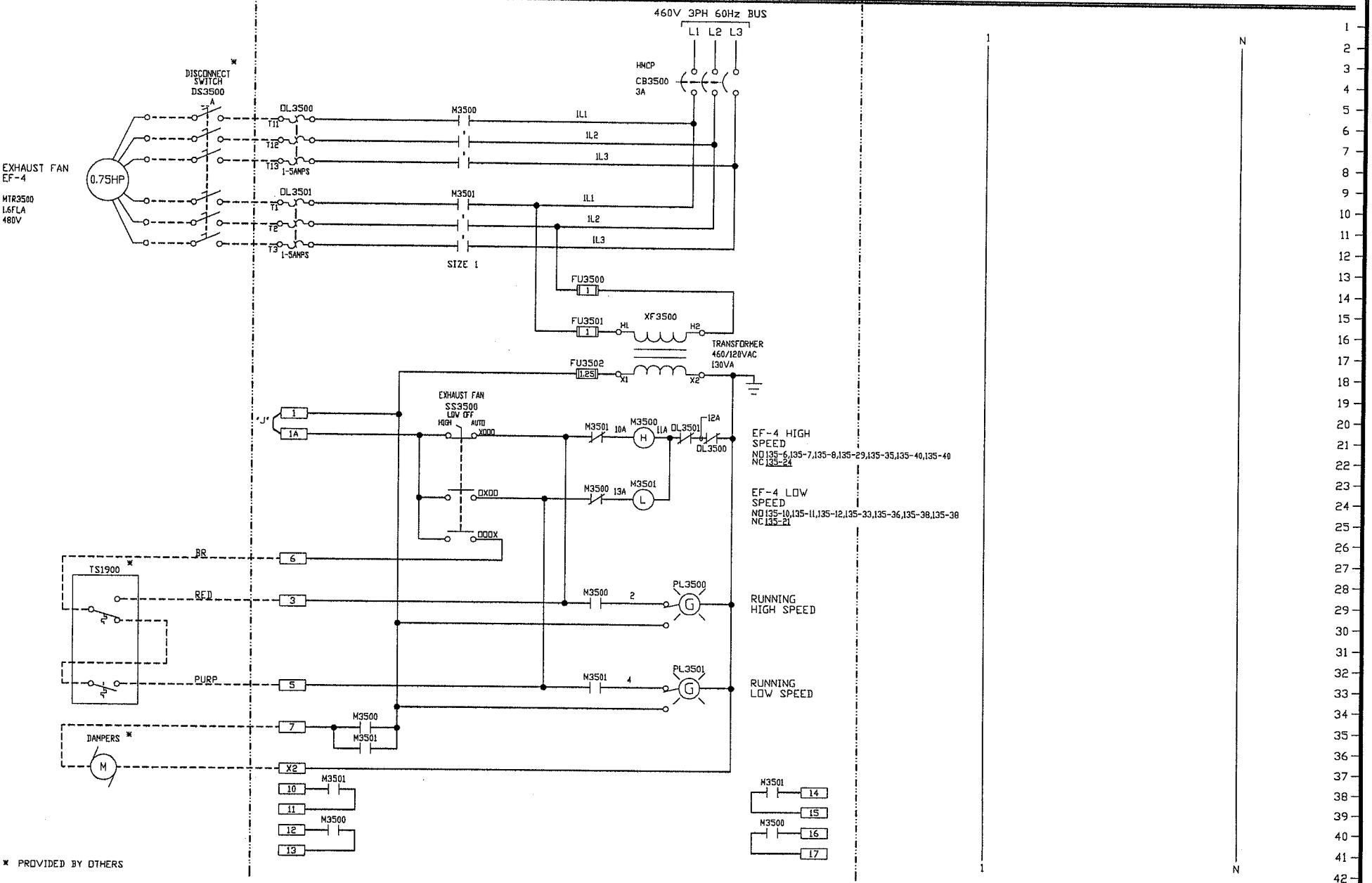
MCC-C
MOTOR CONTROL CENTER
SURGE PROTECTION

PROJ. NO. 1520C

DWG. NO. 134

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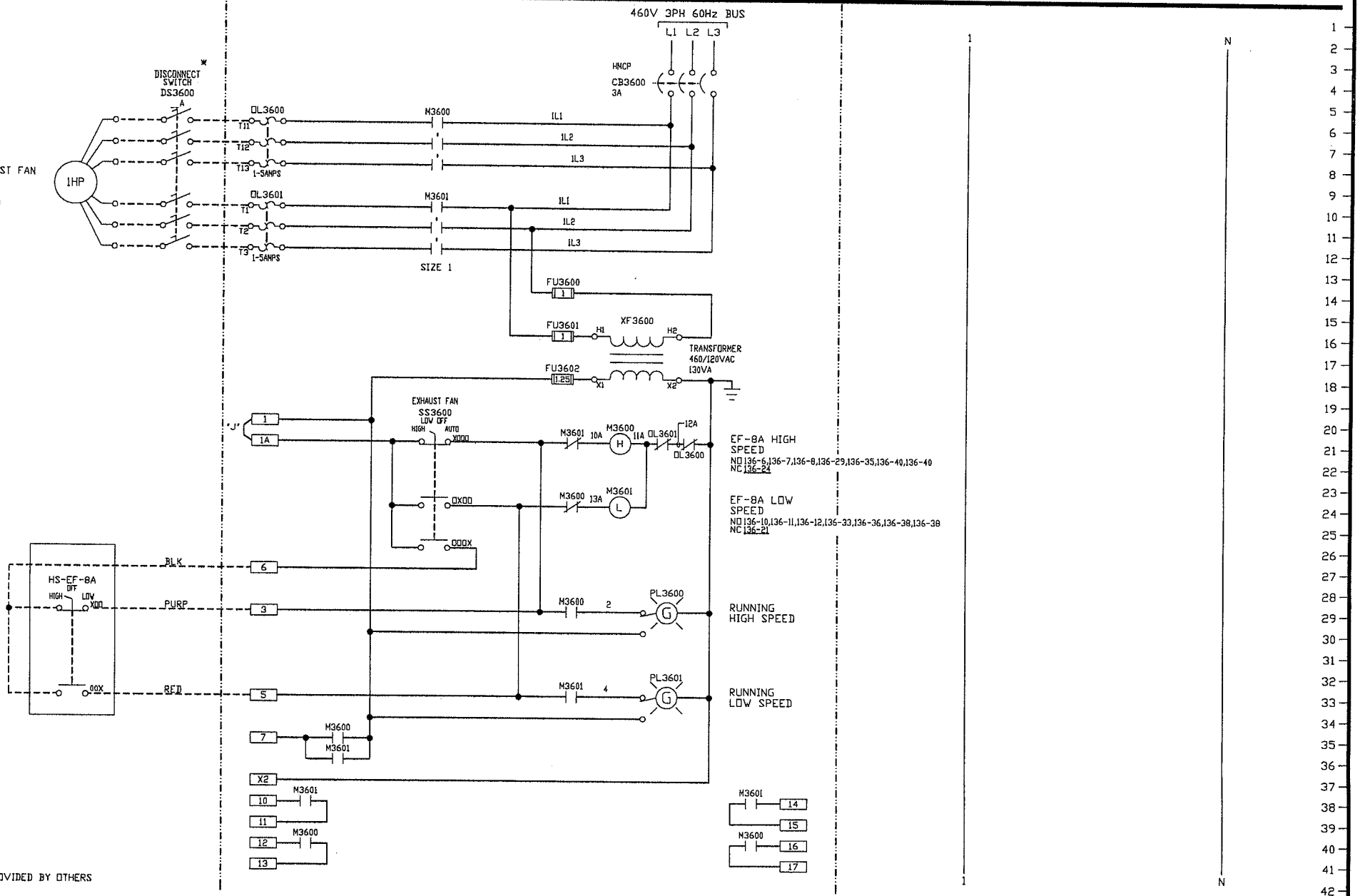
INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
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CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	55 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
EXHAUST FAN EF-4
PROJ. NO. 1520C
DWG. NO. 135

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13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
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PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
EXHAUST FAN EF-8A

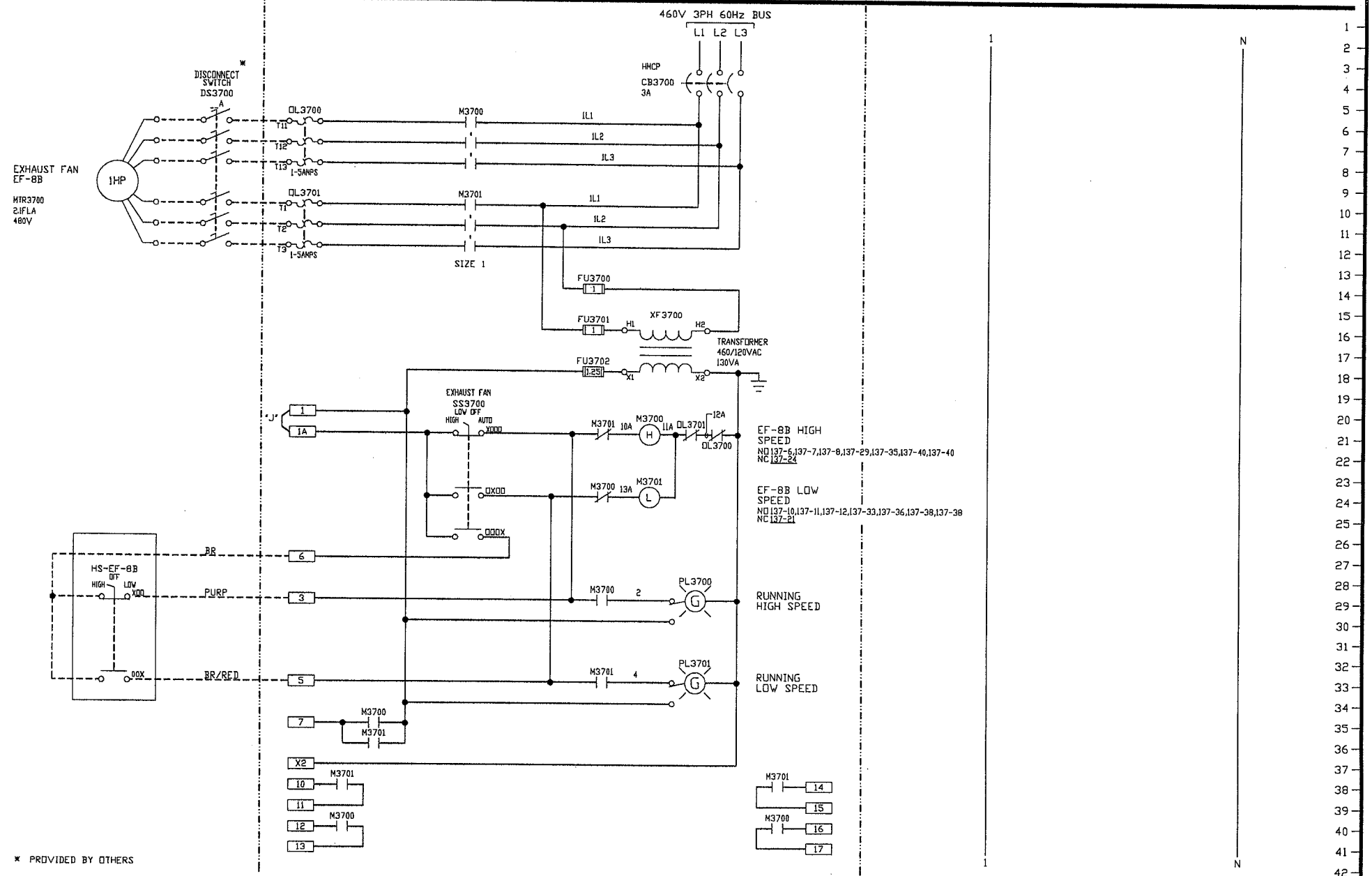
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DWG. NO. 136

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13005 16th Ave. North
Plymouth, Minnesota 55441

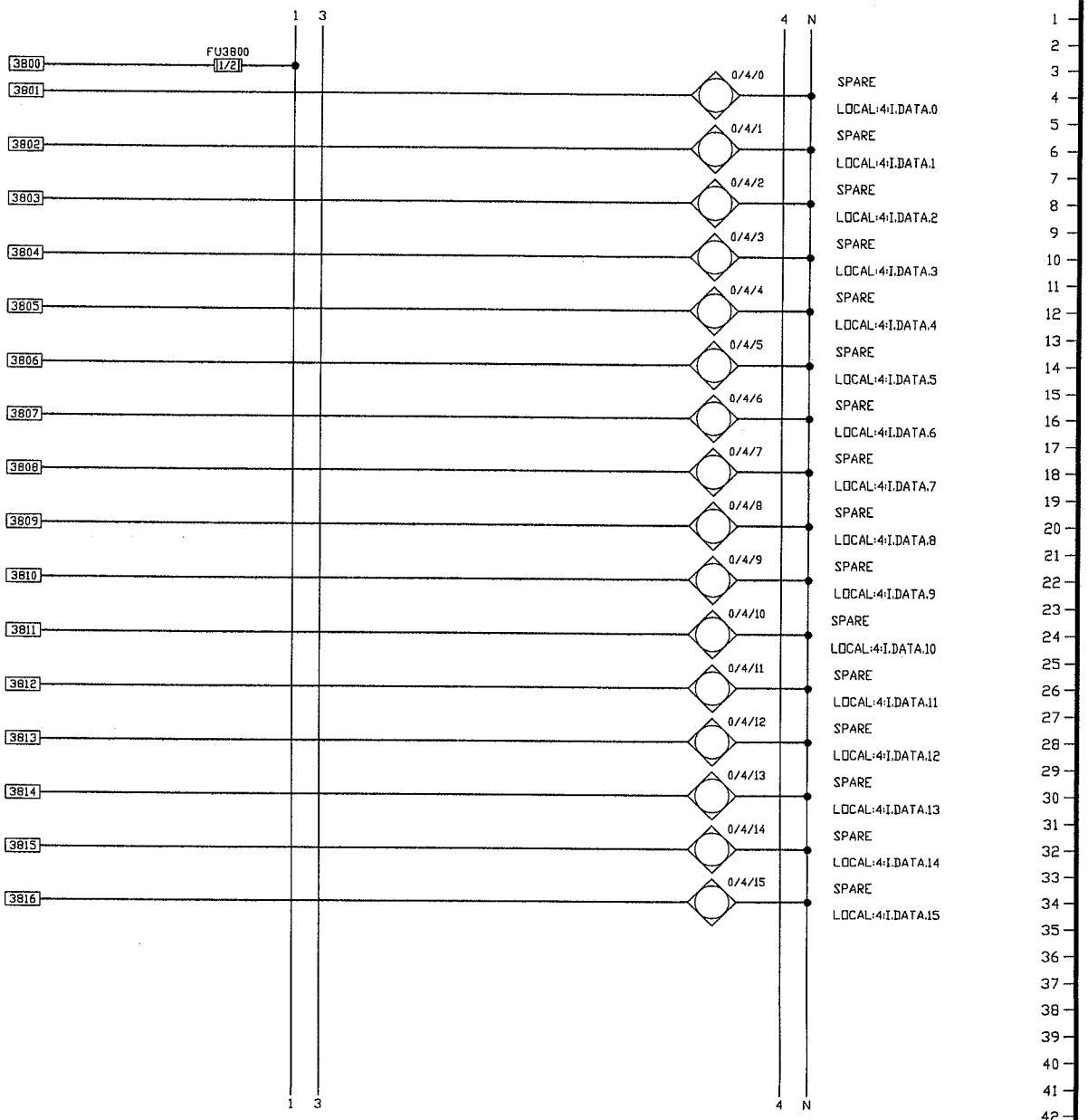
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ENGR.	JJ
ASSEM.	
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PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
LCP-C
EXHAUST FAN EF-8B
PROJ. NO. 1520C
DWG. NO. 137

FIELD OR AS NOTED

LCP-C



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INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
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PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SPARE DISCRETE INPUTS

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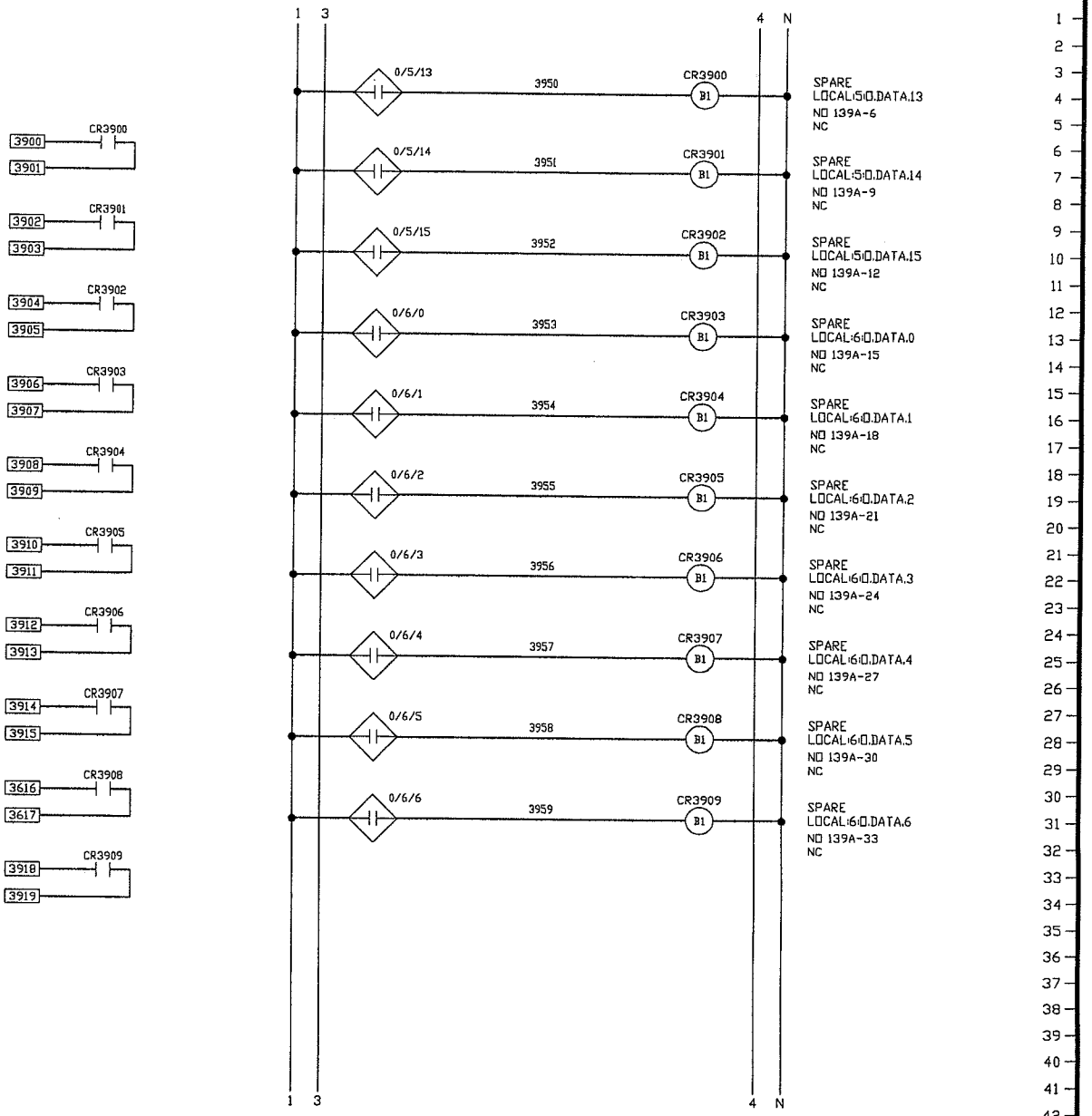
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	59 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SPARE DISCRETE OUTPUTS

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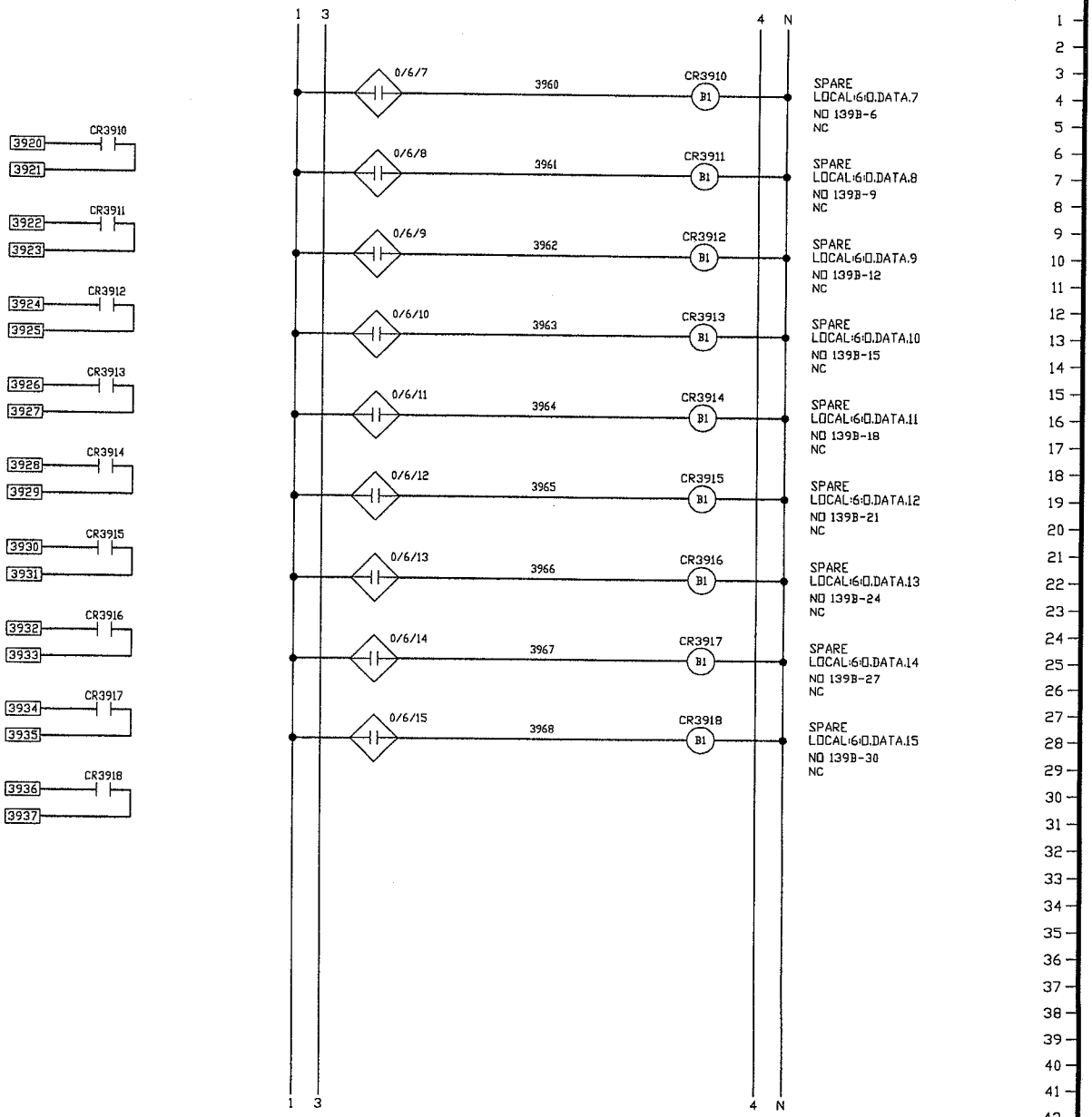
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11/16/06	AS INSTALLED

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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	60 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SPARE DISCRETE OUTPUTS

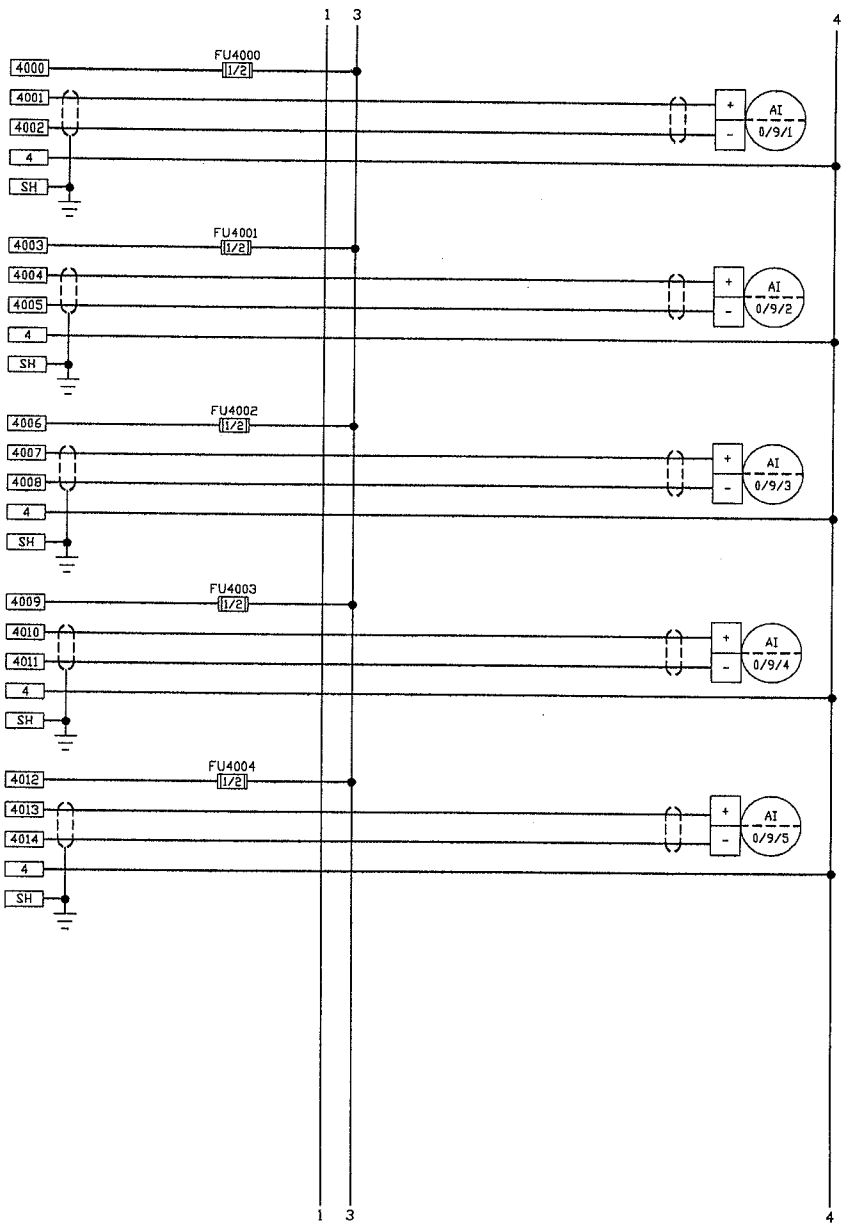
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INSTRUMENT CONTROL SYSTEMS
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(C) 2005, INSTRUMENT CONTROL SYSTEMS, INC.

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
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SHEET	61 OF 63

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SPARE ANALOG INPUTS

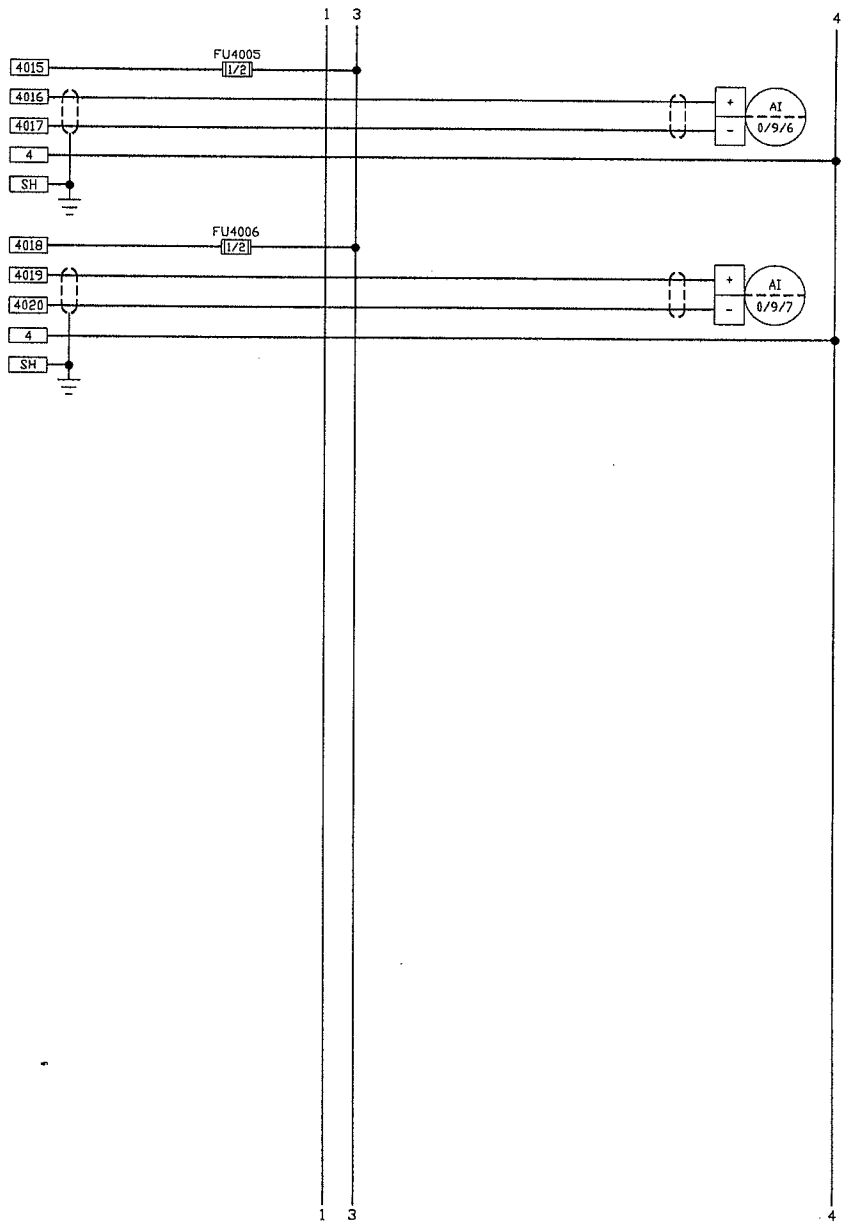
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DATE	DESCRIPTION
2/15/06	AS BUILT
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	62 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SPARE ANALOG INPUTS

PROJ. NO. 1520C

DWG. NO. 140B

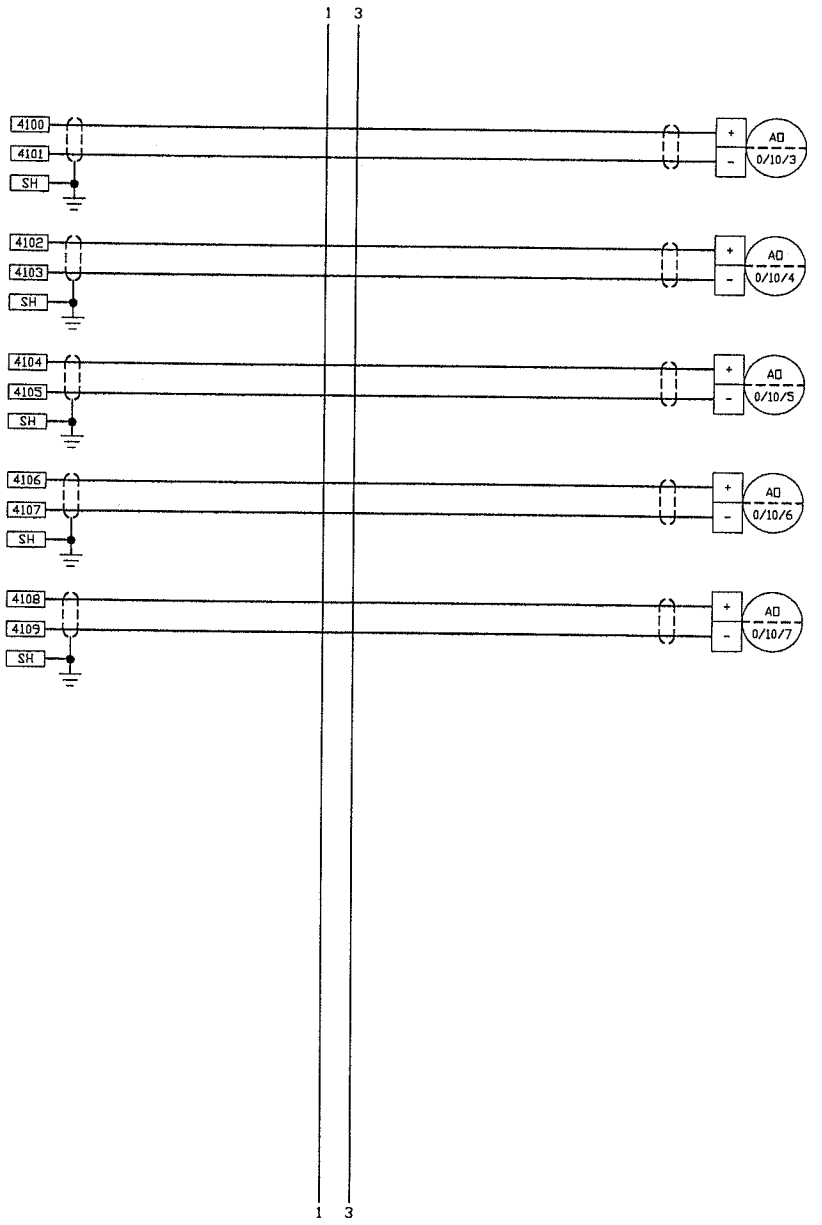
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	63 OF 63

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-C
SPARE ANALOG OUTPUTS

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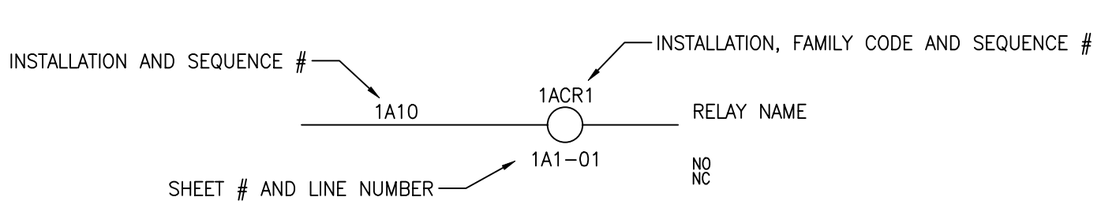
DWG. NO. 141

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WISCONSIN DELLS, WI
WASTEWATER TREATMENT FACILITY
DIGESTER BUILDING
MOTOR CONTROL CENTER MCC–D

SH	FILENAME
TOC	TABLE OF CONTENTS
1A1	INCOMING POWER
1H1	DIGESTER BLOWER 2
1H2	DIGESTER BLOWER 2 IO
2A1	DIGESTER BLOWER 3
2A2	DIGESTER BLOWER 3 IO
L1	LAYOUT
B1	BILL OF MATERIALS 1
B2	BILL OF MATERIALS 2

MCC COMPONENT AND WIRE NUMBERS:



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WWTF DIGESTER BUILDING
MCC–D

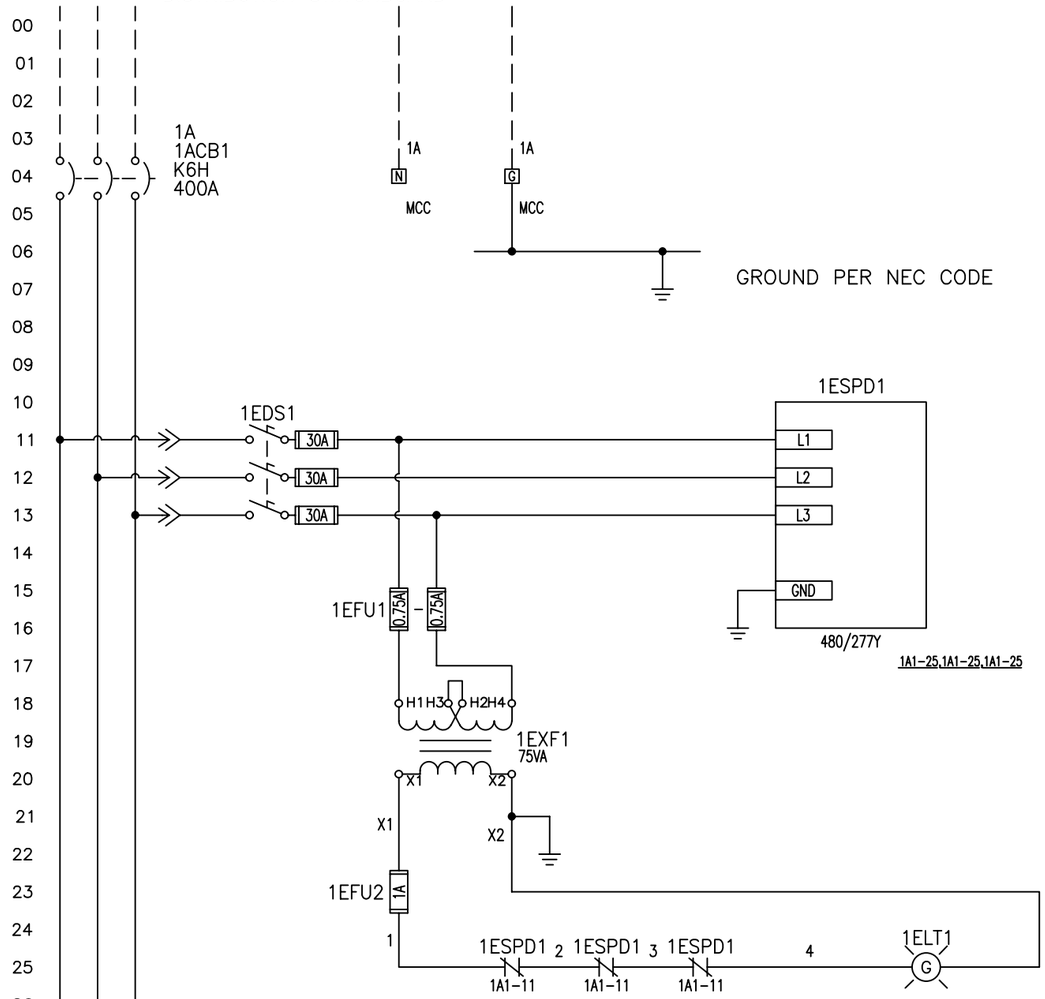
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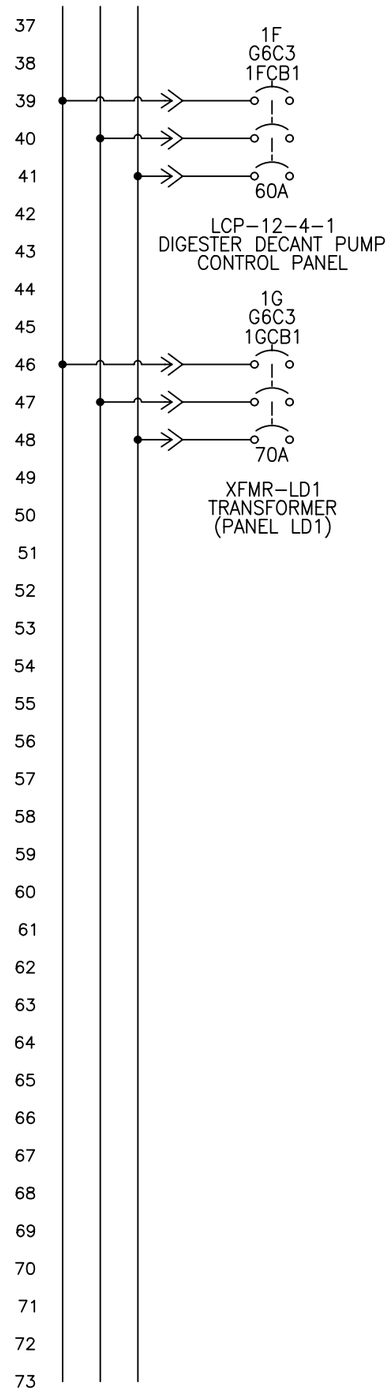
ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222–8622 www.altronex.com

DRAWING D17205–B

PROJECT WISCONSIN DELLS, WI

480V, 3PH, 4W SUPPLY
FROM HEADWORKS BUILDING MAIN
DISTRIBUTION SWITCHBOARD





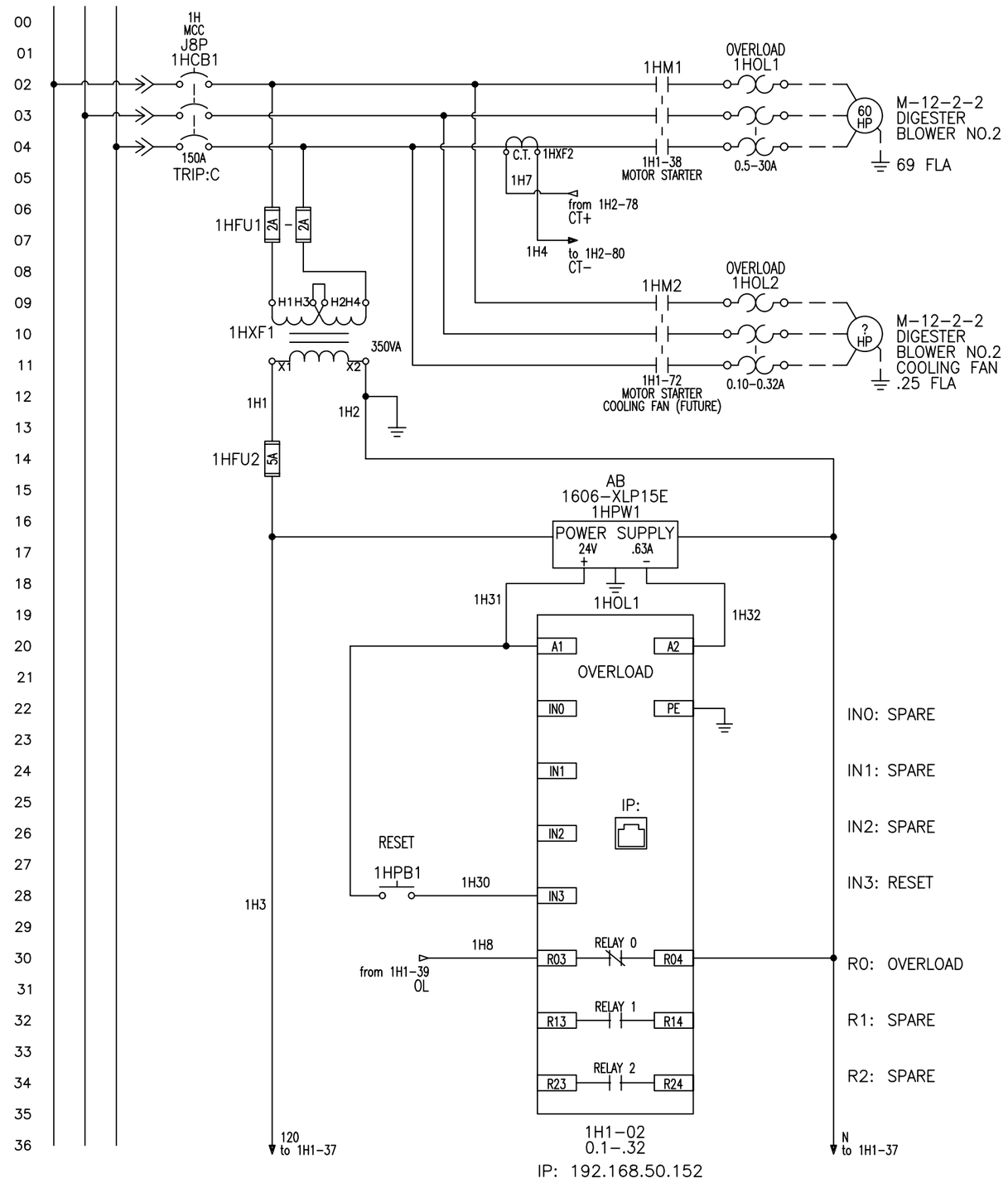
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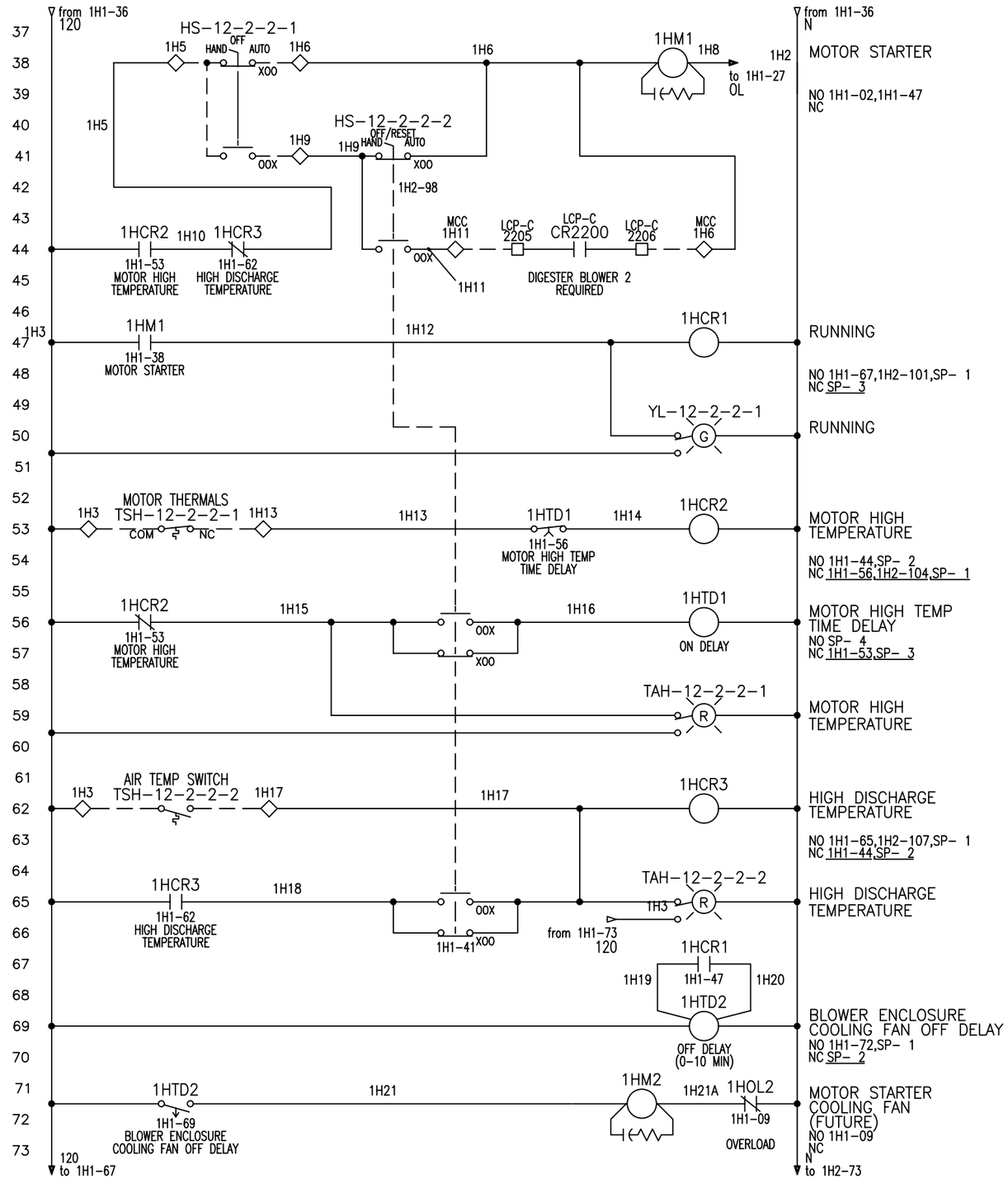
WWTF DIGESTER BUILDING
MCC-D

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DRAWING D17205-B
PROJECT WISCONSIN DELLS, WI





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WWTF DIGESTER BUILDING
MCC-D

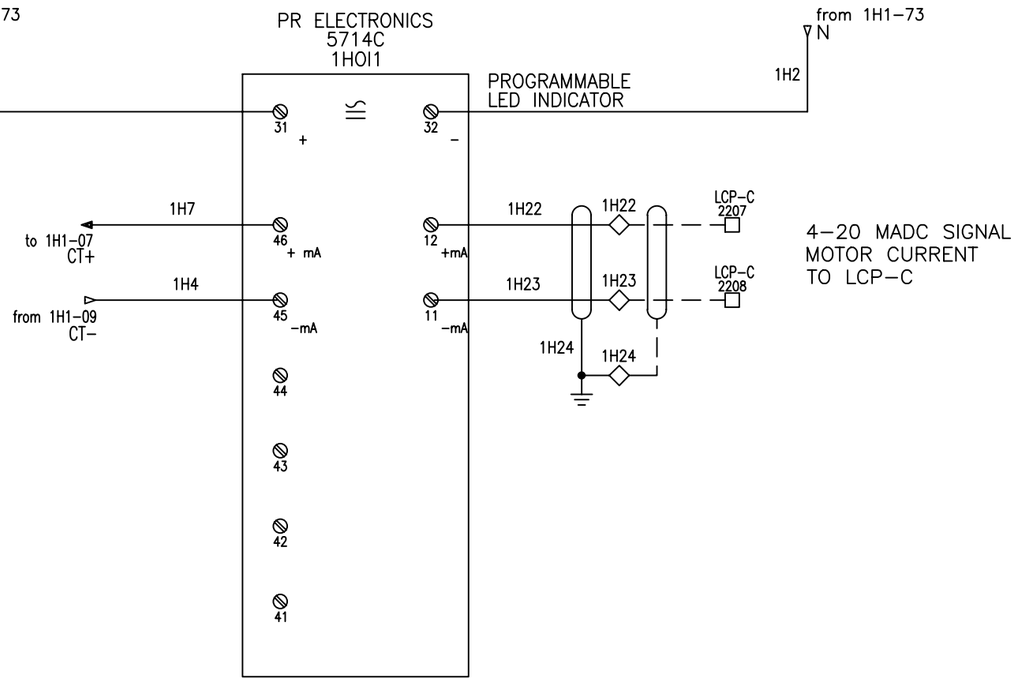
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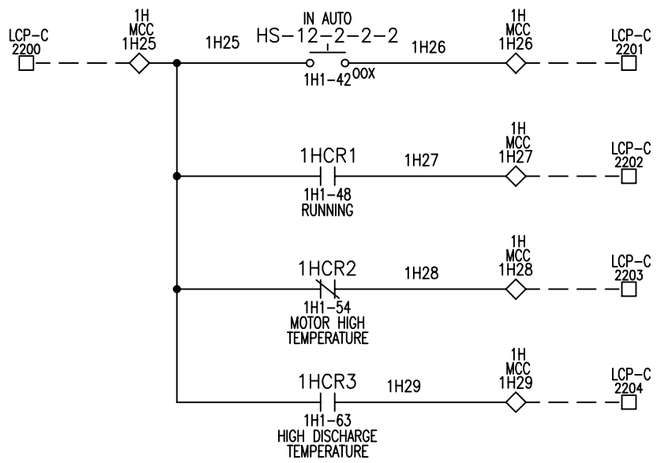
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DRAWING D17205-B
PROJECT WISCONSIN DELLS, WI





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WWTF DIGESTER BUILDING
MCC-D

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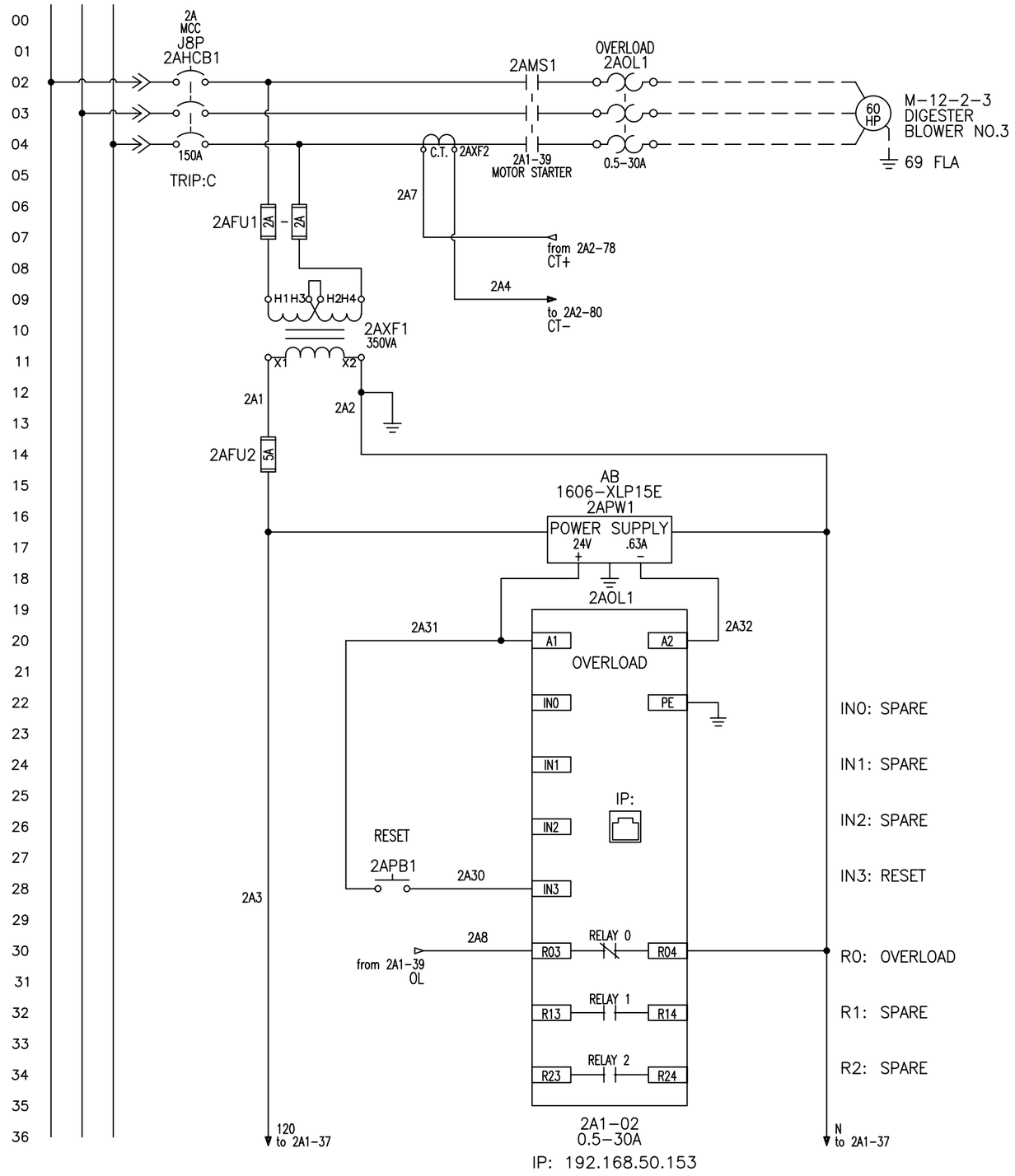
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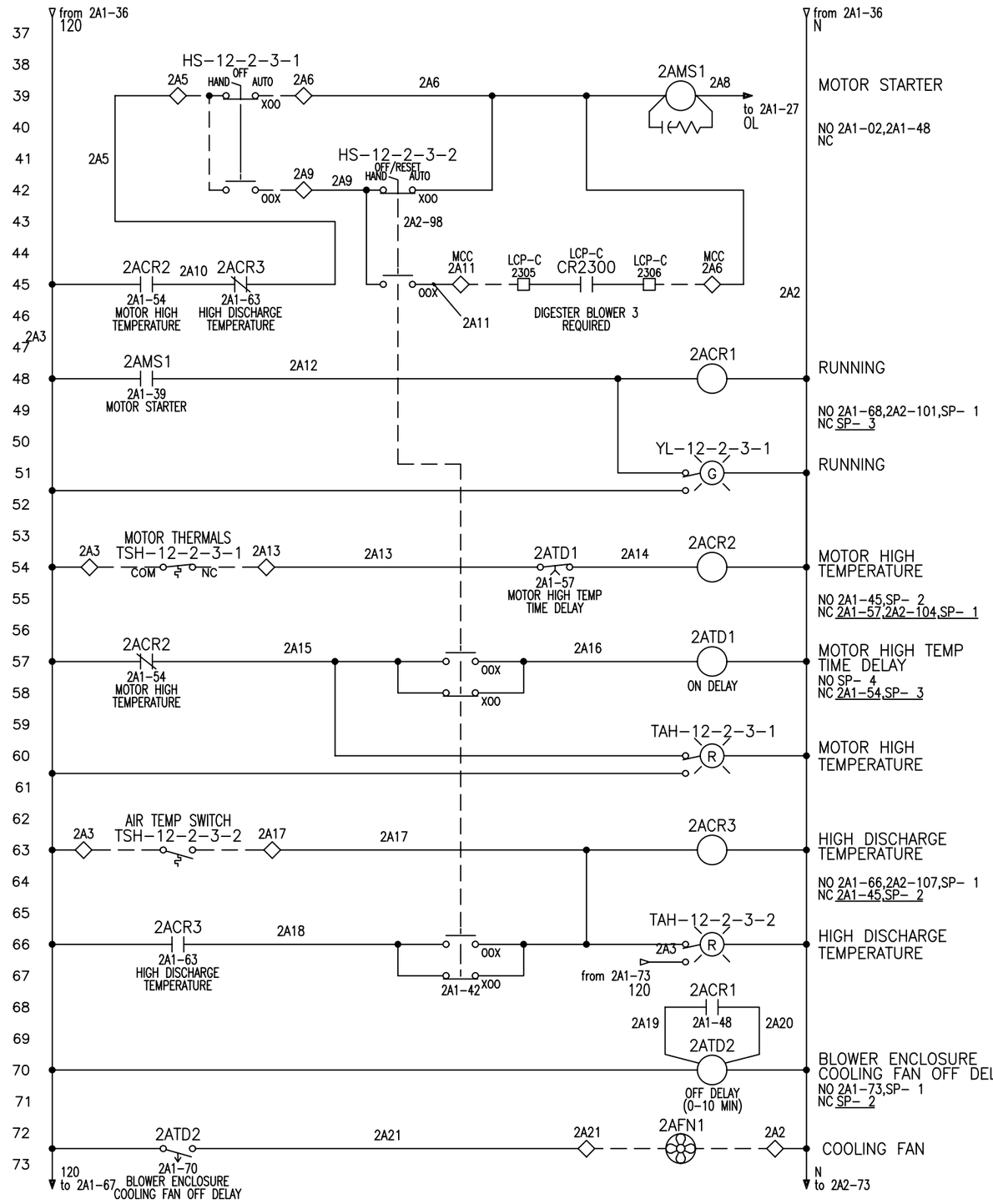
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SECTION 1H
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TYPE
PAGE 1H2 OF 9

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D17205-B
PROJECT WISCONSIN DELLS, WI





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WWTF DIGESTER BUILDING
MCC-D

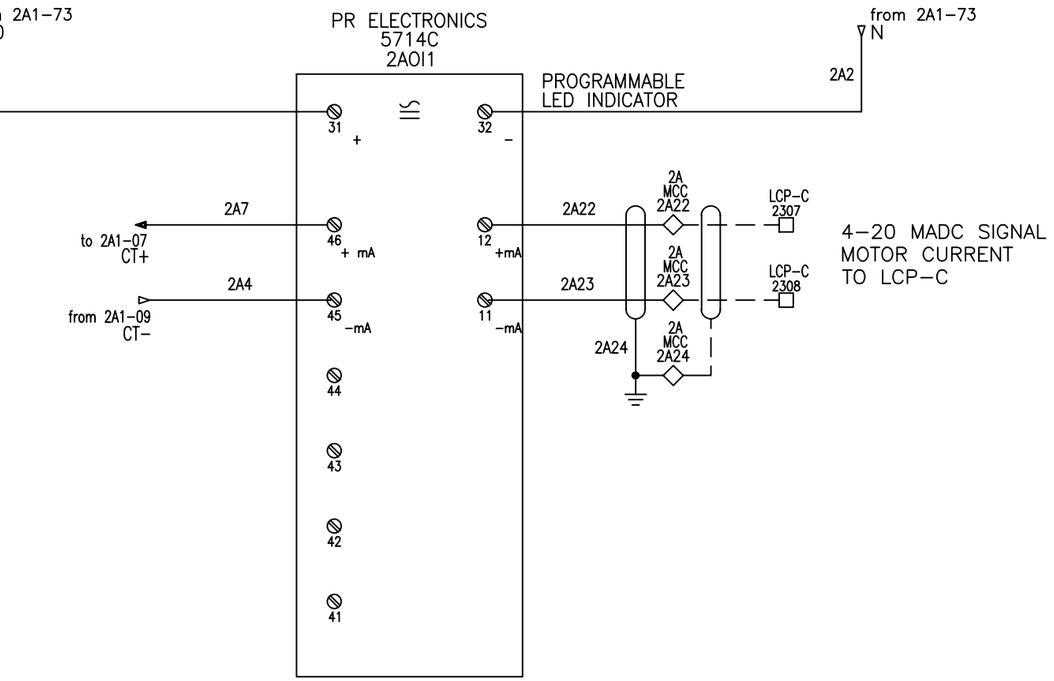
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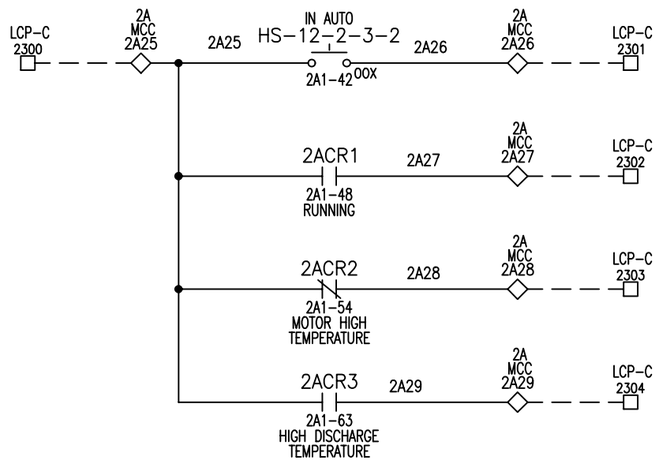
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SECTION 2A
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TYPE
PAGE 2A1 OF 9

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D17205-B
PROJECT WISCONSIN DELLS, WI





STATUS CONTACTS
TO LCP-C

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WWTF DIGESTER BUILDING
MCC-D

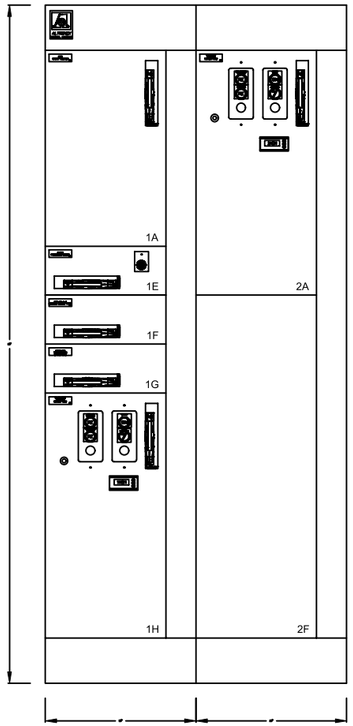
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DRN	K.ATWOOD	DATE	08/08/17	A	RELEASED	10/17	AO	G					
APP	K.ATWOOD	DATE	08/08/17	REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT		

SECTION 2A
LOCATION 100
TYPE
PAGE 2A2 OF 9

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D17205-B
PROJECT WISCONSIN DELLS, WI

LAYOUT



MCC–H
1. ALLEN BRADLEY BULLETIN 2100 CENTERLINE MOTOR CONTROL CENTER (S/N: 6503742789/000300)
2. NEMA 1G ENCLOSURE ASA 49 EXTERIOR COLOR (MEDIUM GRAY)
3. 600 AMP TIN PLATED COPPER HORIZONTAL BUS
4. 300 AMP TIN PLATED COPPER VERTICAL BUS
5. $\frac{1}{4}$" X 2" COPPER GROUND BUS
6. 42,000 AIC BUS BRACING AND ALL PROTECTIVE DEVICES
7. CLASS IIB WIRING
8. WIREWAY TIE BAR
9. AUTOMATIC SHUTTERS

NAMEPLATES:

Installation: 1A Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
1ACB1	MAIN	CIRCUIT BREAKER				

Installation: 1E Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
1EDS1	SURGE	PROTECTION DEVICE				
	ON					

Installation: 1F Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
2LCB1	LCP–12–4–1	DIGESTER DECANT PUMP	CONTROL PANEL			

Installation: 1G Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
2MCB1	XFMR–LD1	TRANSFORMER	(PANEL LD1)			

Installation: 1H Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
M–12–2–2	DIGESTER	BLOWER NO.2				
HS–12–2–2–2				HAND	OFF/RESET	AUTO
TAH–12–2–2–1	MOTOR HIGH	TEMPERATURE				
TAH–12–2–2–2	HIGH DISCHARGE	TEMPERATURE				
YL–12–2–2–1	RUNNING					
	MOTOR CURRENT					

Installation: 1M Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
	SPARE					

Installation: 2A Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
M–12–23	DIGESTER	BLOWER NO.3				
HS–12–2–3–2				HAND	OFF/RESET	AUTO
TAH–12–2–3–1	MOTOR HIGH	TEMPERATURE				
TAH–12–2–3–2	HIGH DISCHARGE	TEMPERATURE				
YL–12–2–3–1	RUNNING					
	MOTOR CURRENT					

Installation: 2E Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
	SPARE					

Installation: 2F Location: MCC

TAGNAME	DESC1	DESC2	DESC3	POS1	POS2	POS3
	SPARE					

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WWTF DIGESTER BUILDING
MCC–D

DES	K.ATWOOD	DATE	08/08/17
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REV	DESCRIPTION	DATE	INIT
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SECTION
LOCATION 100
TYPE
PAGE L1 OF 9

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222–8622 www.altronex.com

DRAWING D17205–B
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: 1A Location: MCC

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
1ACB1	1		140G-K6H3-D40	AB	CIRCUIT BREAKER, ELECTRONIC LSI TRIP UNIT, In = 400 AMP, 3 POLE

Installation: 1E Location: MCC

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
1EFU1	2		FNQ-R-3/4	BUSSMANN	FUSE - CLASS CC
1EDS1	1	*3	LPJ-30SP	BUSSMANN	CLASS J FUSE, 30A, 600VAC
1EFU2	1		TRM-1	MERSEN	MIDGET FUSE, 1 A, 250 VAC
1ELT1	1		800FP-P3	AB	GREEN PILOT LIGHT, NEMA 4/4X/13, 22.5mm, 120VAC,
1ESPD1	1		4983-DS277-803	AB	SURGE PROTECTION DEVICE, 480/277Y, 3 PH, 80 KA
1EXF1	1		5636-169-01	AB	CONTROL CIRCUIT TRANSFORMER, TYPE SN

BILL OF MATERIALS
Installation: 1H Location: MCC

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
1HCB1	1		140MG-J8P-D15	AB	INSTANTANEOUS TRIP MOTOR CIRCUIT PROTECTOR, 150 AMP, 3 POLE
1HOL2	1	*1	193-ESM-VIG-30A-CT	AB	E300 OVERLOAD, 0.5-30A, VOLT/CUR/GND FAULT SENSING MODULE
		*1	193-ECM-ETR	AB	E300 ETHERNET MODULE
		*1	193-EIOGP-42-24D	AB	E300 OVERLOAD, I/O MODULE, 4 IN/2 OUT, 24VDC CONTROL
1HM1	1		509-EOD	AB	FULL VOLTAGE MOTOR STARTER - 3 POLES, NEMA SIZE 4
HS-12-2-2-2	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
YL-12-2-2-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
TAH-12-2-2-1 TAH-12-2-2-2	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
1HXF1	1		1497-F-BASX-3-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497, 350VA
1HM2	1		AF26N1-30-00-13	ABB	AF NEMA SIZE 1 CONTACTOR, 120V COIL, 3 POLE, 26 AMPS
1HOL2	1	*1	EF19-0.32	ABB	ELECTRONIC OVERLOAD RELAYS EF19
		*1	193-ECM-ETR	AB	E300 ETHERNET MODULE
		*1	193-EIOGP-42-24D	AB	E300 OVERLOAD, I/O MODULE, 4 IN/2 OUT, 24VDC CONTROL
1HXF2	1		H721HC	HAWKEYE	CURRENT TRANSFORMER, 4-20 mA LOOP POWERED, 0-50/100/200A, SOLID CORE
1HPB1	1		ABD110N-BGR	IDEC	FLUSH PUSHBUTTON, 1 NO, NEMA 4, 13, 4X
1HTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
1HCR1 1HCR2 1HCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
1HTD2	1	*1	RTE-B2AF20	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 600 HOURS, 2 FORM C CONTACTS, 120VAC COIL
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET, OPEN STYLE CONSTRUCTION
1HFU1	2		ATQR-2	MERSEN	MIDGET FUSE, CLASS CC, 2 A, 600 VAC
1HFU2	1		TRM-5	MERSEN	MIDGET FUSE, 5 A, 250 VAC
	4		3001035	PHOENIX CONTACT	STANDARD IEC TERMINAL BLOCK - UK 2,5 B
1HOI1	1		5714C	PR ELECTRONICS	PROGRAMMABLE LED INDICATOR, 4 DIGIT, AC/DC POWERED, ANALOG INPUT, ANALOG OUTPUT

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WWTF DIGESTER BUILDING
MCC-D

DES	K.ATWOOD	DATE	08/08/17
DRN	K.ATWOOD	DATE	08/08/17
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SECTION
LOCATION 100
TYPE
PAGE B1 OF 9

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D17205-B
PROJECT WISCONSIN DELLS, WI

Installation: 2A			Location: MCC		
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
2AHCB1	1		140MG-J8P-D15	AB	INSTANTANEOUS TRIP MOTOR CIRCUIT PROTECTOR, 150 AMP, 3 POLE
2ACR1 2ACR2 2ACR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
2AFU2	1		TRM-5	MERSEN	MIDGET FUSE, 5 A, 250 VAC
2AFU1	2		ATQR-2	MERSEN	MIDGET FUSE, CLASS CC, 2 A, 600 VAC
TAH-12-2-3-1 TAH-12-2-3-2	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-12-2-3-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
2AMS1	1		509-EOD	AB	FULL VOLTAGE MOTOR STARTER - 3 POLES, NEMA SIZE 4
2AOI1	1		5714C	PR ELECTRONICS	PROGRAMMABLE LED INDICATOR, 4 DIGIT, AC/DC POWERED, ANALOG INPUT, ANALOG OUTPUT
2AOL1	1	*1	193-ESM-VIG-30A-CT	AB	E300 OVERLOAD, 0.5-30A, VOLT/CUR/GND FAULT SENSING MODULE
		*1	193-ECM-ETR	AB	E300 ETHERNET MODULE
		*1	193-EIOGP-42-24D	AB	E300 OVERLOAD, I/O MODULE, 4 IN/2 OUT, 24VDC CONTROL
2APB1	1		ABD110N-BGR	IDEC	FLUSH PUSHBUTTON, 1 NO, NEMA 4, 13, 4X
2APW1	2		1606-XLP15E	AB	15W, 24 VDC POWER SUPPLY
HS-12-2-3-2	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
2ATD2	1	*1	RTE-B2AF20	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 600 HOURS, 2 FORM C CONTACTS, 120VAC COIL
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET, OPEN STYLE CONSTRUCTION
2ATD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
	10		3001035	PHOENIX CONTACT	STANDARD IEC TERMINAL BLOCK - UK 2,5 B
2AXF1	1		1497-F-BASX-3-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497, 350VA
2AXF2	1		H721HC	HAWKEYE	CURRENT TRANSFORMER, 4-20 mA LOOP POWERED, 0-50/100/200A, SOLID CORE

Installation: 2L			Location: MCC		
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
2LCB1	1		140G-G6C3-C60	AB	THERMAL-MAGNETIC BREAKER, 60 AMP TRIP, 3 POLE

Installation: 2M			Location: MCC		
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
2MCB1	1		140G-G6C3-C70	AB	THERMAL-MAGNETIC BREAKER, 70 AMP TRIP, 3 POLE

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WWTF DIGESTER BUILDING
MCC-D

DES	K.ATWOOD	DATE	08/08/17
DRN	K.ATWOOD	DATE	08/08/17
APP	K.ATWOOD	DATE	08/08/17

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	01/18	AO
A	RELEASED	10/17	AO

SECTION

LOCATION
100

TYPE

PAGE
B2 OF 9

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D17205-B

PROJECT
WISCONSIN DELLS, WI

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WISCONSIN DELLS, WI
WWTF SLUDGE DRYER BUILDING H

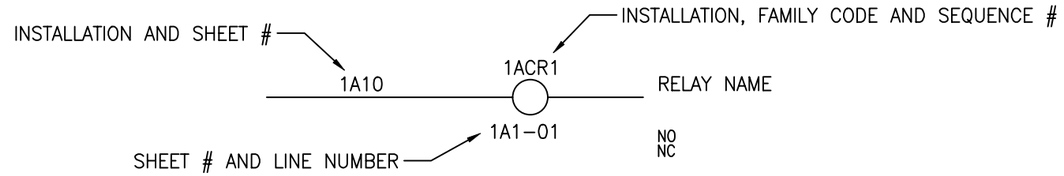
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2A2	BULK BAG CONV CONTROL1
2A3	BULK BAG CONV CONTROL2
2A4	BULK BAG CONV CONTROL3
2F1	WELL PUMP POWER
2F2	WELL PUMP CONTROL1
3A1	TRANSFER CONV POWER
3A2	TRANSFER CONV CONTROL1
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3A4	TRANSFER CONV CONTROL3
3G1	MOBILE CONVEYOR POWER
3G2	MOBILE CONVEYOR CONTROL1
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5H1	CAKE SCREW CONVEYOR POWER
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SH	FILENAME
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11A1	BULK BAG INFLATING BLOWER POWER
11C1	CONDENSATE WASTE PUMP 1 PWR
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12C1	CAKE BIN AREA MOBILE CONVEYOR 1
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L2	NAMEPLATES 1
L3	NAMEPLATES 2
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L6	BOM3
L7	BOM4
L8	BOM5
L9	BOM6
L10	BOM7
L11	BOM8
L12	BOM9
A1	CONTROL POWER
A2	UPS-PLC
A3	ETHERNET NETWORK
A4	DI-1
A5	DI-2

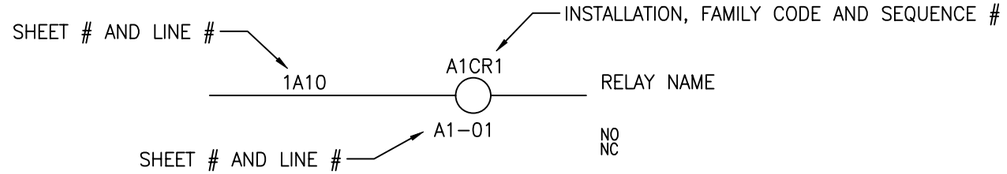
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A15	DI-12
A16	DI-13
A17	DI-14
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A20	DI-17
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A22	DO-1
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SH	FILENAME
B2	LCP-28-1 HOAs
B3	LCP-28-1 LAYOUT
B4	LCP-28-1 BOM
C1	LCP-CAM PWR
C2	LCP-CAM LAYOUT
C3	LCP-CAM BOM
D1	CONVEYOR BEACONS
D2	CONVEYOR BEACONS LAYOUT
D3	CONVEYOR BEACONS BOM
R1	REMOTE INSTRUMENTATION
R2	REMOTE INSTRUMENTATION 2

MCC COMPONENT AND WIRE NUMBERS:



LCP-X COMPONENT AND WIRE NUMBERS:



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WWTF SLUDGE DRYER BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION

LOCATION
LCP-BEACON

TYPE
101

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ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D16007-C

PROJECT
WISCONSIN DELLS, WI

480 VAC, 3 PHASE, 4 WIRE SUPPLY FROM
HEADWORKS BUILDING SWITCHBOARD MD

CUSTOMER
MD
1APDB1

L1 L2 L3 N G

1A
1ACB1
M6H3
600A

1M
N

1A
G

GROUND PER NEC

1EDS1
30A
30A
30A

1ESPD1
L1
L2
L3
GND
480/277Y

1A1-24,1A1-24,1A1-24

1EFU1
0.75A
0.75A

H1 H3 H2 H4
1EXF1
75VA
X1 X2

1EFU2
1A

1ESPD1 1A1-10
1ESPD1 1A1-10
1ESPD1 1A1-10
1ELT1
G
ON

1F
J6F3
1FCB1
200A

DRYER VFD
CONTROL PANEL
LCP-23-1-2

1J
K6H
1JCB1
300A

SLUDGE DRYER BLDG NORTH
480VAC LIGHTING &
APPLIANCE PANEL HH-1

(ADJUST TO 250 A)

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

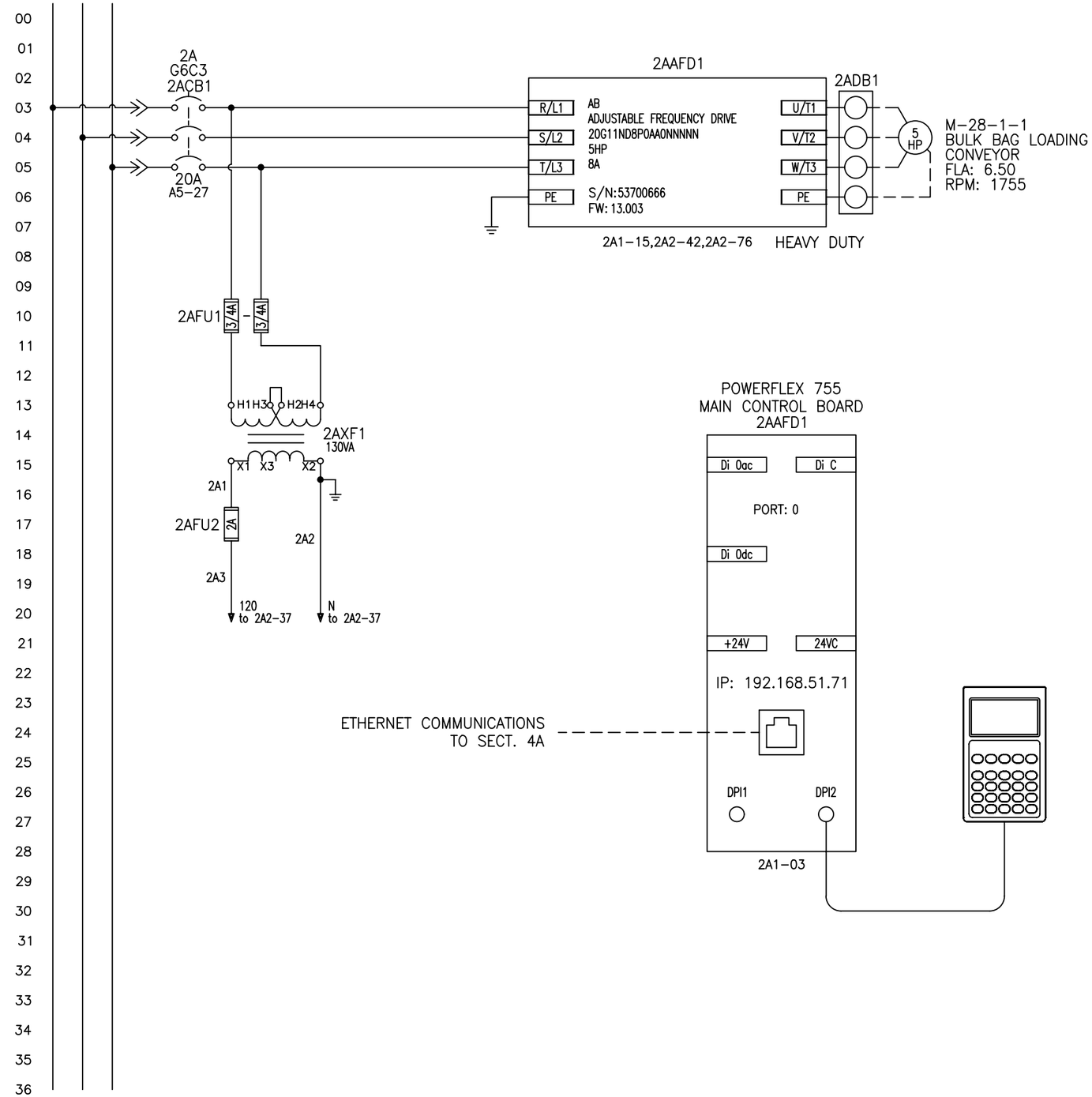
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B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

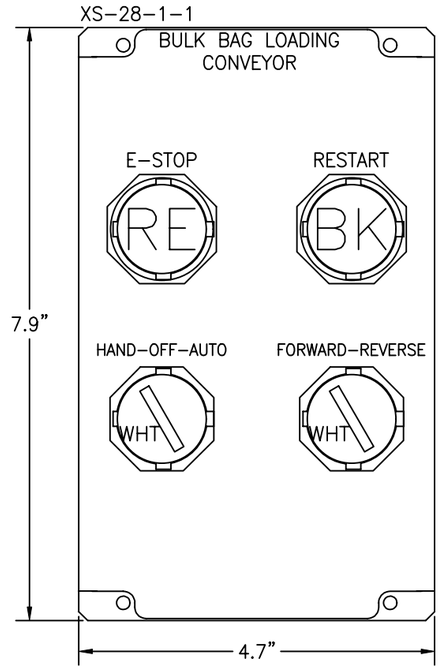
REV	DESCRIPTION	DATE	INIT
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K			
J			
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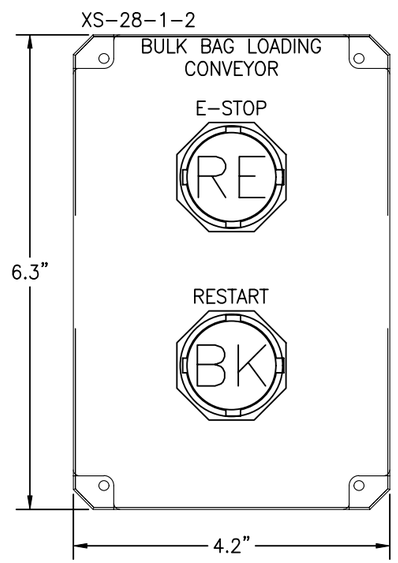
SECTION 1A
LOCATION LCP-BEACON
TYPE 101
PAGE 1A1 OF 117

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI







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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

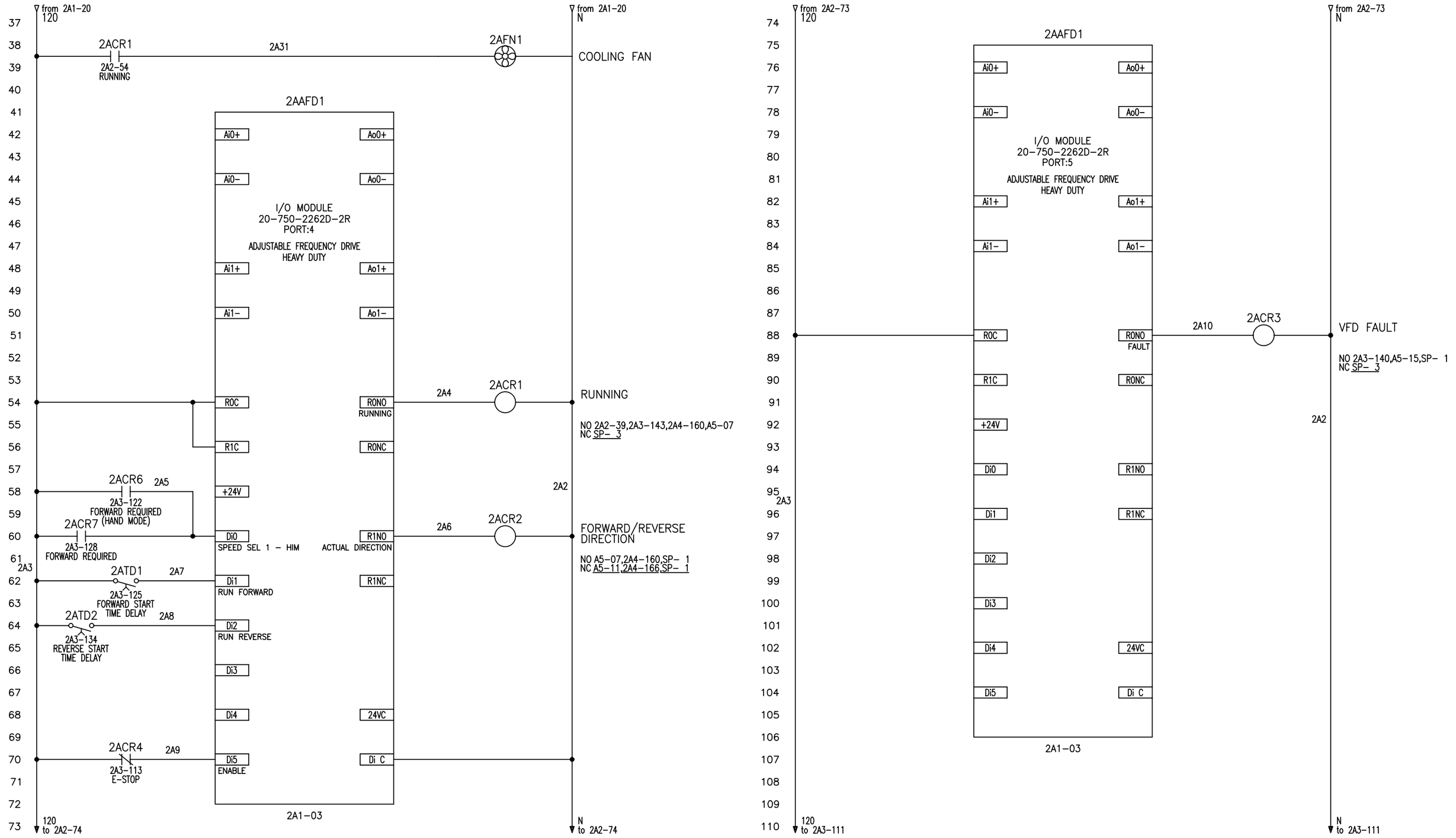
REV	DESCRIPTION	DATE	INIT
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E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION 2A
LOCATION LCP-BEACON
TYPE 101
PAGE 2A1 OF 116

ALTRONEX CONTROL SYSTEMS
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

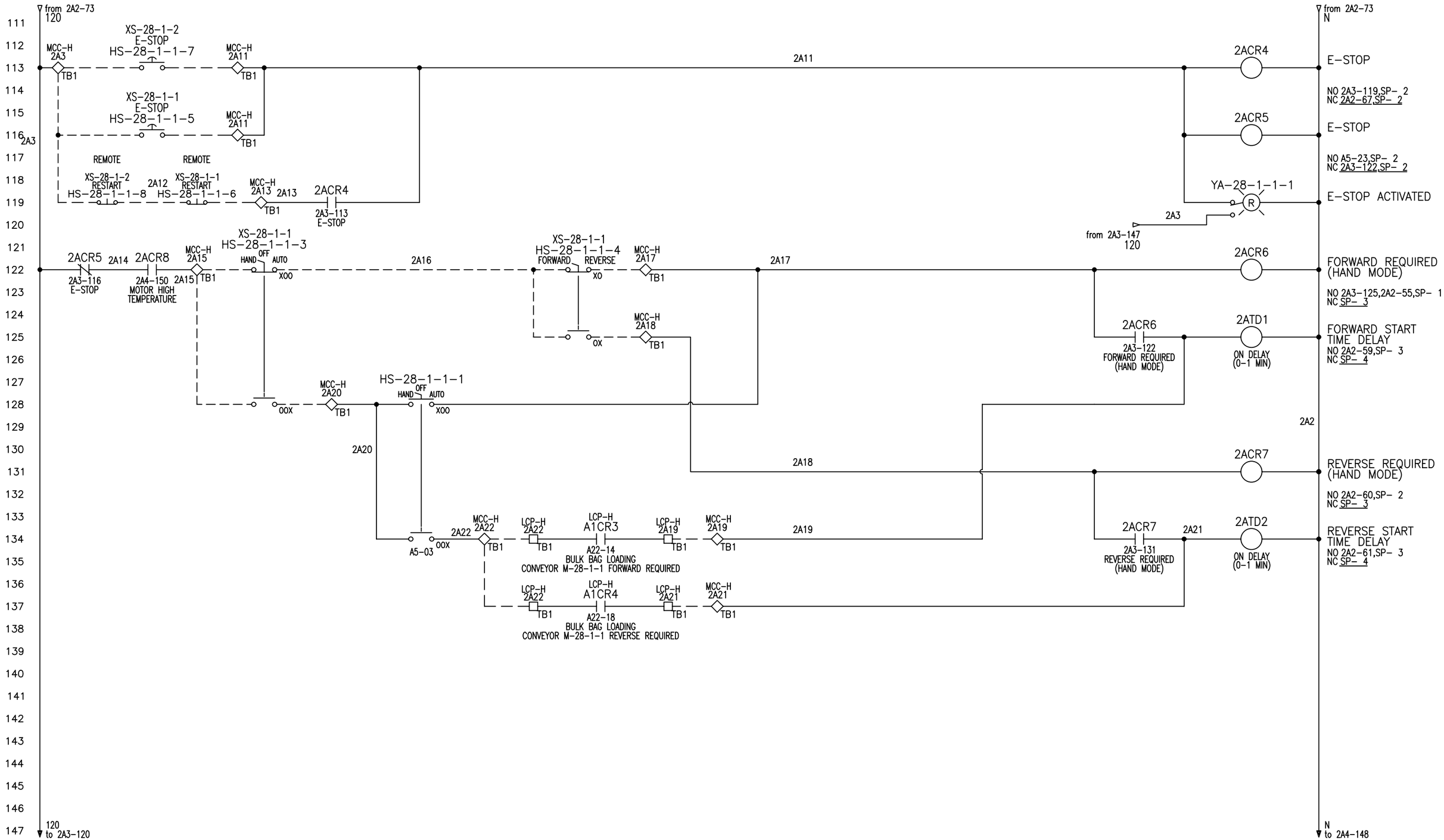
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C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
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SECTION 2A
LOCATION LCP-BEACON
TYPE 101
PAGE 2A2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



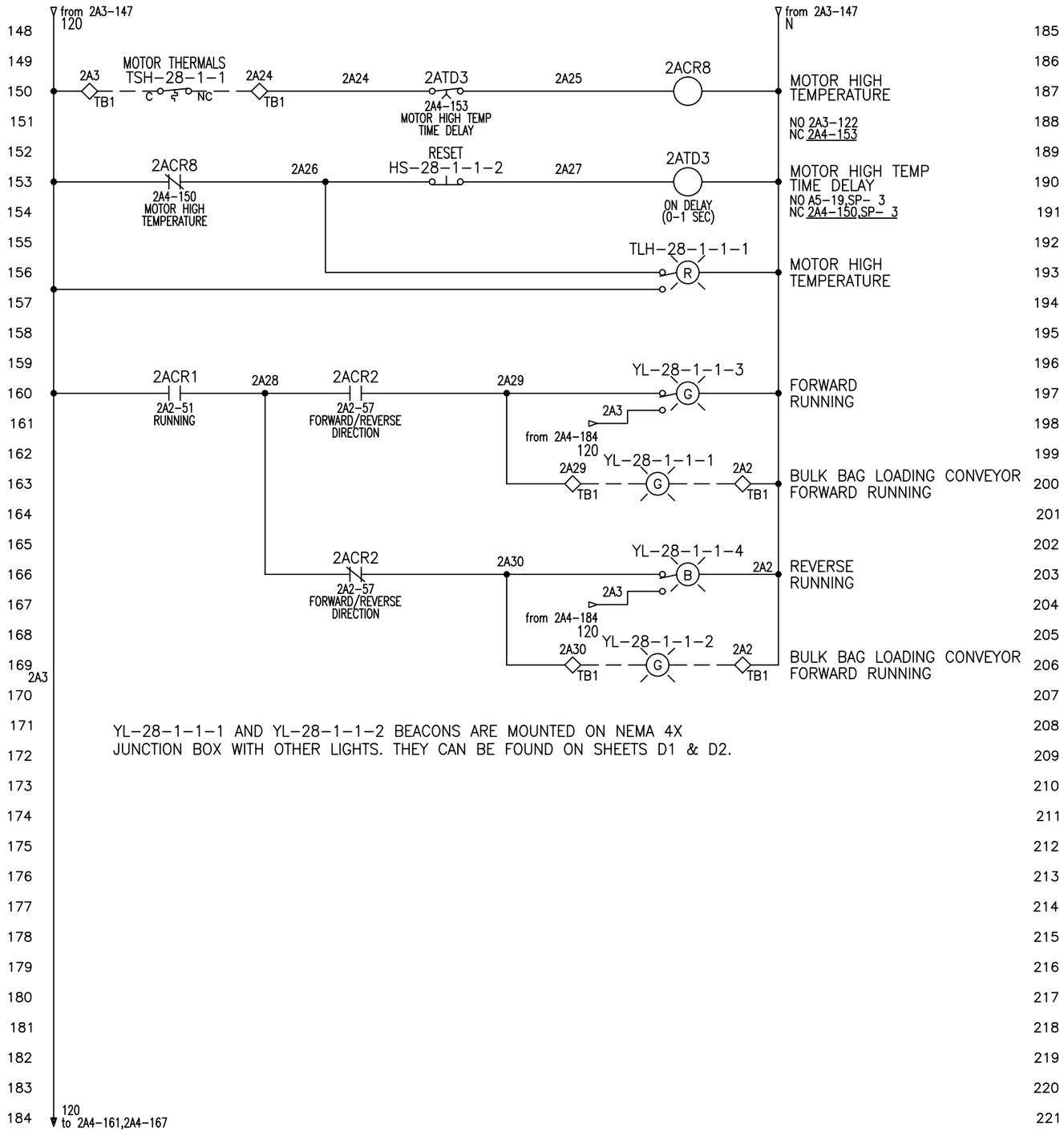
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16	F				L				SECTION			
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				REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT				

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4633 TOMPKINS DRIVE MADISON, WI 53716
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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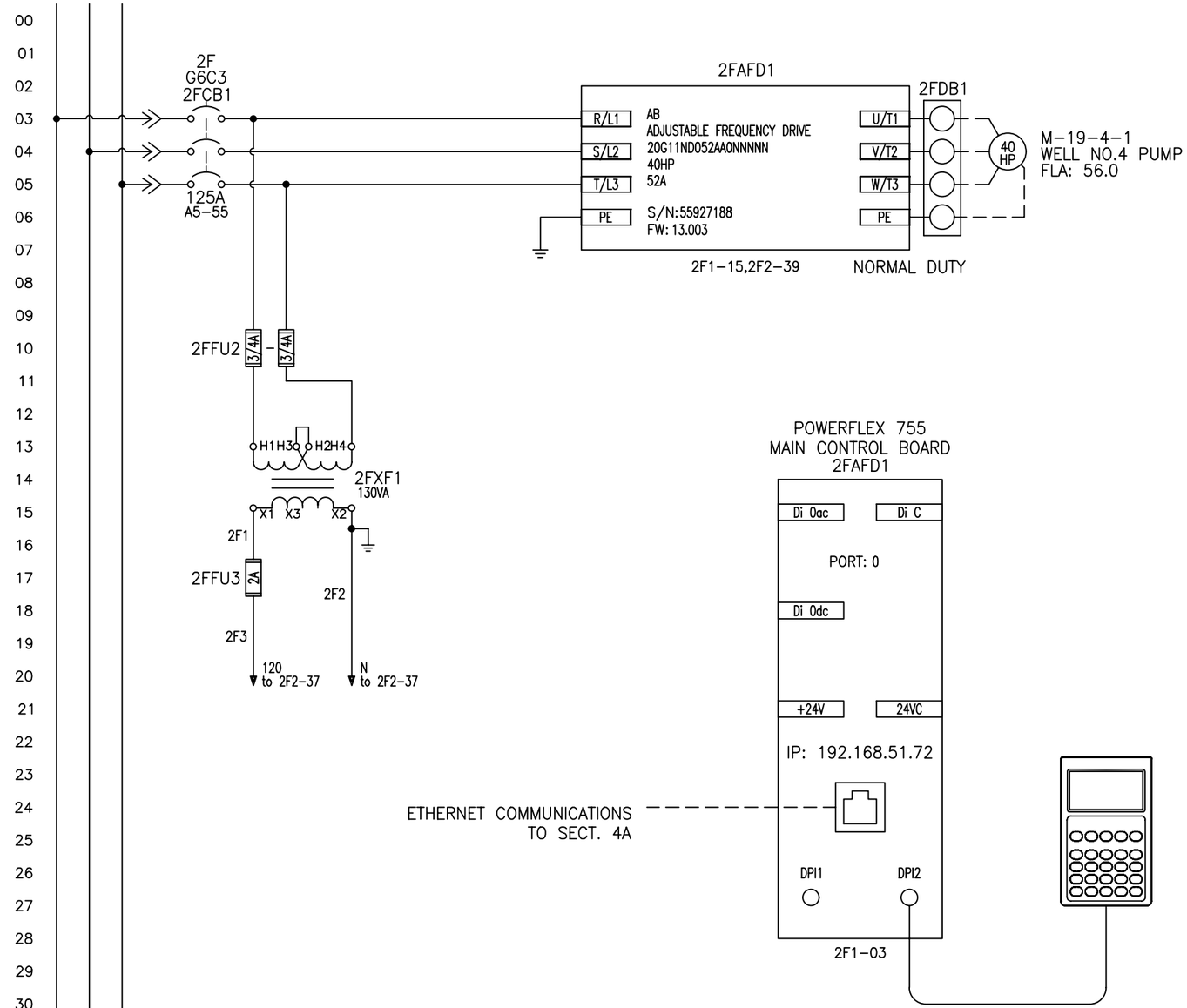
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SECTION 2A
LOCATION LCP-BEACON
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ALTRONEX CONTROL SYSTEMS
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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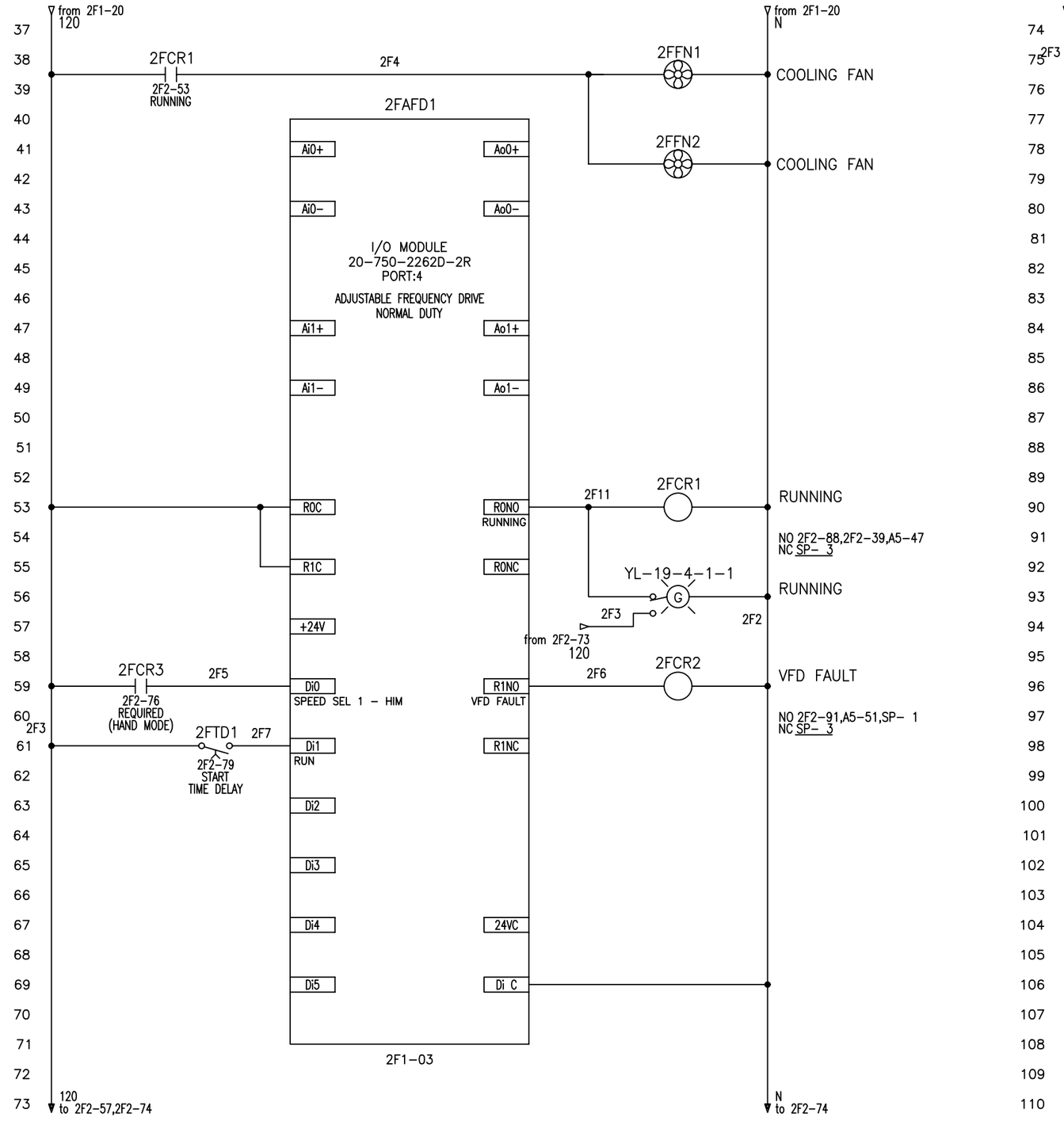
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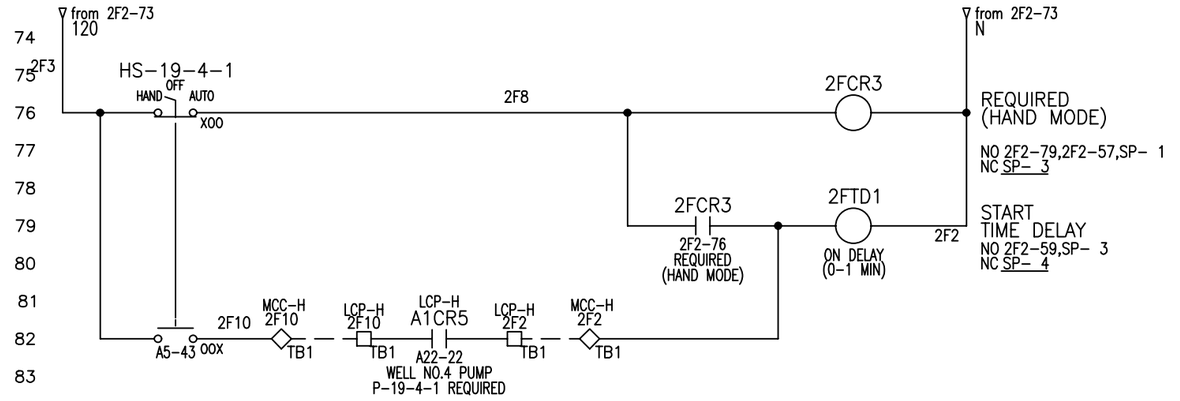
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SECTION 2F
LOCATION LCP-BEACON
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PAGE 2F1 OF 116

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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





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WWTF SLUDGE DRYER
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SECTION 2F
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ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

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3A
G6C3
3ACB1

20A
A6-31

3AAFD1

R/L1
S/L2
T/L3
PE

AB
ADJUSTABLE FREQUENCY DRIVE
20G11ND8P0AA0NNNNN
5HP
8A

S/N:55761510
FW: 13.003

3A1-15,3A2-41,3A2-76 HEAVY DUTY

3ADB1

U/T1
V/T2
W/T3
PE

5 HP

M-27-1-1
TRANSFER
CONVEYOR
FLA: 6.5
RPM: 1755

3AFU1 3/4A| 3/4A|

H1 H3 H2 H4

3AXF1
130VA

X1 X3 X2

3A1

3AFU2 2A|

3A2

3A3

120
to 3A2-37

N
to 3A2-37

POWERFLEX 755
MAIN CONTROL BOARD
3AAFD1

Di 0ac
Di C
PORT: 0
Di 0dc
+24V
24VC

IP: 192.168.51.73

ETHERNET COMMUNICATIONS
TO SECT. 4A

DPI1
DPI2

3A1-03

XS-27-1-1

TRANSFER CONVEYOR
FORWARD-REVERSE
WHT
HAND-OFF-AUTO
WHT

6.3"
3.15"

XS-27-1-2

TRANSFER
CONVEYOR
E-STOP
RE

3.125"
3.125"

XS-27-1-3

TRANSFER
CONVEYOR
E-STOP
RE

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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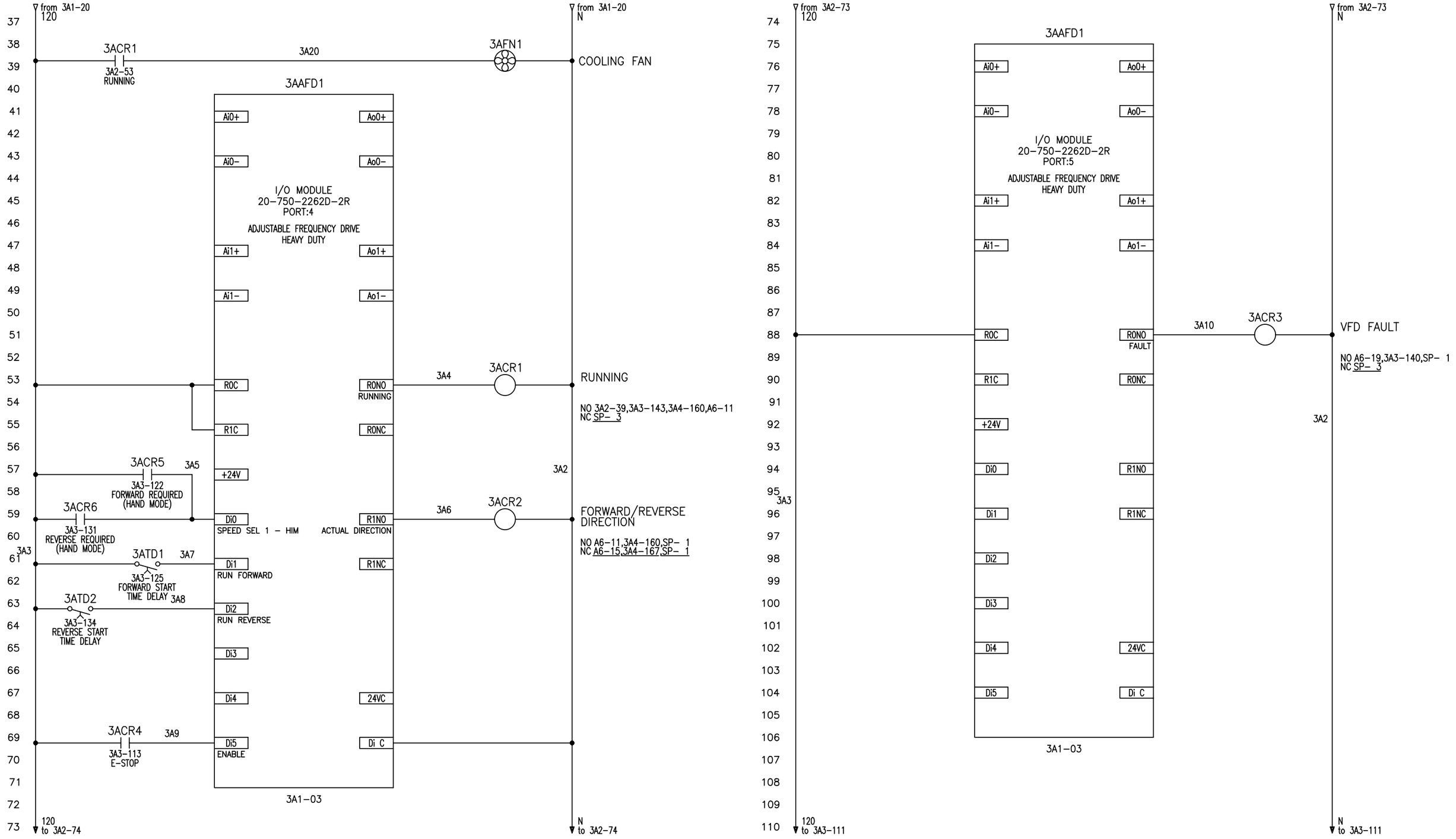
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B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

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SECTION 3A
LOCATION LCP-BEACON
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ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
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MCC-H

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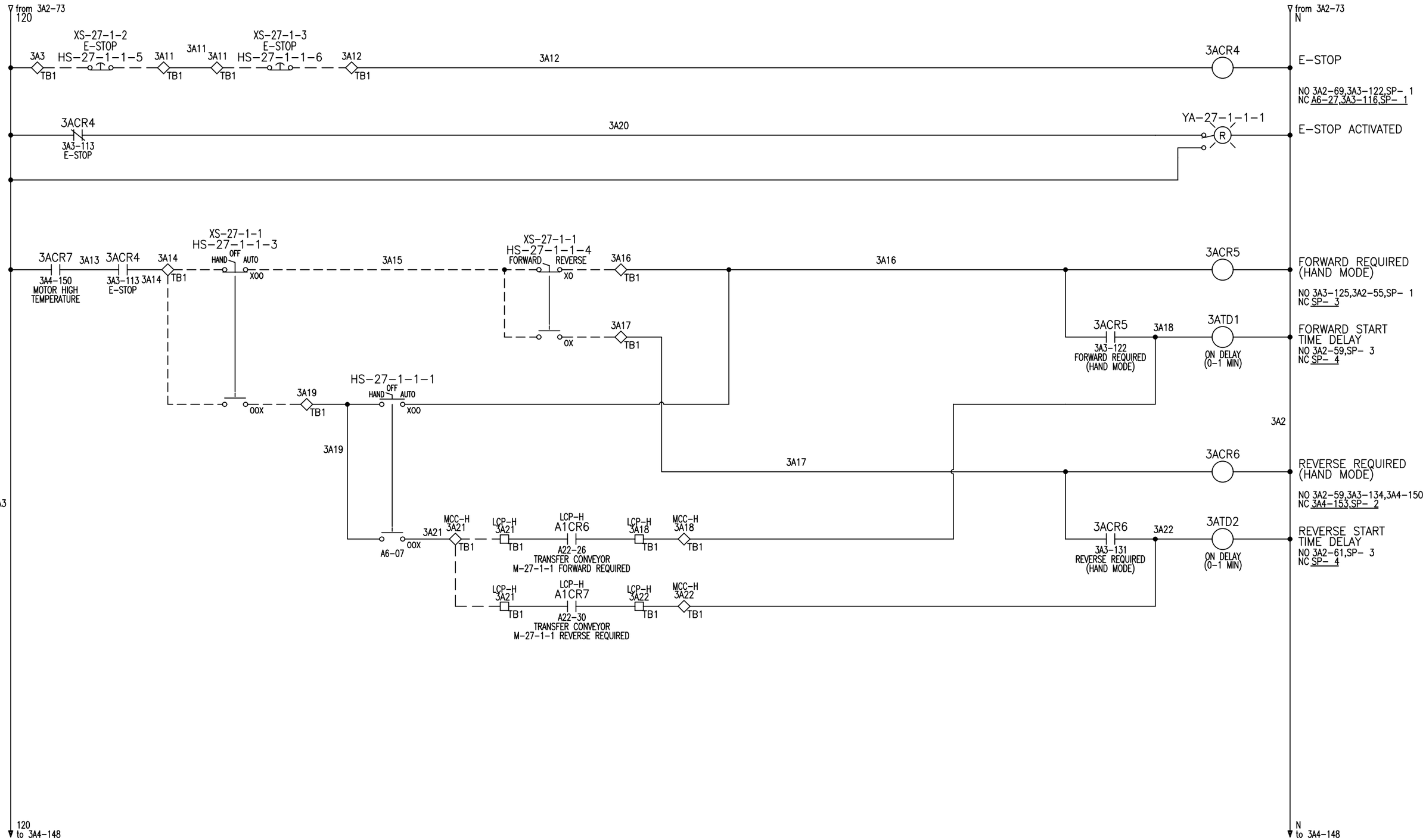
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REV	DESCRIPTION	DATE	INIT

SECTION 3A
LOCATION LCP-BEACON
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PAGE 3A2 OF 116

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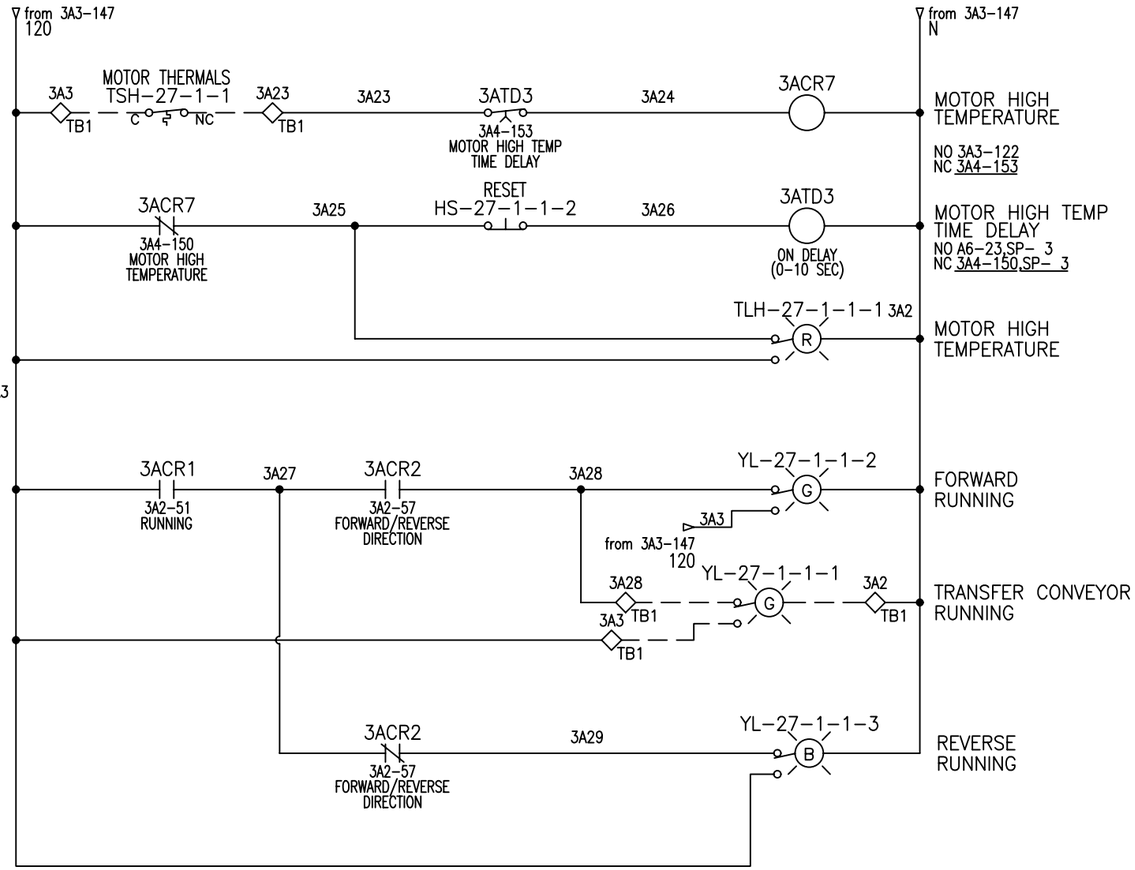
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SECTION 3A
LOCATION LCP-BEACON
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PAGE 3A3 OF 116

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4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



YL-27-1-1-1 BEACON IS MOUNTED ON NEMA 4X JUNCTION BOX WITH OTHER LIGHTS. THEY CAN BE FOUND ON SHEETS D1 & D2.

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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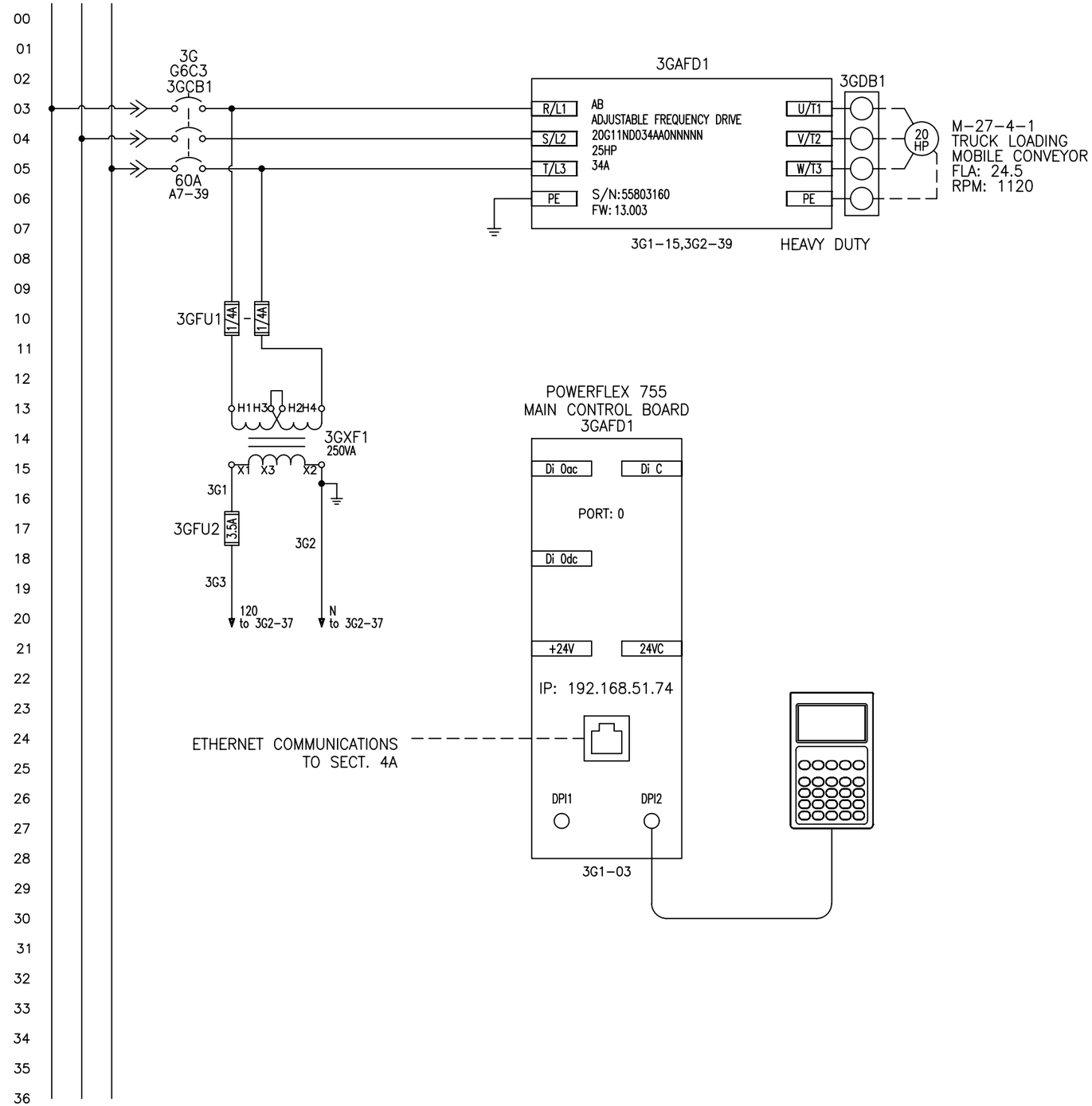
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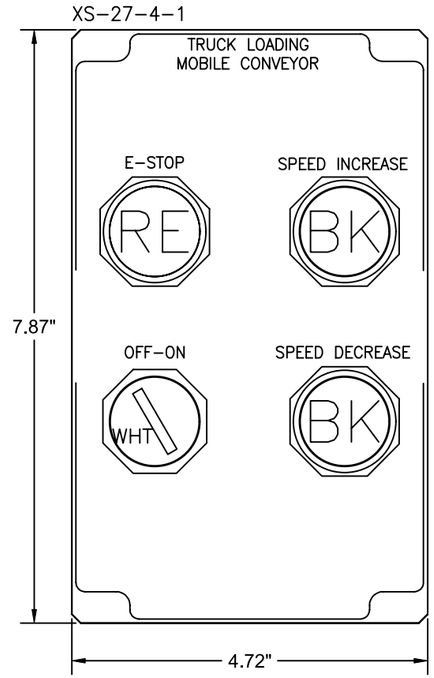
REV	DESCRIPTION	DATE	INIT
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SECTION 3A
LOCATION LCP-BEACON
TYPE 101
PAGE 3A4 OF 116

ALTRONEX CONTROL SYSTEMS
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DRAWING D16007-C
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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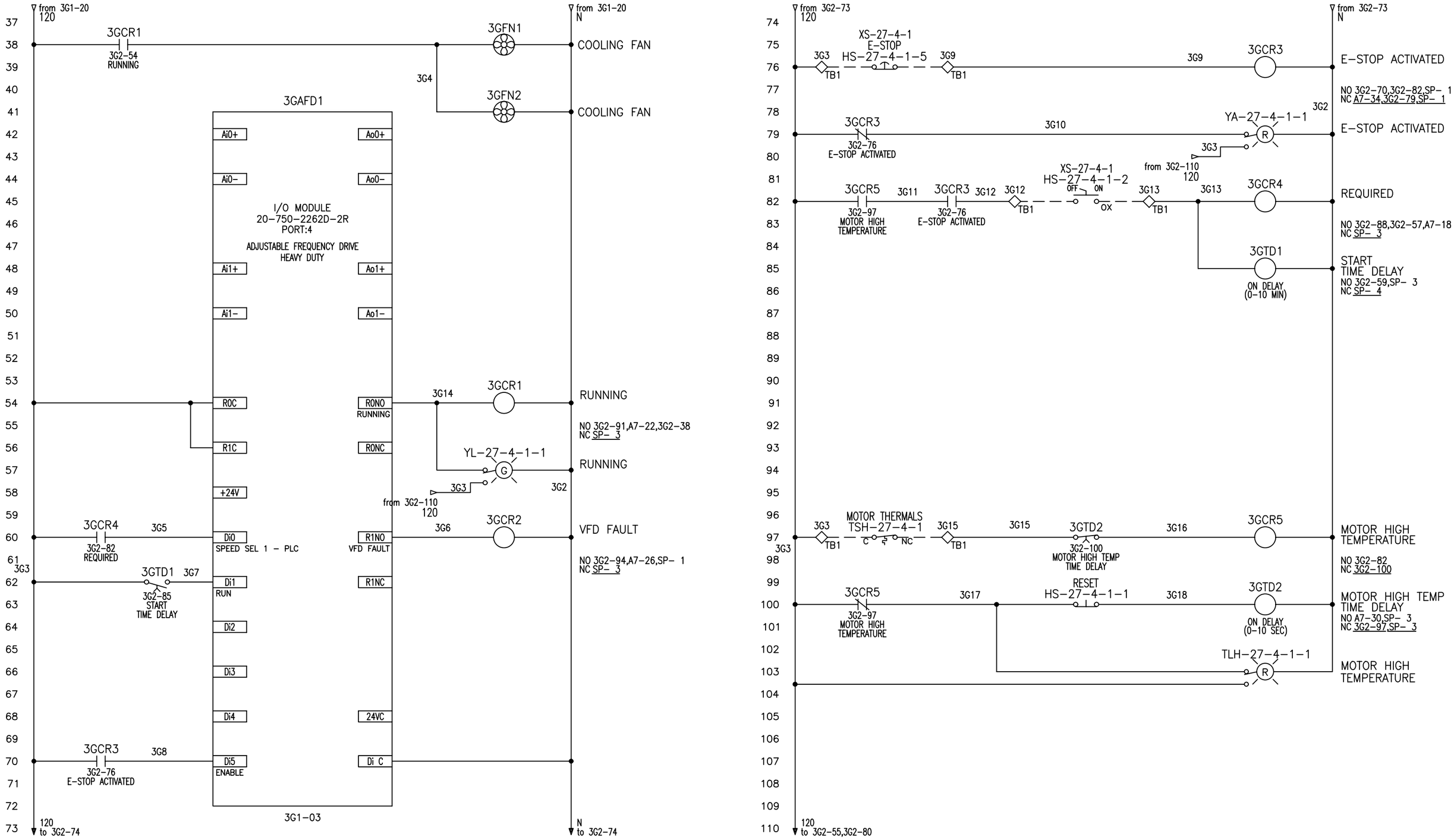
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SECTION 3G
LOCATION LCP-BEACON
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PAGE 3G1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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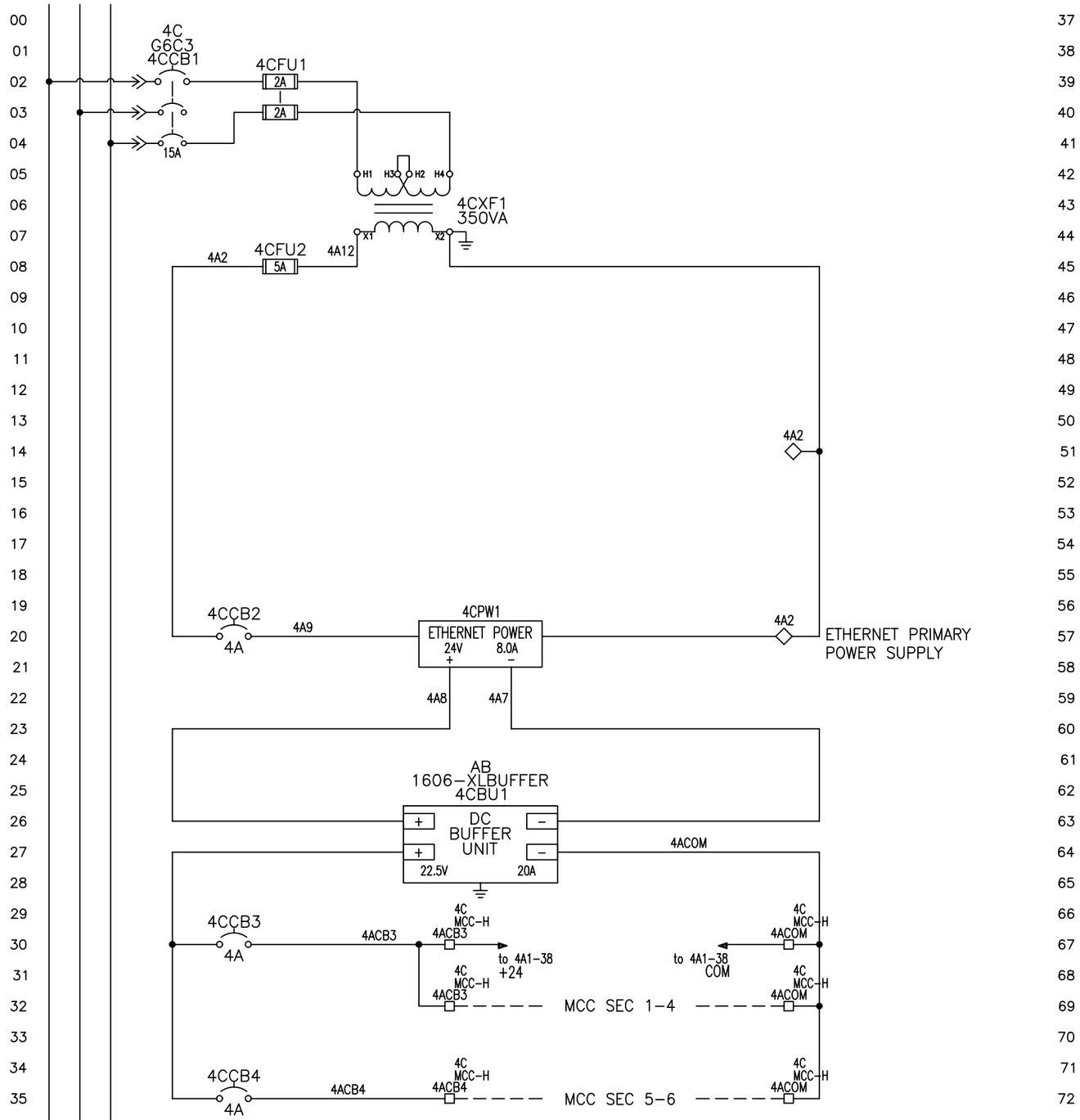
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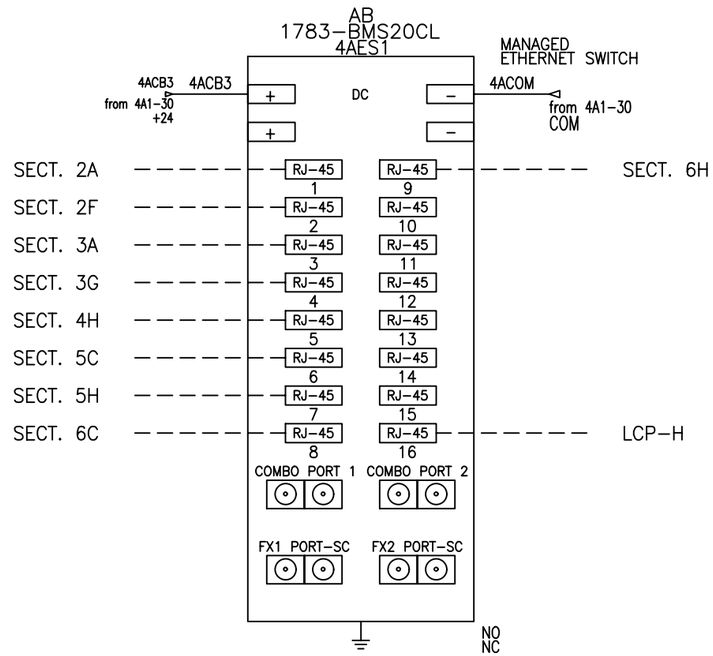
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SECTION 3G
LOCATION LCP-BEACON
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PAGE 3G2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





IP: 192.168.51.162

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WWTF SLUDGE DRYER
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MCC−H

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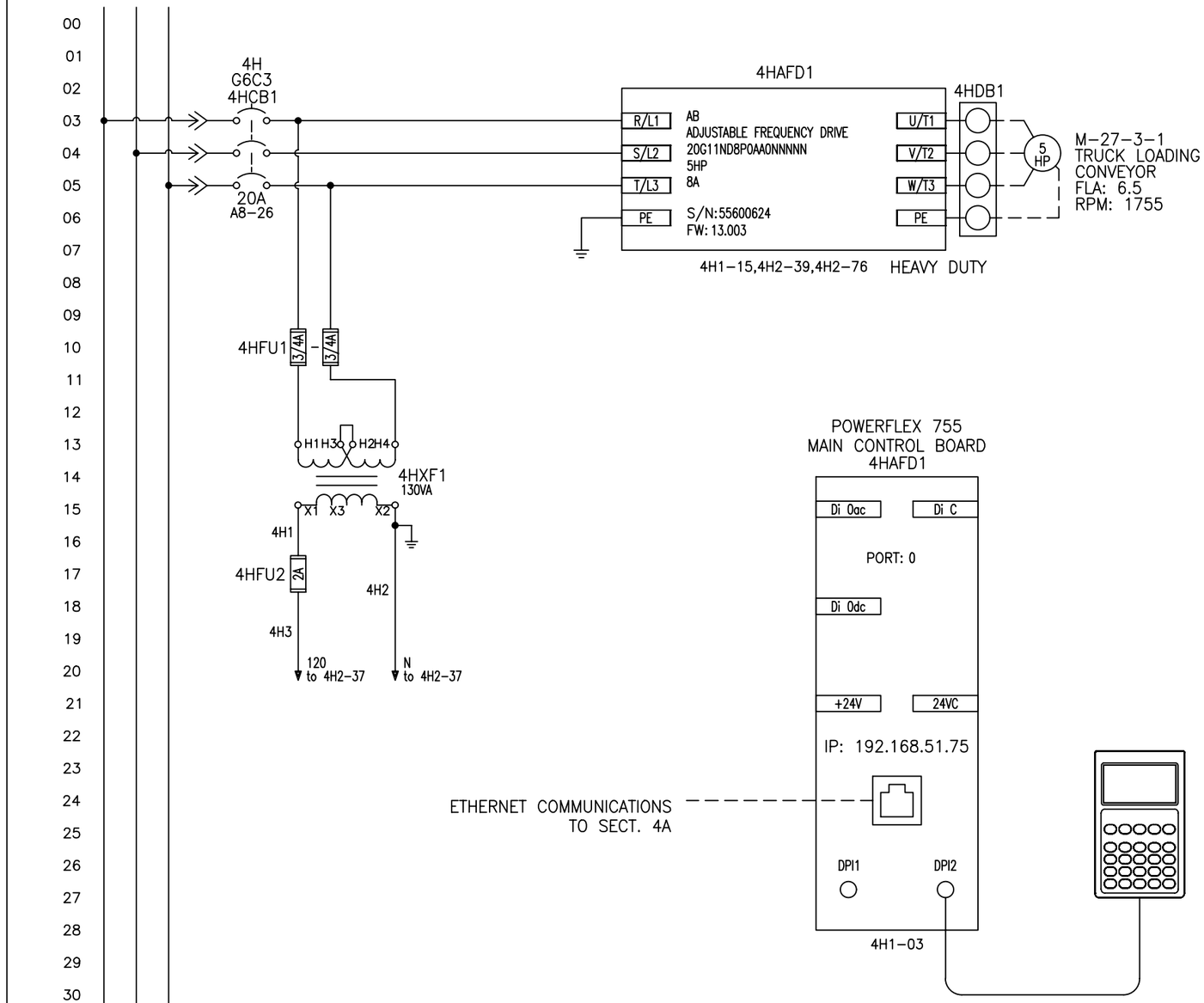
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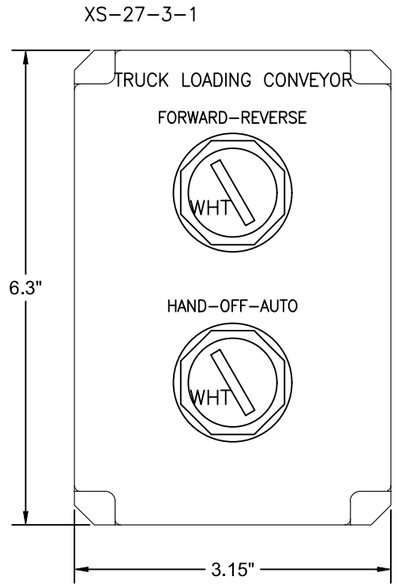
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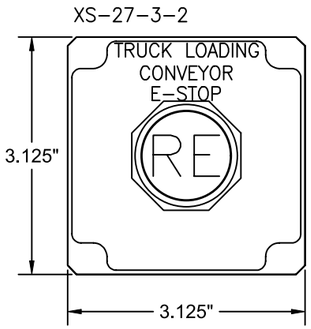
SECTION 4A
LOCATION LCP−BEACON
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BUILDING H
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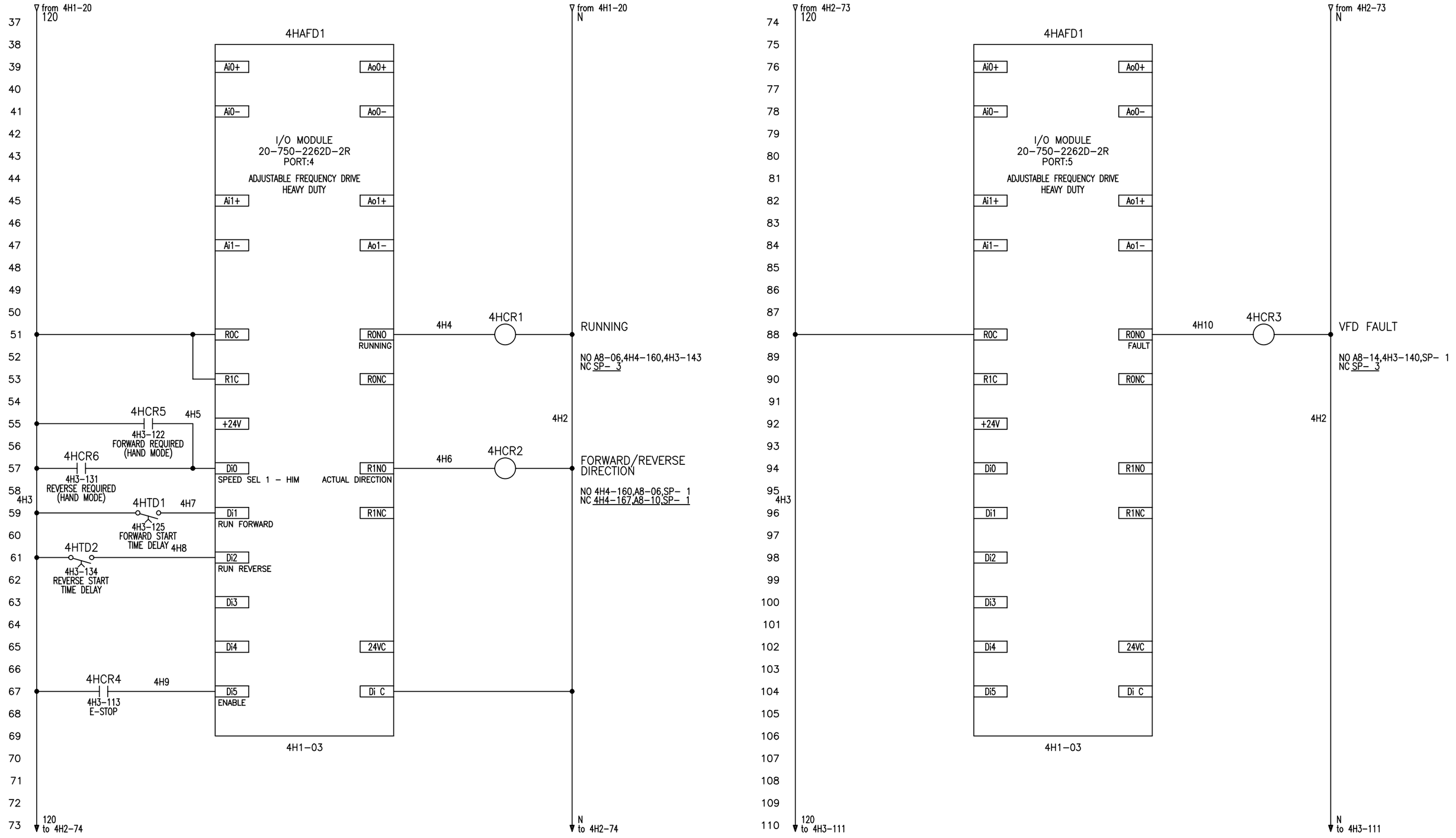
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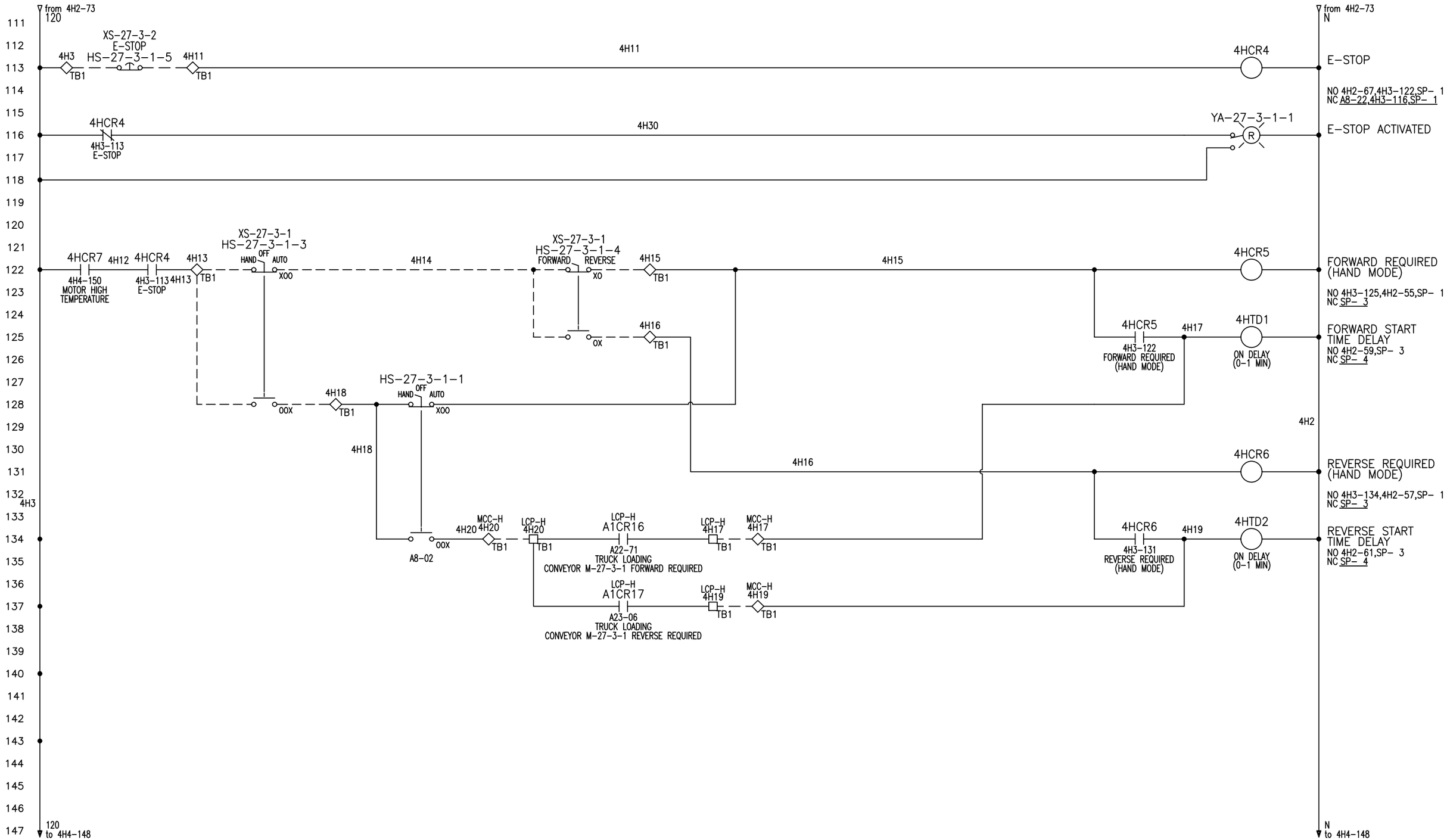
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APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION 4H
LOCATION LCP-BEACON
TYPE 101
PAGE 4H2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
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APP	K.ATWOOD	DATE	01/18/16

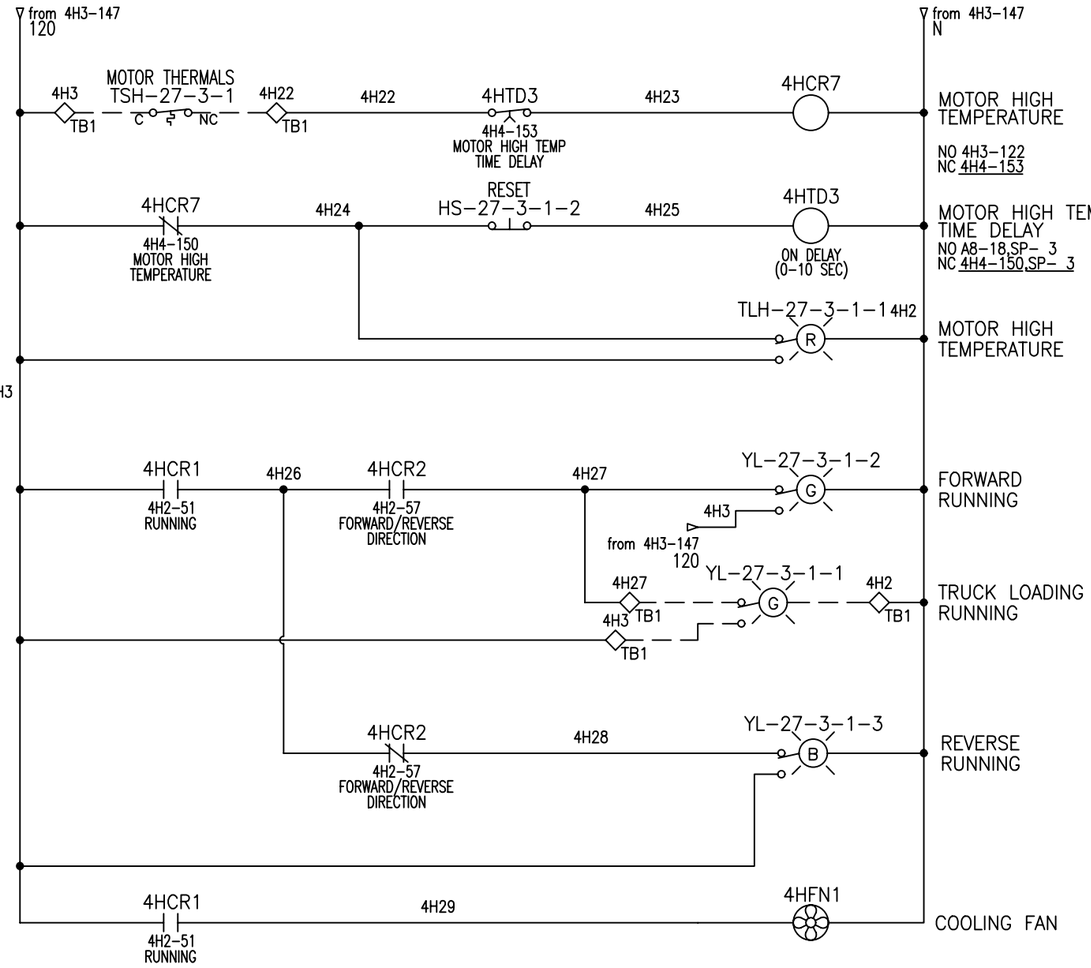
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REV	DESCRIPTION	DATE	INIT
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SECTION 4H
LOCATION LCP-BEACON
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PAGE 4H3 OF 116

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4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



YL-27-3-1-1 BEACON IS MOUNTED ON NEMA 4X JUNCTION BOX WITH OTHER LIGHTS. THEY CAN BE FOUND ON SHEETS D1 & D2.

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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APP	K.ATWOOD	DATE	01/18/16

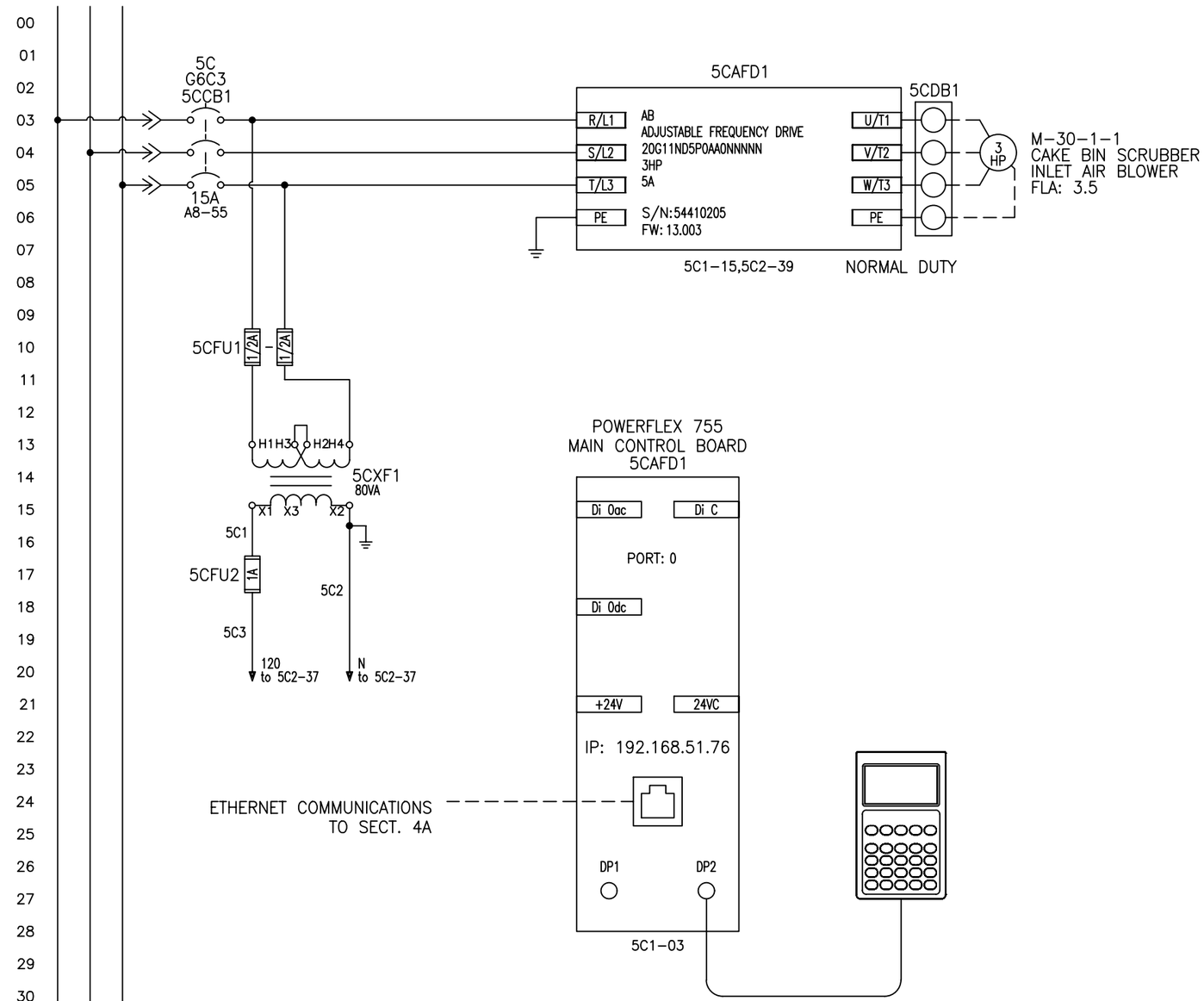
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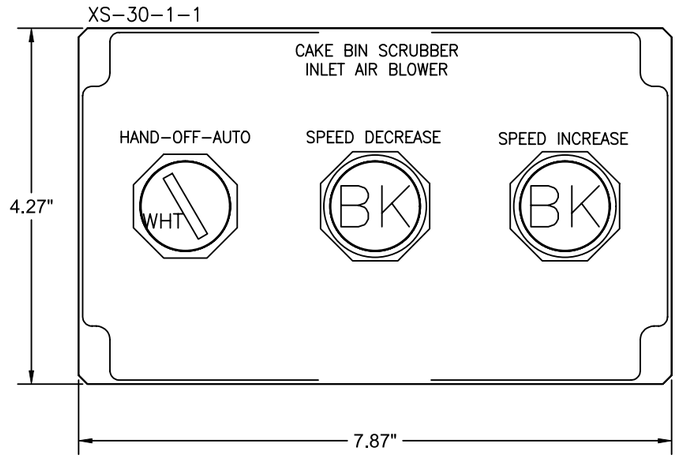
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SECTION 4H
LOCATION LCP-BEACON
TYPE 101
PAGE 4H4 OF 116

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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





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WWTF SLUDGE DRYER
BUILDING H
MCC–H

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APP	K.ATWOOD	DATE 01/18/16

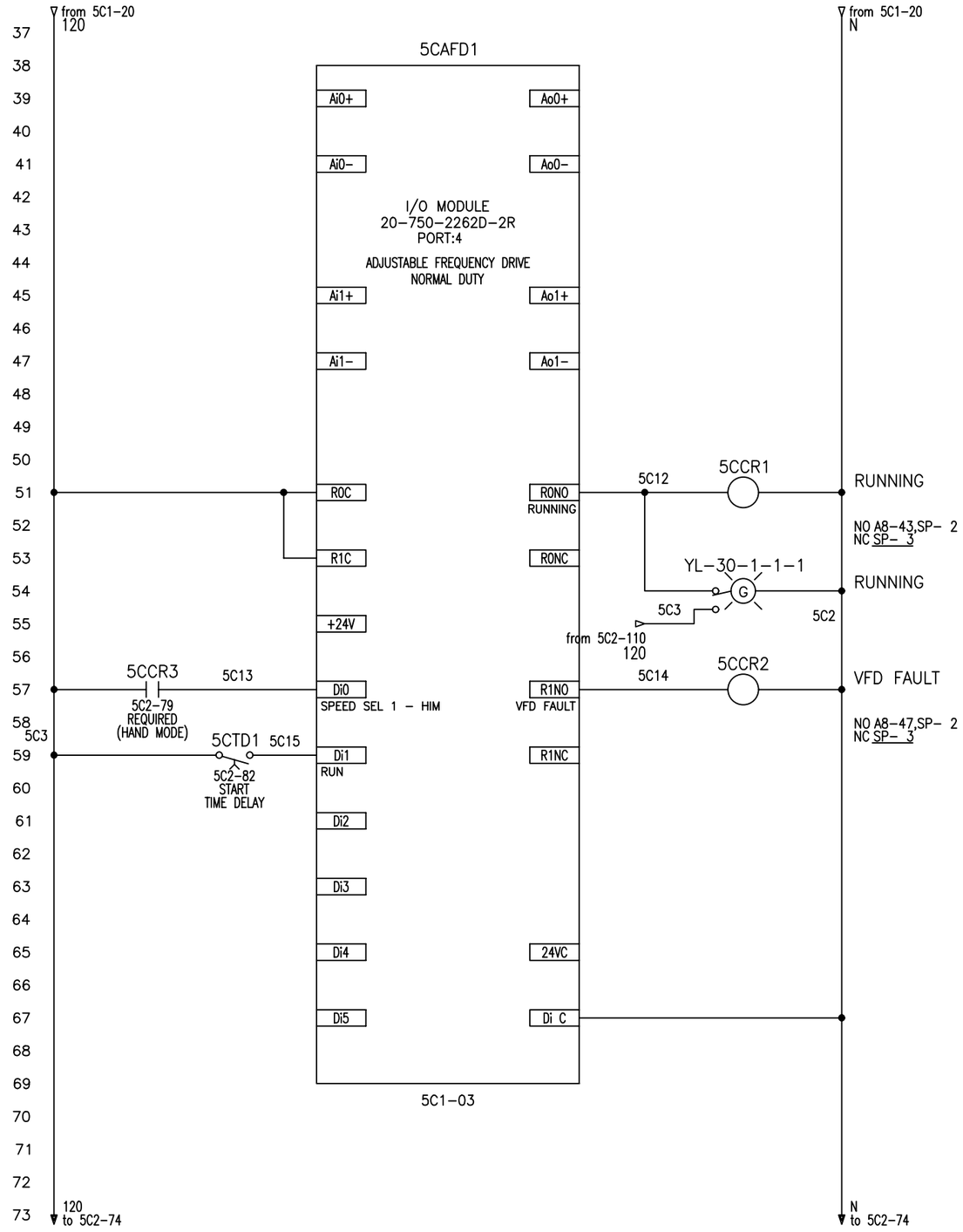
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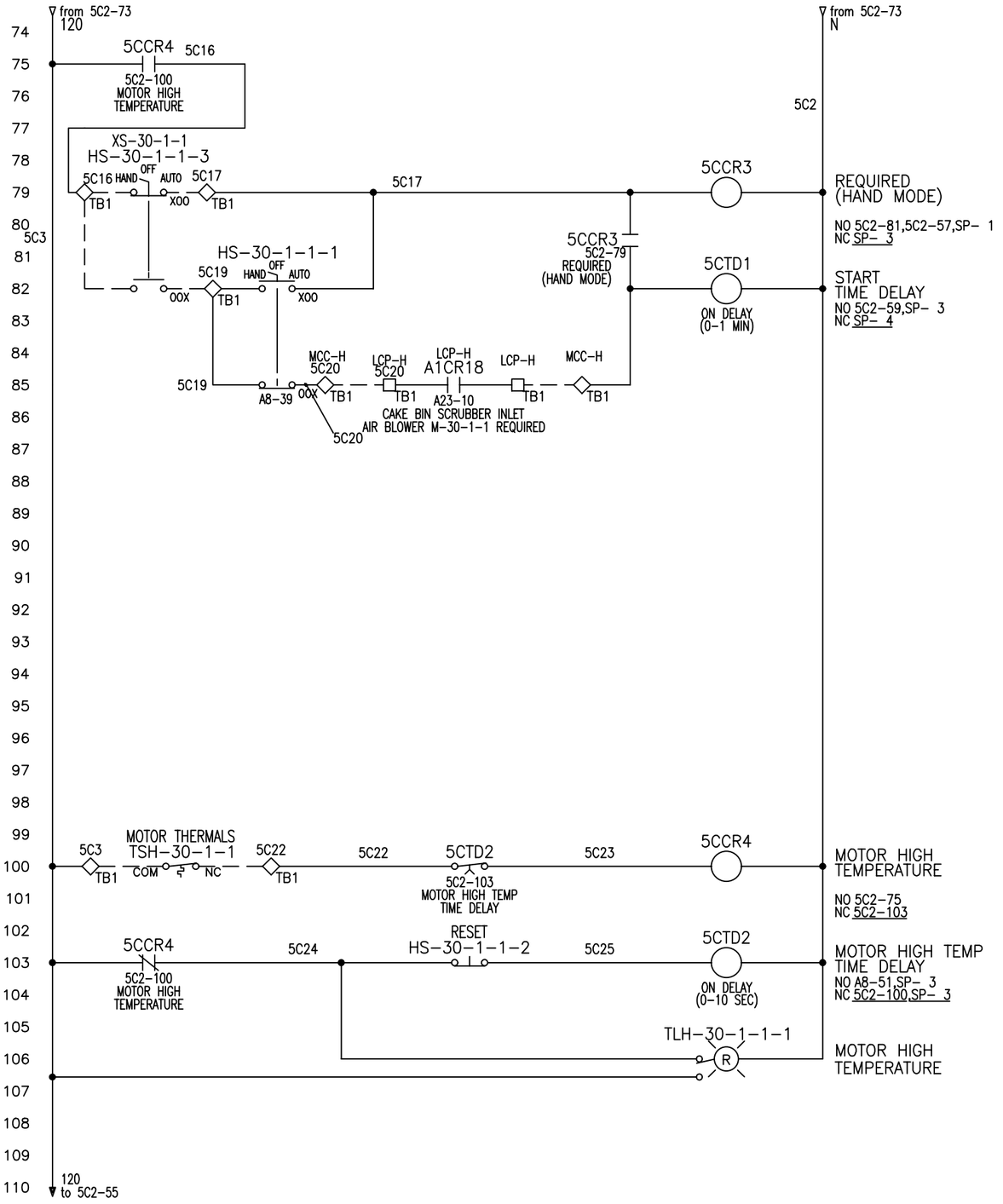
REV	DESCRIPTION	DATE	INIT
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SECTION 5C
LOCATION LCP–BEACON
TYPE 101
PAGE 5C1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007–C
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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REV	DESCRIPTION	DATE	INIT

SECTION 5C
LOCATION LCP-BEACON
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4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

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5H
G6C3
5HCB1

20A
A9–39

5HAFD1

R/L1
S/L2
T/L3
PE

AB
ADJUSTABLE FREQUENCY DRIVE
20G11ND8P0AA0NNNNN
5HP
8A

S/N:55624332
FW: 13.003

U/T1
V/T2
W/T3
PE

5HDB1

5
HP

M–18–3–1
CAKE SCREW
CONVEYOR
FLA:

5H1–15,5H2–43,5H2–76 HEAVY DUTY

5HFU1 1A 1A

H1 H3 H2 H4

5HXF1
200VA

X1 X3 X2

5H1

5HFU2 2.5A

5H2

5H3

120
to 5H2–37

N
to 5H2–37

POWERFLEX 755
MAIN CONTROL BOARD
5HAFD1

Di 0ac
Di C

PORT: 0

Di 0dc

+24V
24VC

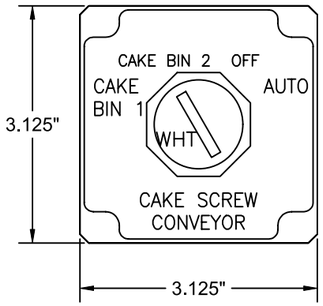
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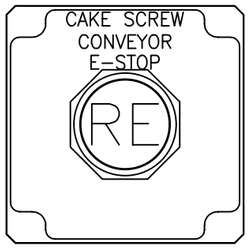
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DPI2

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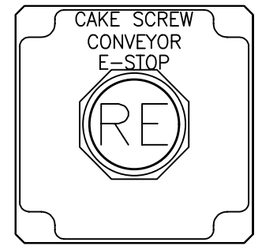
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XS–18–3–2



XS–18–3–3



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WWTF SLUDGE DRYER
BUILDING H
MCC–H

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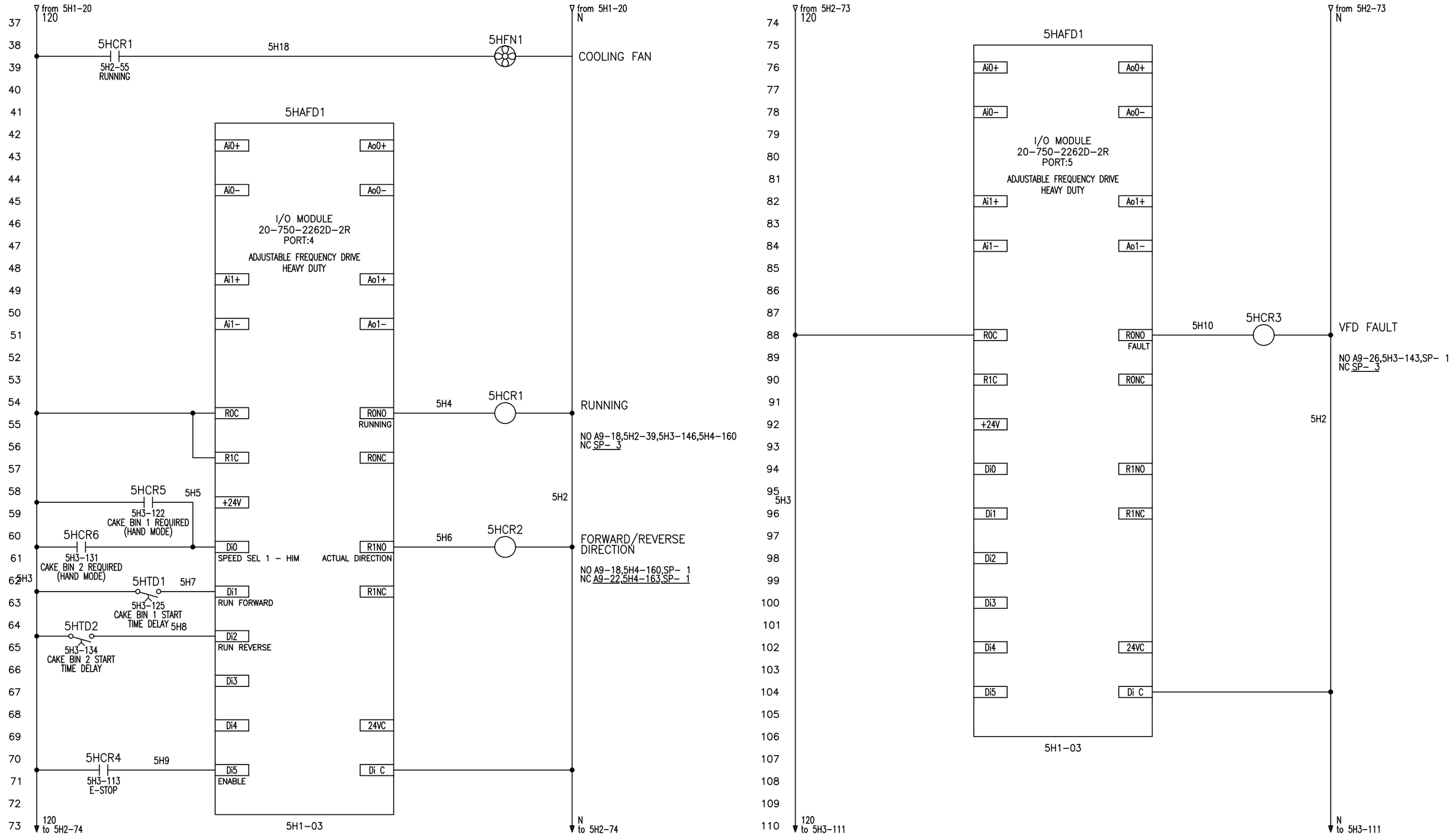
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A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
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SECTION 5H
LOCATION LCP–BEACON
TYPE 101
PAGE 5H1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222–8622 www.altronex.com

DRAWING D16007–C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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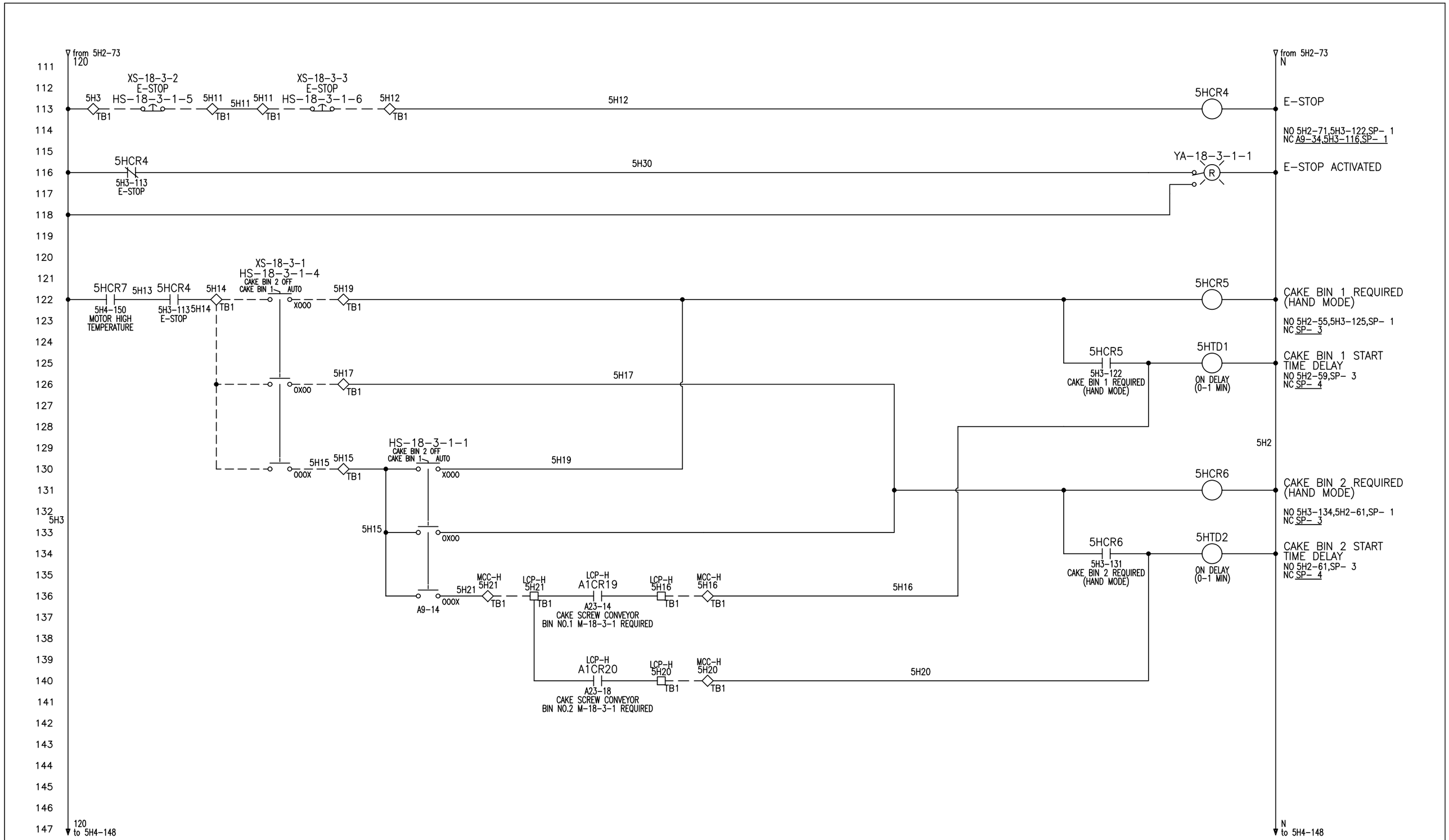
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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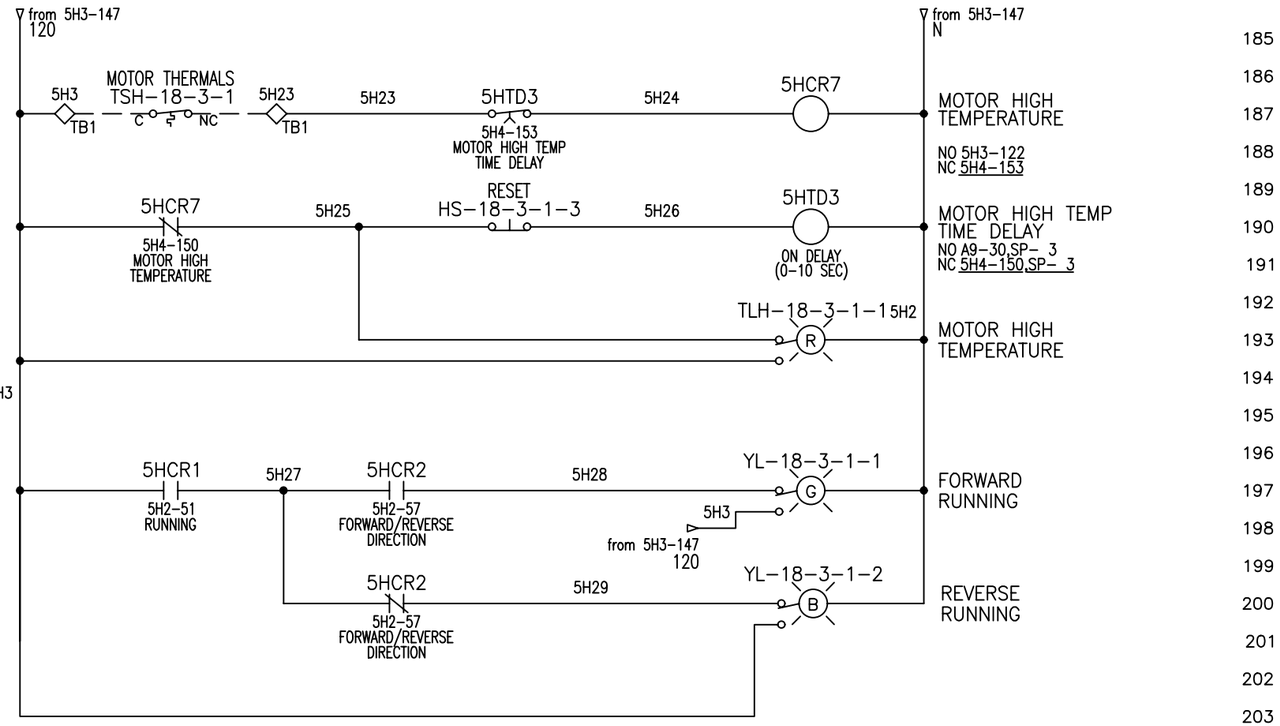
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SECTION 5H
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PAGE 5H3 OF 116

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

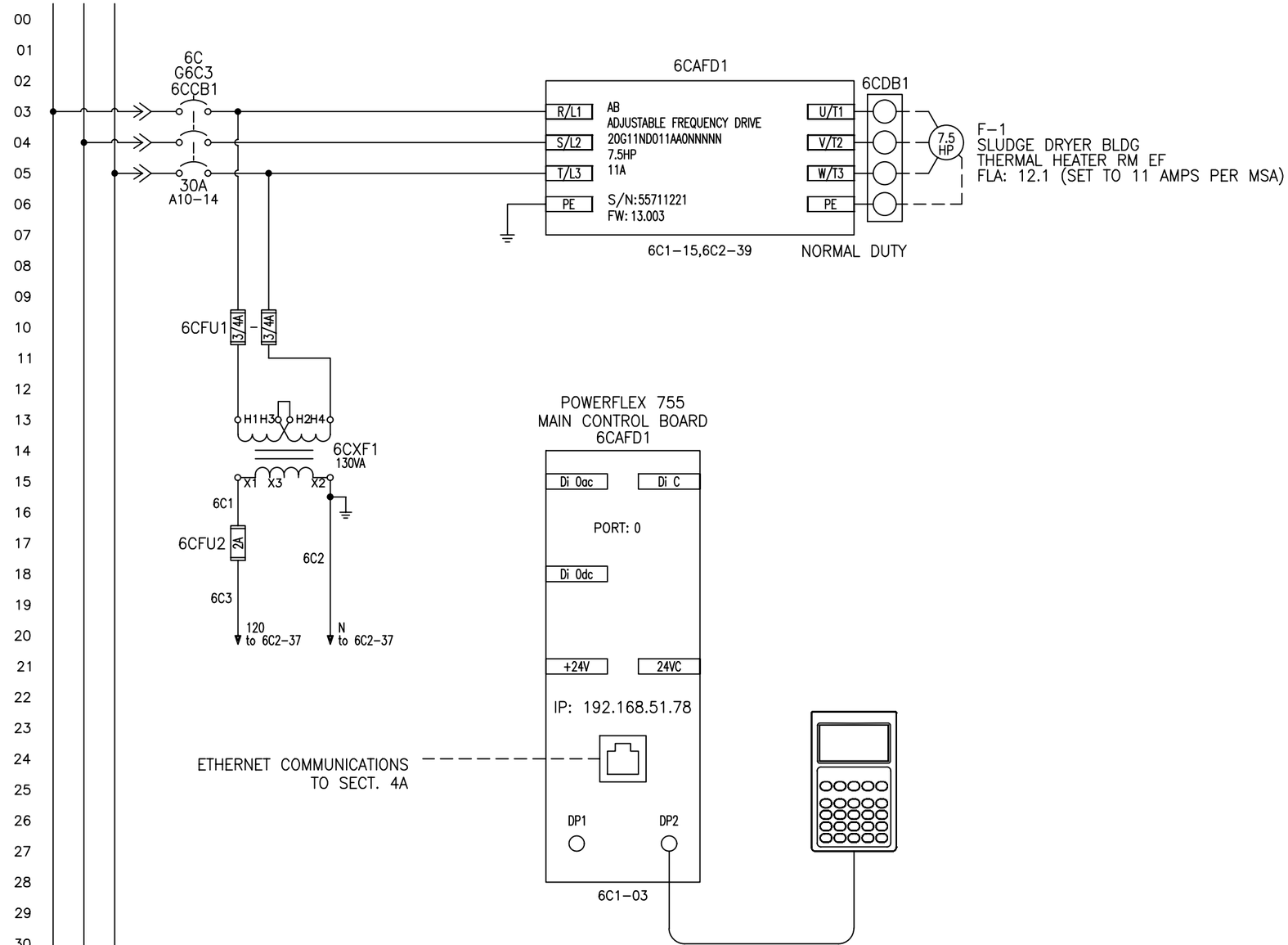
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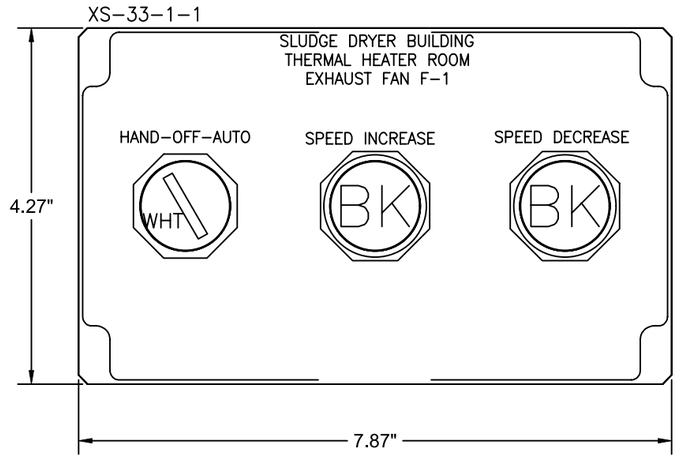
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SECTION 5H
LOCATION LCP-BEACON
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PAGE 5H4 OF 116

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DRAWING D16007-C
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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APP	K.ATWOOD	DATE	01/18/16

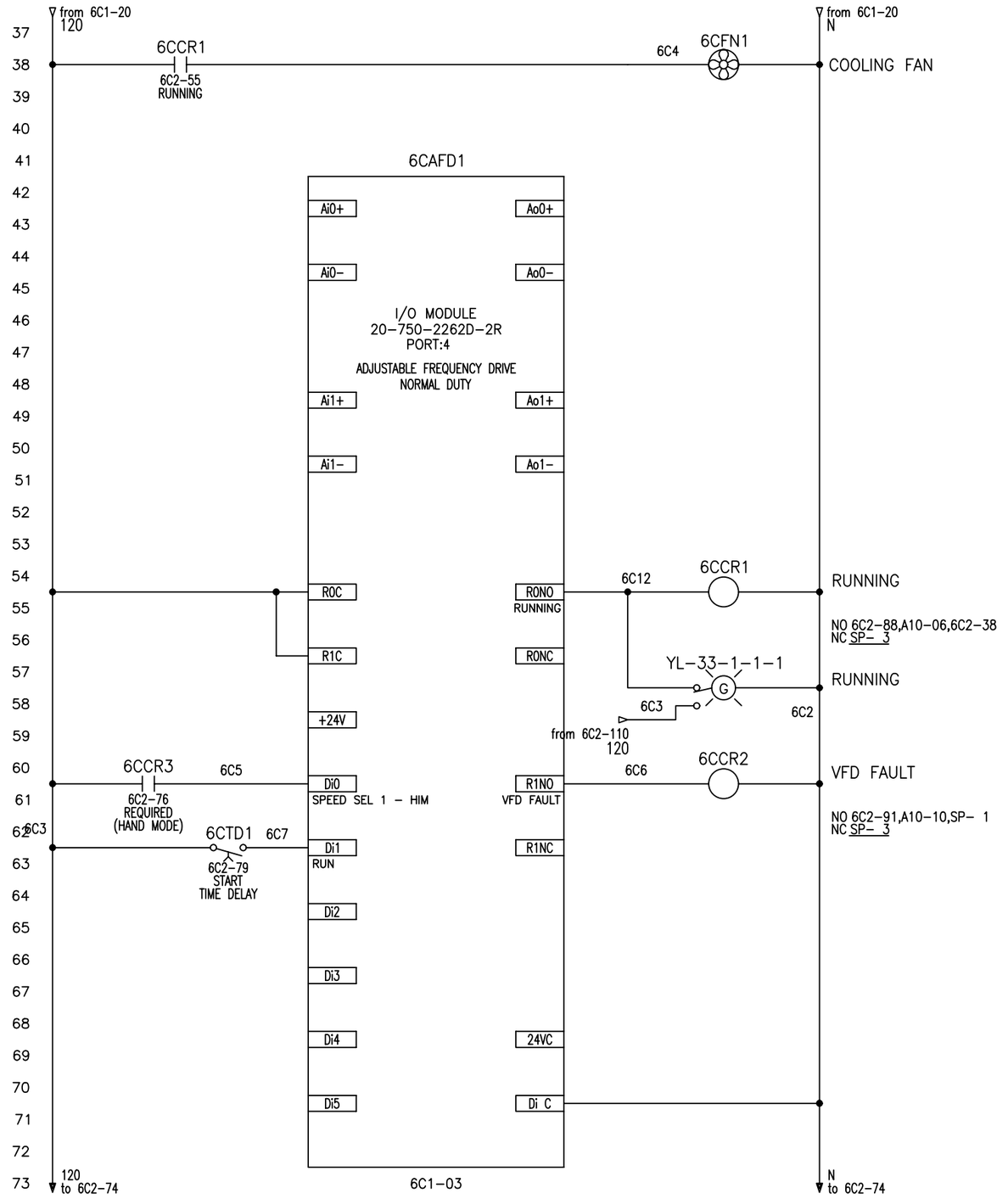
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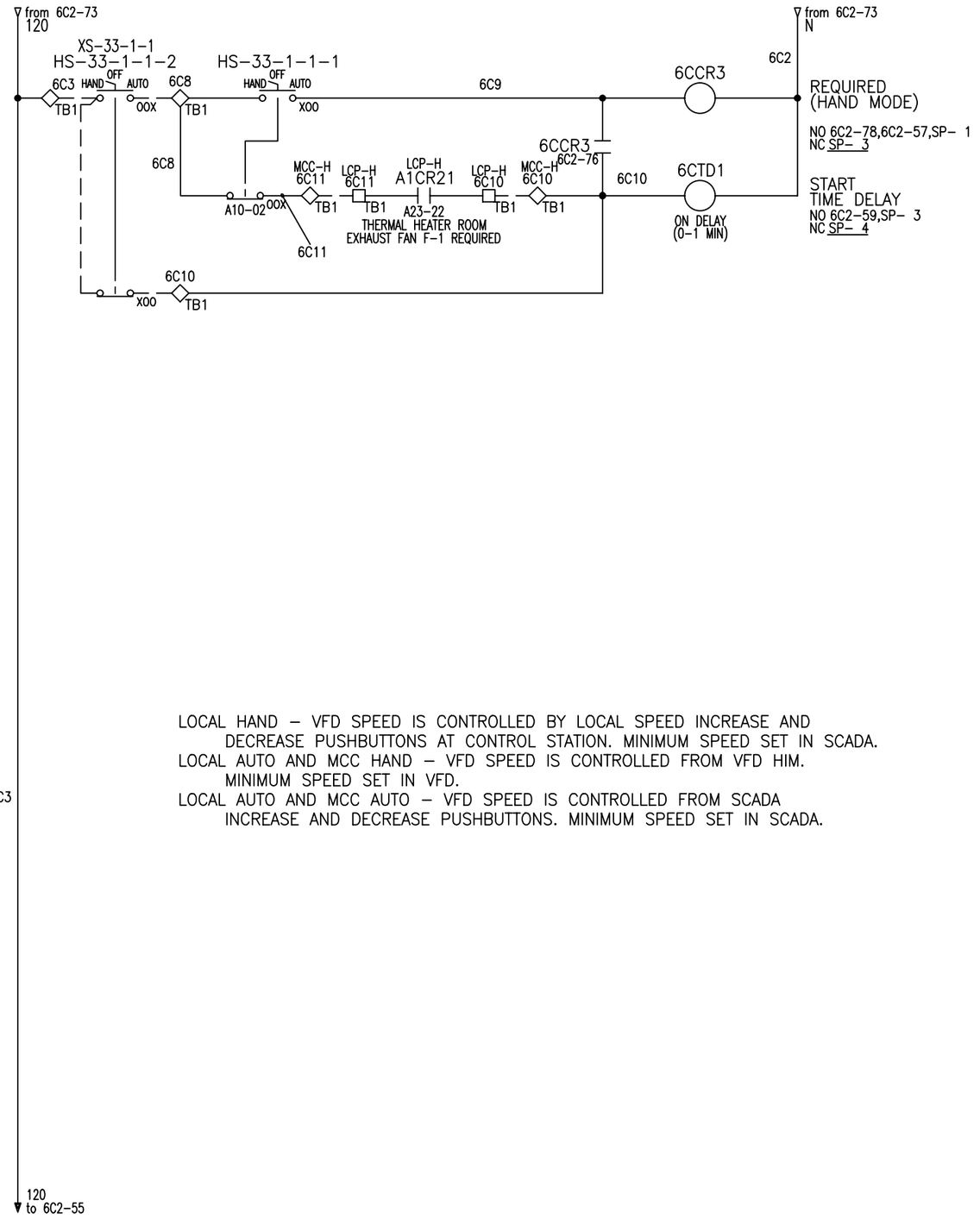
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SECTION 6C
LOCATION LCP-BEACON
TYPE 101
PAGE 6C1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





LOCAL HAND – VFD SPEED IS CONTROLLED BY LOCAL SPEED INCREASE AND DECREASE PUSHBUTTONS AT CONTROL STATION. MINIMUM SPEED SET IN SCADA.
LOCAL AUTO AND MCC HAND – VFD SPEED IS CONTROLLED FROM VFD HIM. MINIMUM SPEED SET IN VFD.
LOCAL AUTO AND MCC AUTO – VFD SPEED IS CONTROLLED FROM SCADA INCREASE AND DECREASE PUSHBUTTONS. MINIMUM SPEED SET IN SCADA.

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

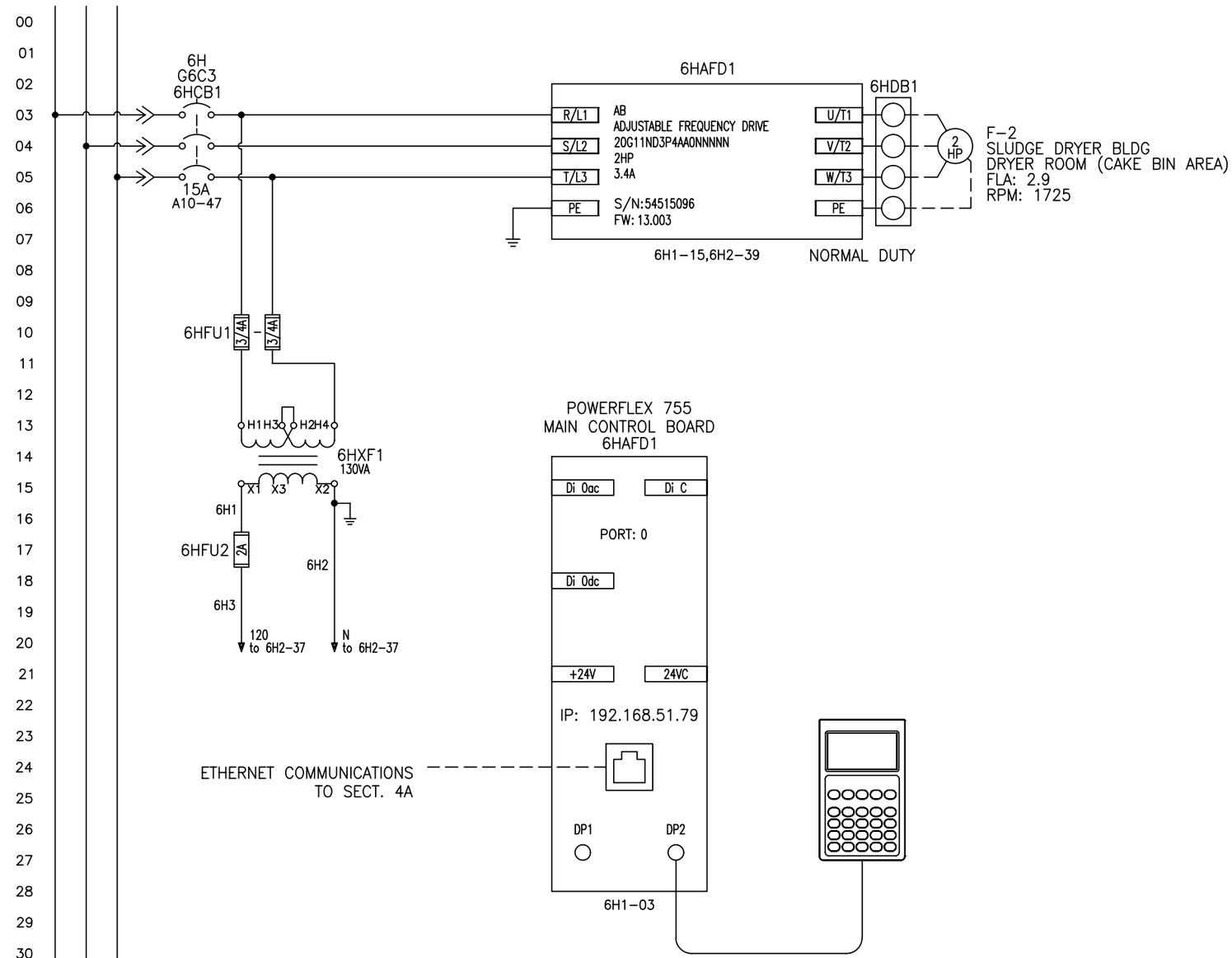
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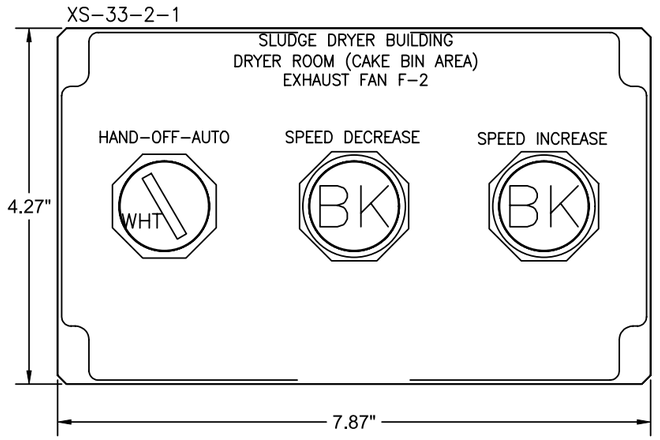
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SECTION 6C
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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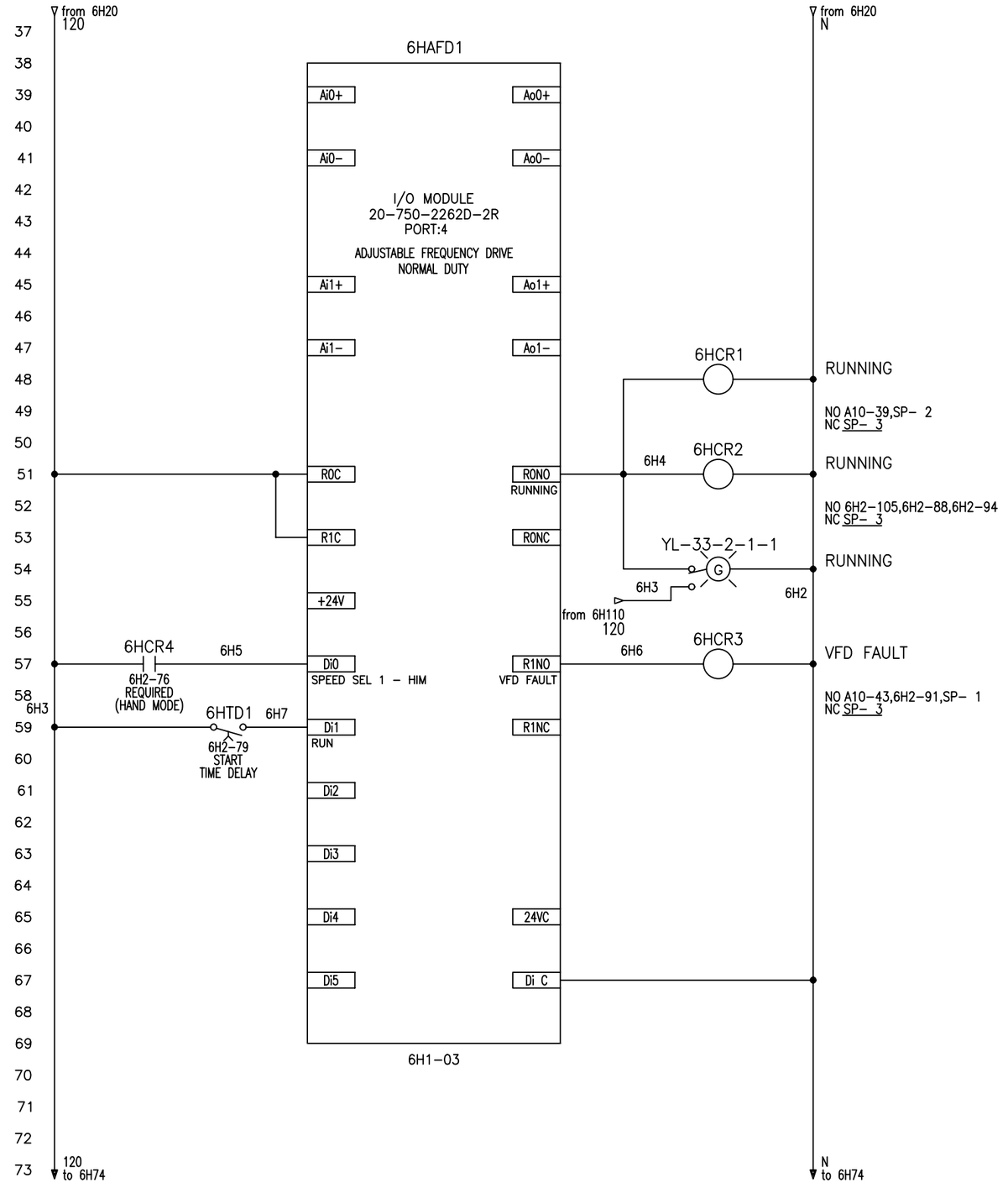
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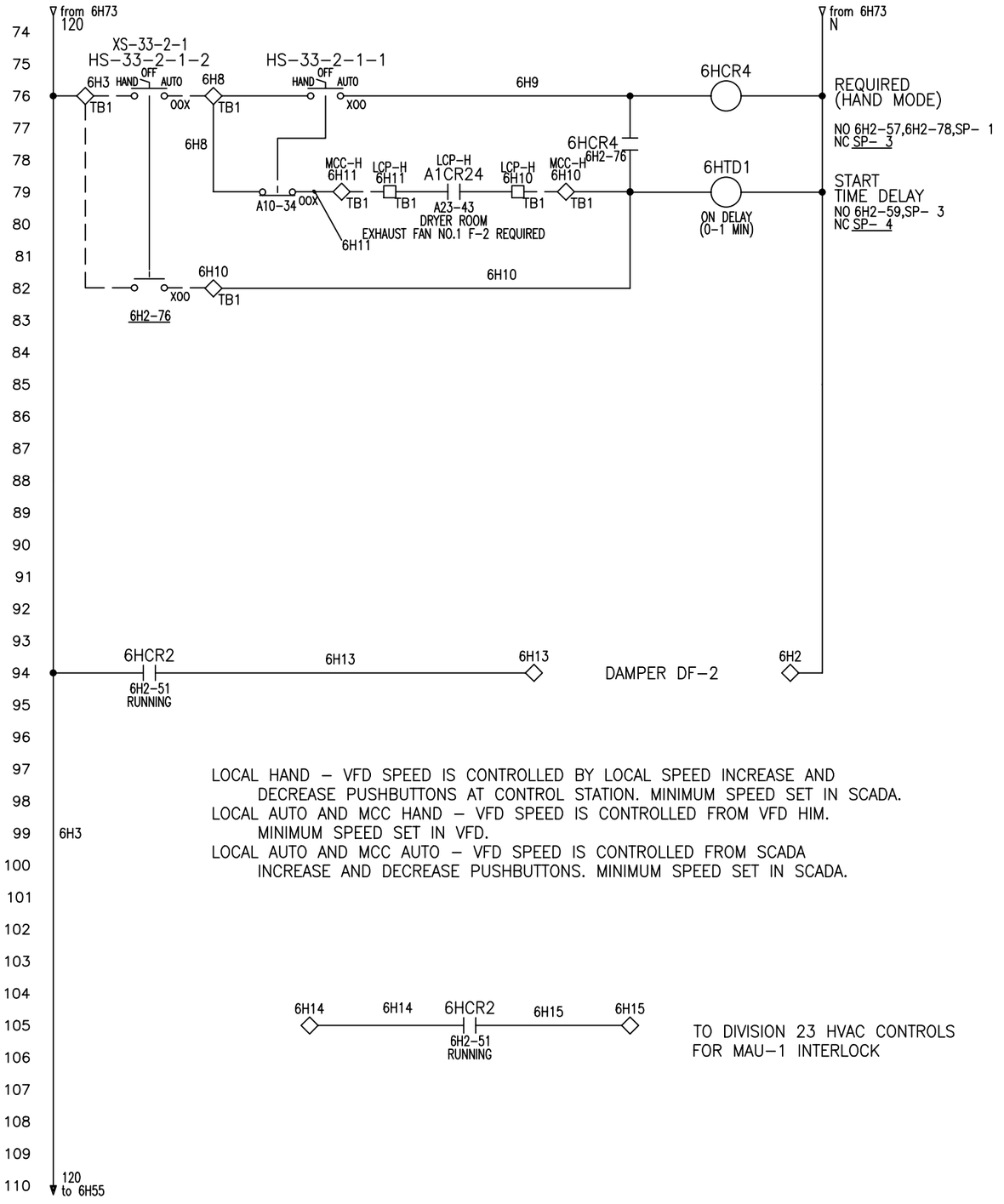
REV	DESCRIPTION	DATE	INIT
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SECTION 6H
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PAGE 6H1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





LOCAL HAND – VFD SPEED IS CONTROLLED BY LOCAL SPEED INCREASE AND DECREASE PUSHBUTTONS AT CONTROL STATION. MINIMUM SPEED SET IN SCADA.
LOCAL AUTO AND MCC HAND – VFD SPEED IS CONTROLLED FROM VFD HIM. MINIMUM SPEED SET IN VFD.
LOCAL AUTO AND MCC AUTO – VFD SPEED IS CONTROLLED FROM SCADA INCREASE AND DECREASE PUSHBUTTONS. MINIMUM SPEED SET IN SCADA.

TO DIVISION 23 HVAC CONTROLS FOR MAU-1 INTERLOCK

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

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7C
G6C3
7CCB1

15A
A11–14

7CAFD1

R/L1
S/L2
T/L3
PE

AB
ADJUSTABLE FREQUENCY DRIVE
20G11ND3P4AA0NNNNN
2HP
3.4A

S/N:55551194
FW: 13.003

7C1–15,7C2–39

7CDB1

U/T1
V/T2
W/T3
PE

2 HP

F–3
SLUDGE DRYER BLDG
DRYER ROOM (DRYER AREA) EF
FLA:

NORMAL DUTY

7CFU1
3/4A
3/4A

H1 H3 H2 H4
7CXF1
130VA
X1 X3 X2

7C1
7CFU2
2A
7C2
7C3

120
to 7C2–37

N
to 7C2–37

POWERFLEX 755
MAIN CONTROL BOARD
7CAFD1

Di 0ac
Di C
PORT: 0
Di 0dc
+24V
24VC

IP: 192.168.51.80

ETHERNET COMMUNICATIONS
TO SECT. 10A

DP1
DP2

7C1–03

XS–33–2–2

SLUDGE DRYER BUILDING
DRYER ROOM (DRYER AREA)
EXHAUST FAN F–3

HAND–OFF–AUTO
SPEED DECREASE
SPEED INCREASE

WHT
BK
BK

4.27"
7.87"

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WWTF SLUDGE DRYER
BUILDING H
MCC–H

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DRN	K.ATWOOD	DATE 01/18/16
APP	K.ATWOOD	DATE 01/18/16

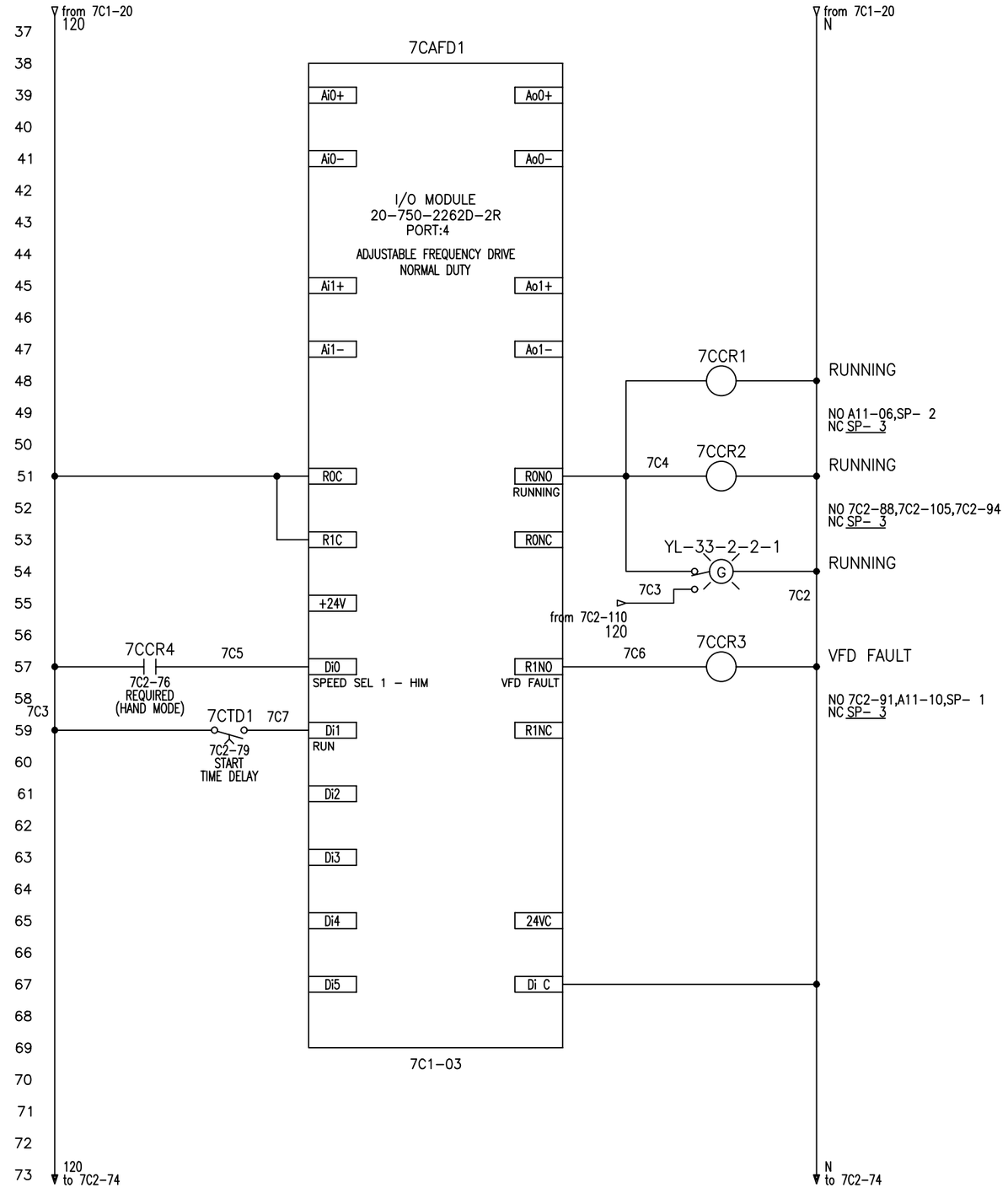
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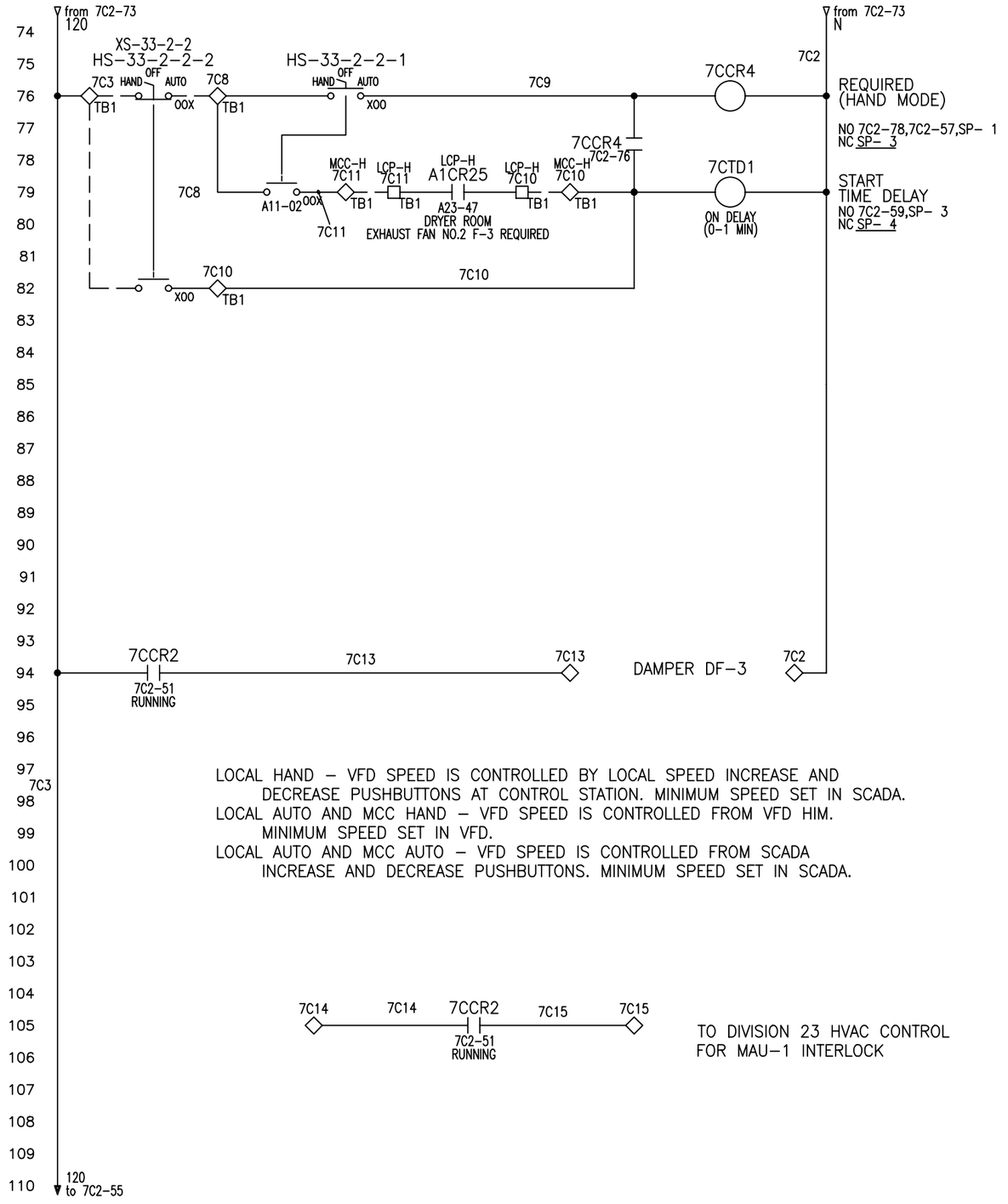
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SECTION 7C
LOCATION LCP–BEACON
TYPE 101
PAGE 7C1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222–8622 www.altronex.com

DRAWING D16007–C
PROJECT WISCONSIN DELLS, WI





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WWTF SLUDGE DRYER
BUILDING H
MCC-H

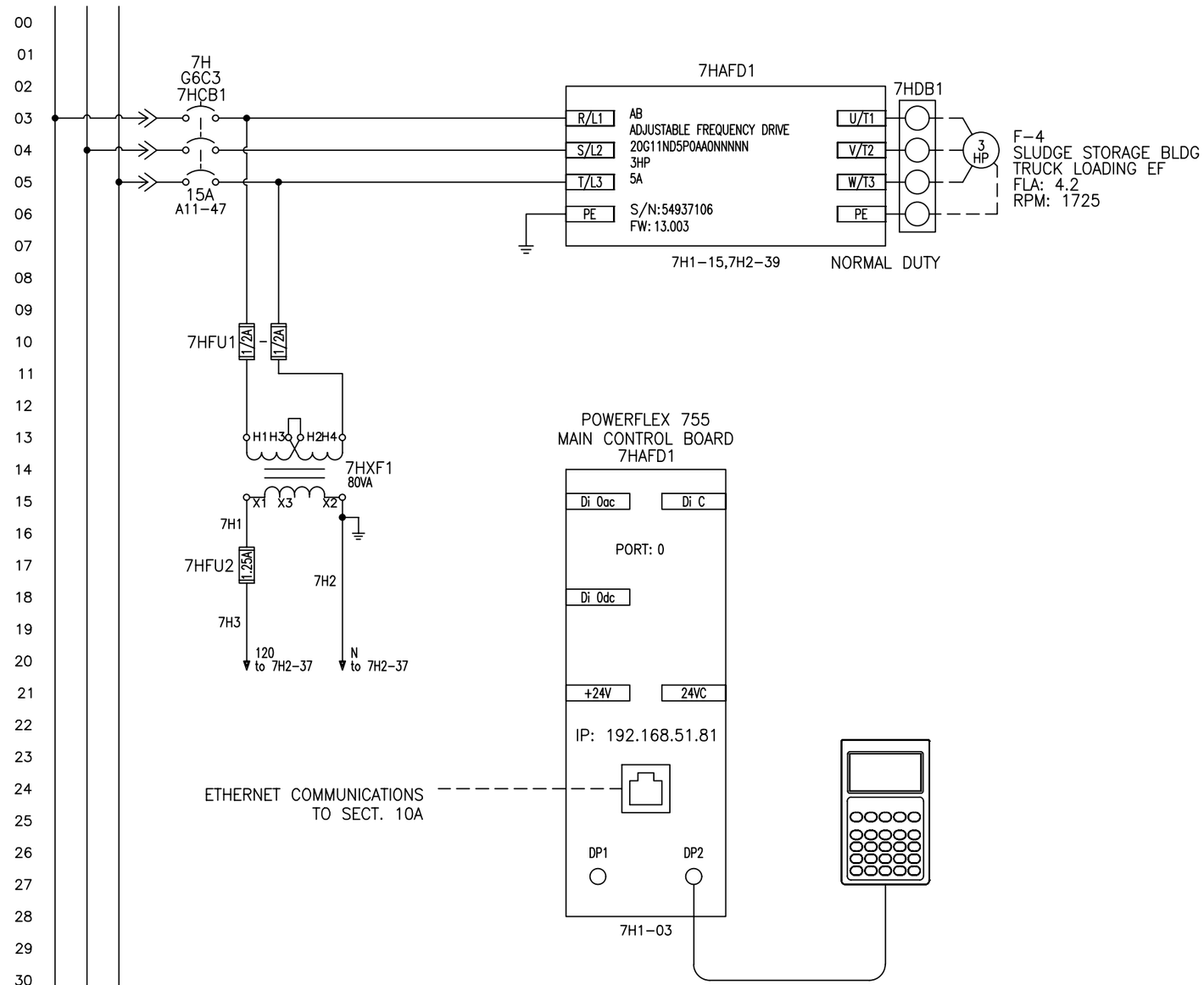
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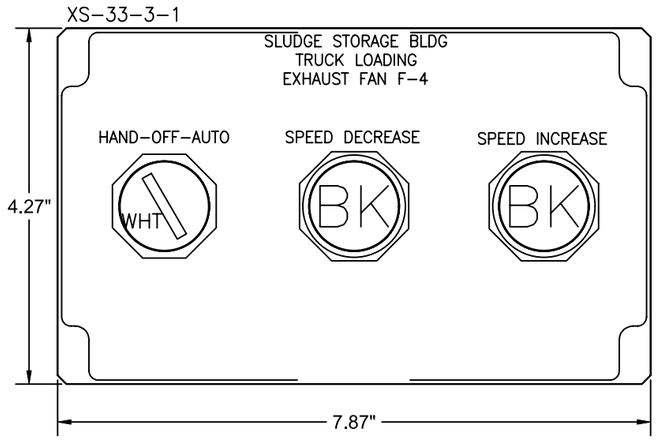
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SECTION 7C
LOCATION LCP-BEACON
TYPE 101
PAGE 7C2 OF 116

ALTRONEX CONTROL SYSTEMS
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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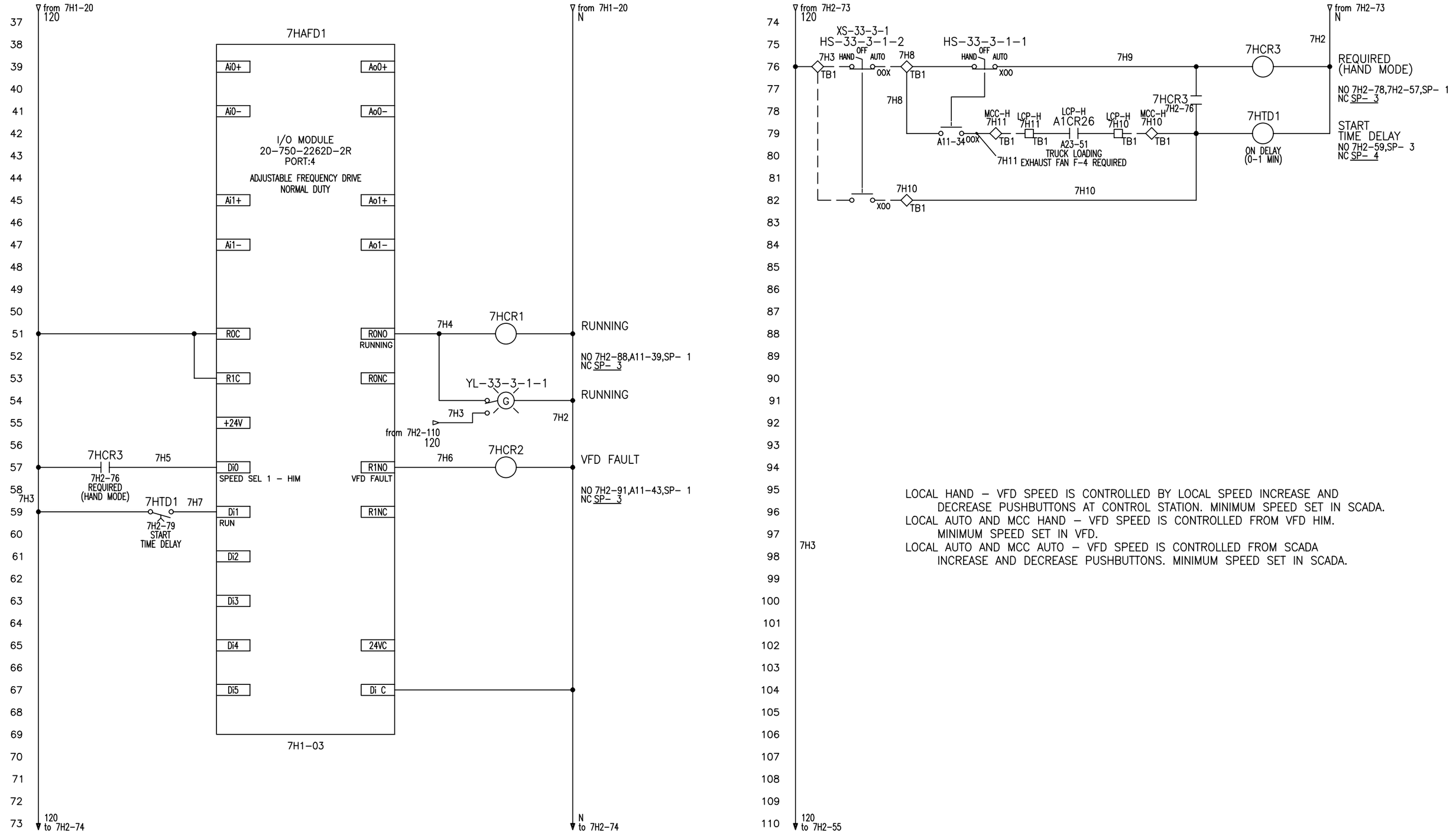
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SECTION 7H
LOCATION LCP-BEACON
TYPE 101
PAGE 7H1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



LOCAL HAND – VFD SPEED IS CONTROLLED BY LOCAL SPEED INCREASE AND DECREASE PUSHBUTTONS AT CONTROL STATION. MINIMUM SPEED SET IN SCADA.
LOCAL AUTO AND MCC HAND – VFD SPEED IS CONTROLLED FROM VFD HIM. MINIMUM SPEED SET IN VFD.
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

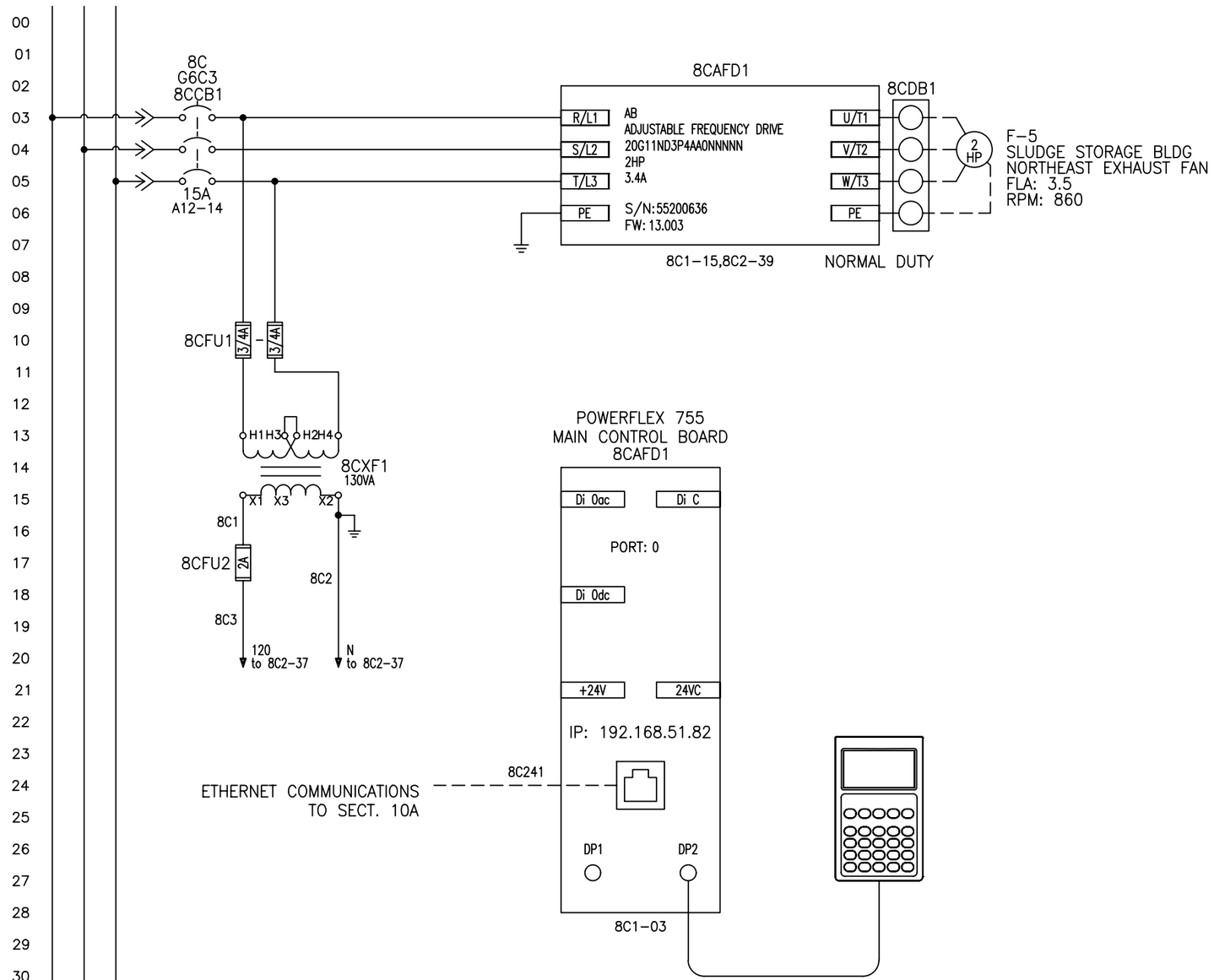
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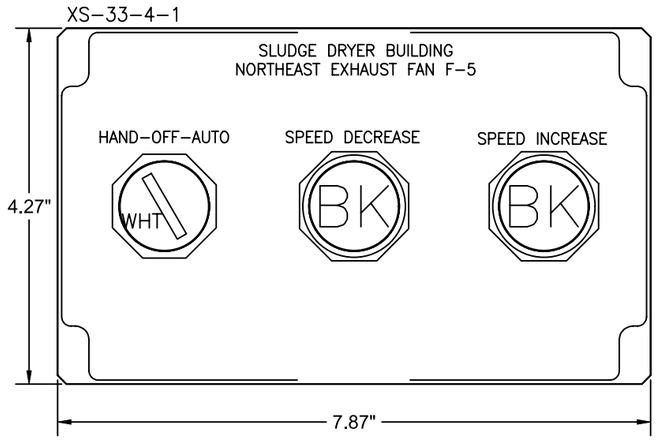
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SECTION 7H
LOCATION LCP-BEACON
TYPE 101
PAGE 7H2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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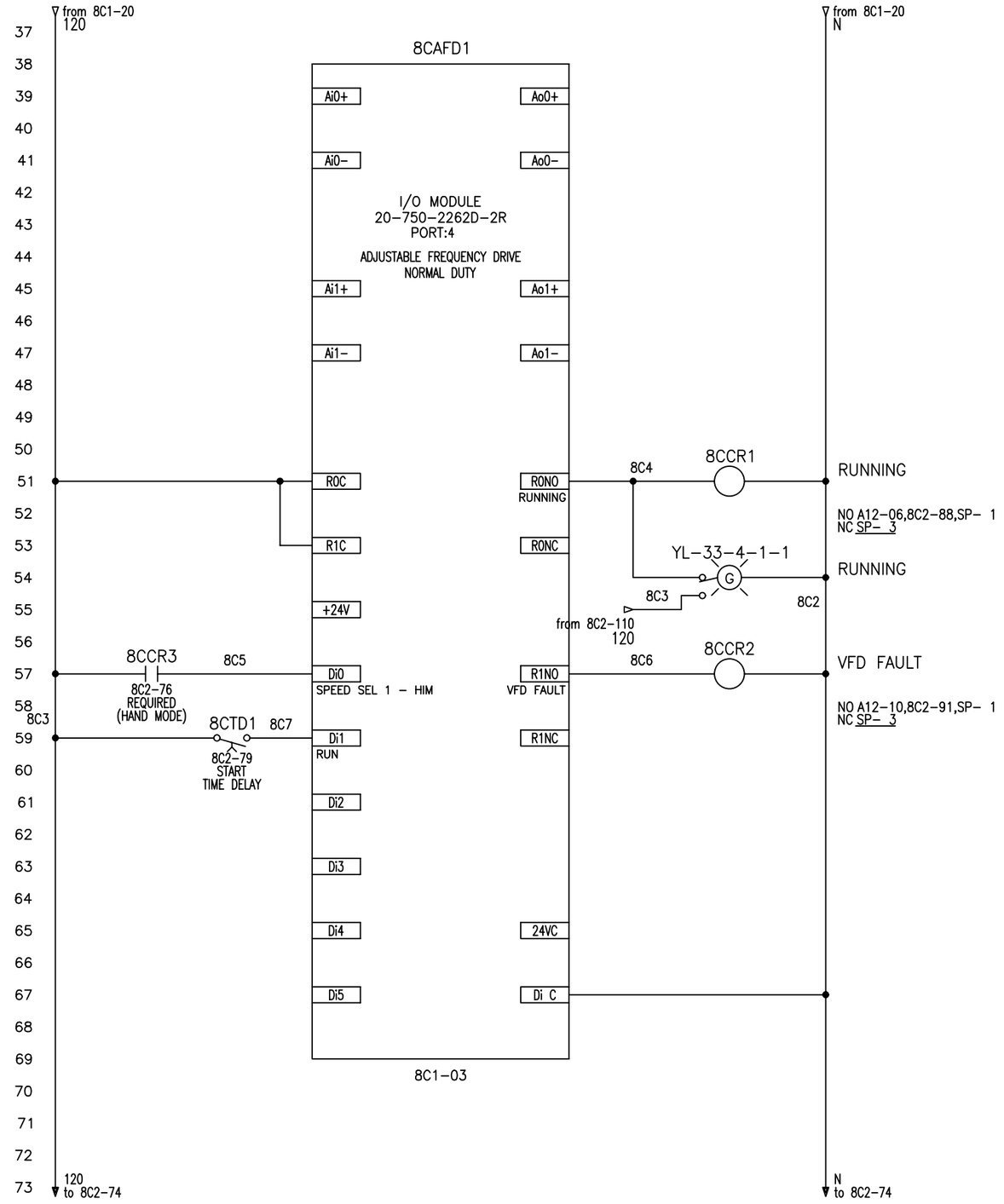
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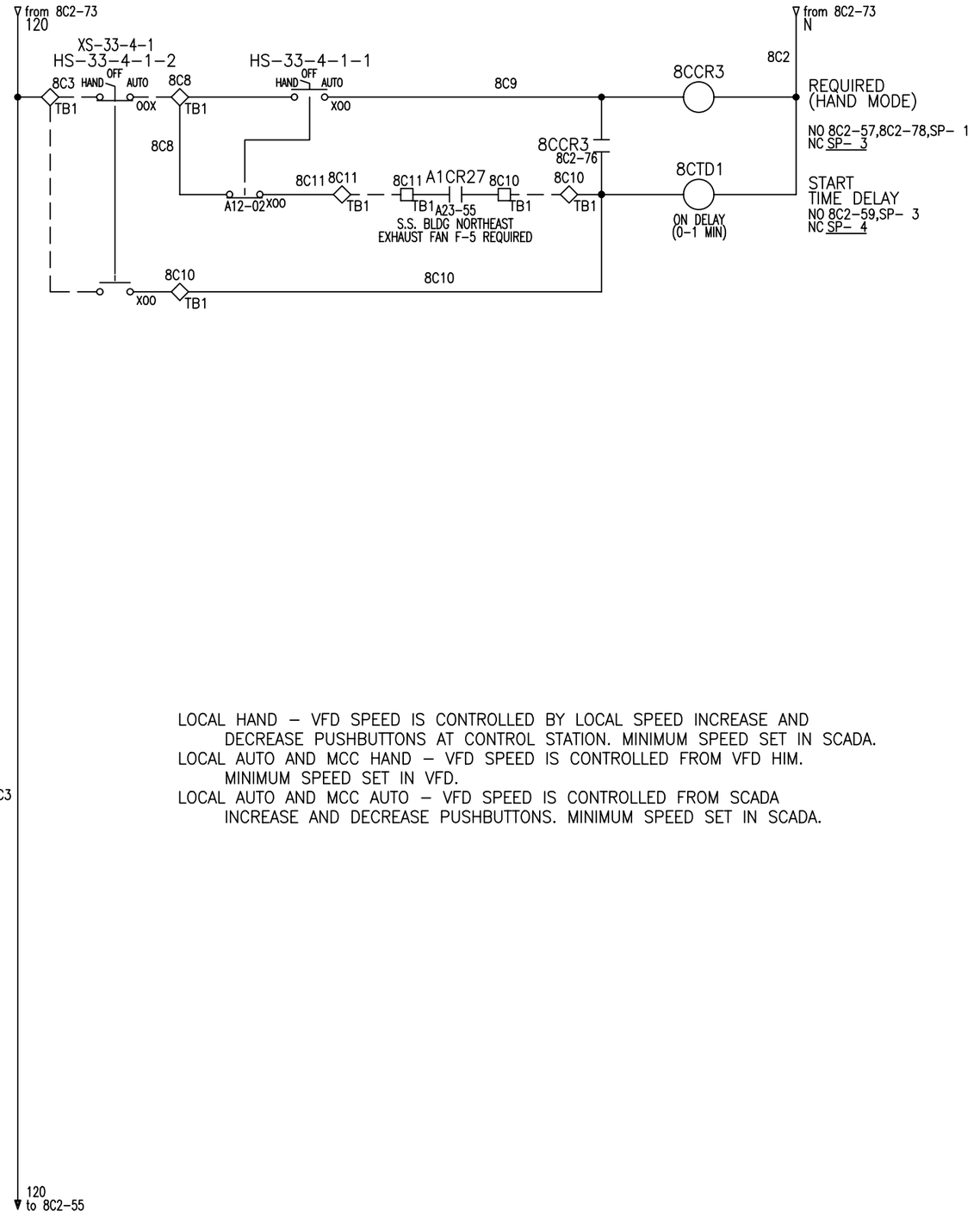
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SECTION 8C
LOCATION LCP-BEACON
TYPE 101
PAGE 8C1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





LOCAL HAND – VFD SPEED IS CONTROLLED BY LOCAL SPEED INCREASE AND DECREASE PUSHBUTTONS AT CONTROL STATION. MINIMUM SPEED SET IN SCADA.
LOCAL AUTO AND MCC HAND – VFD SPEED IS CONTROLLED FROM VFD HIM. MINIMUM SPEED SET IN VFD.
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

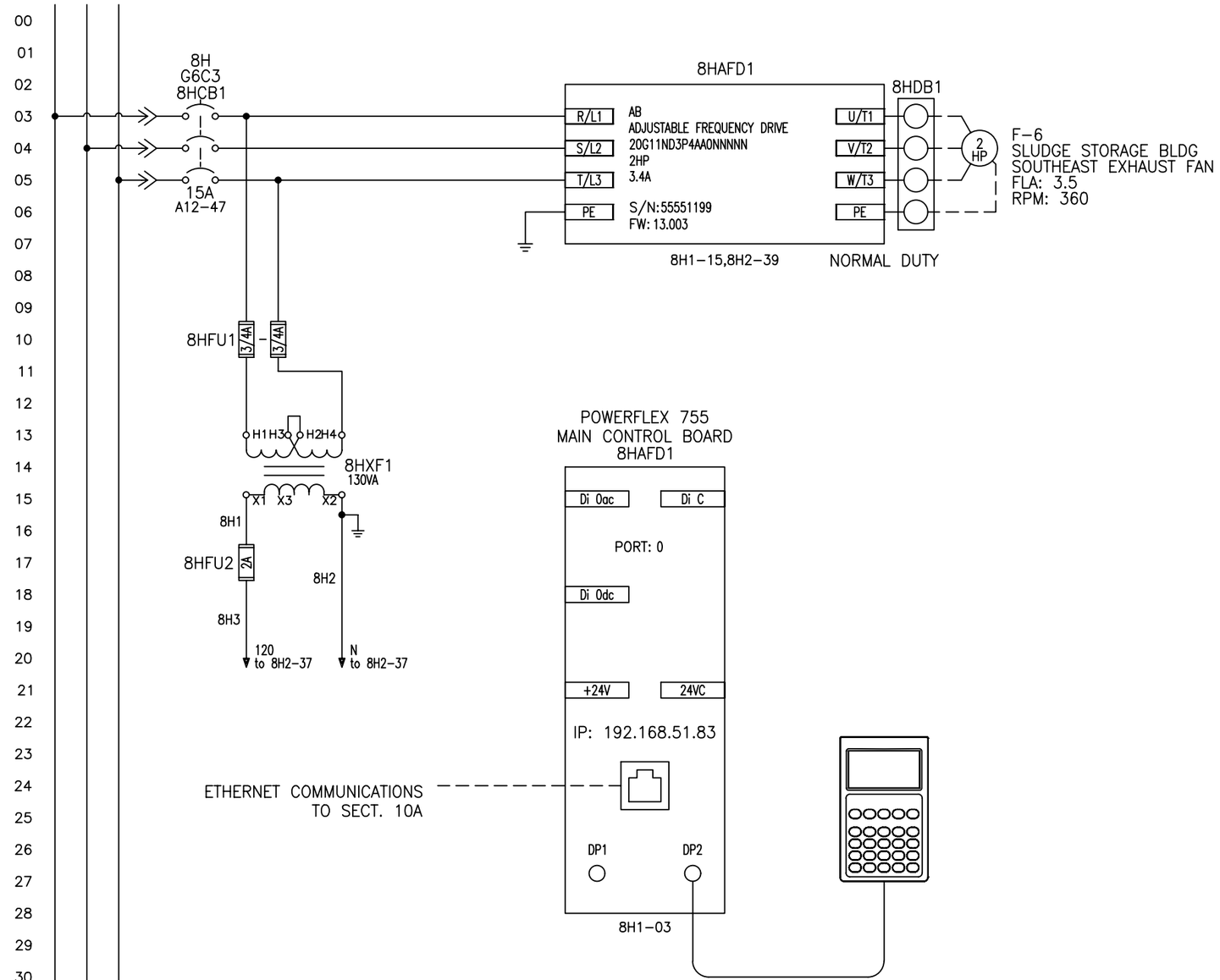
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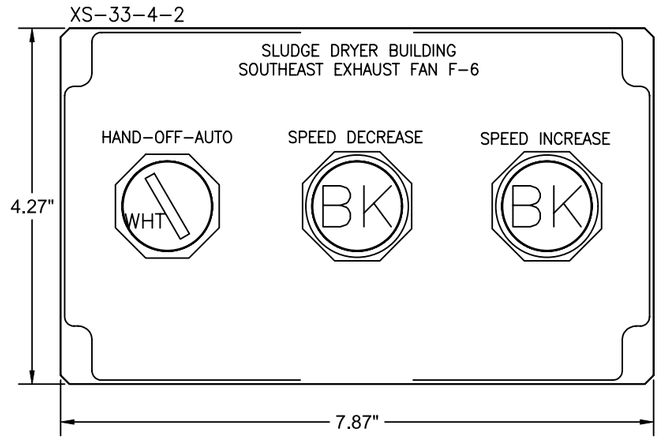
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SECTION 8C
LOCATION LCP-BEACON
TYPE 101
PAGE 8C2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





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WWTF SLUDGE DRYER BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
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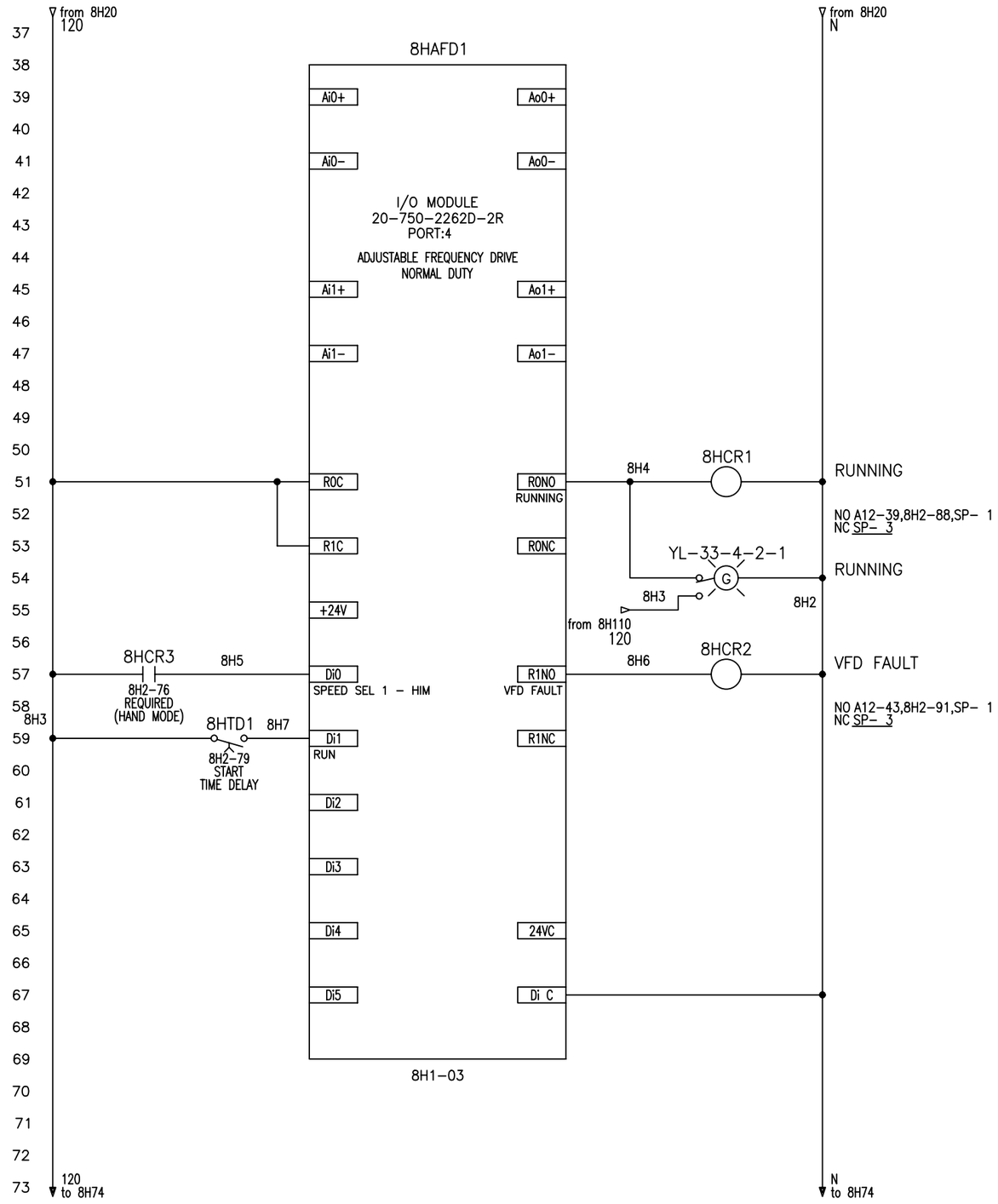
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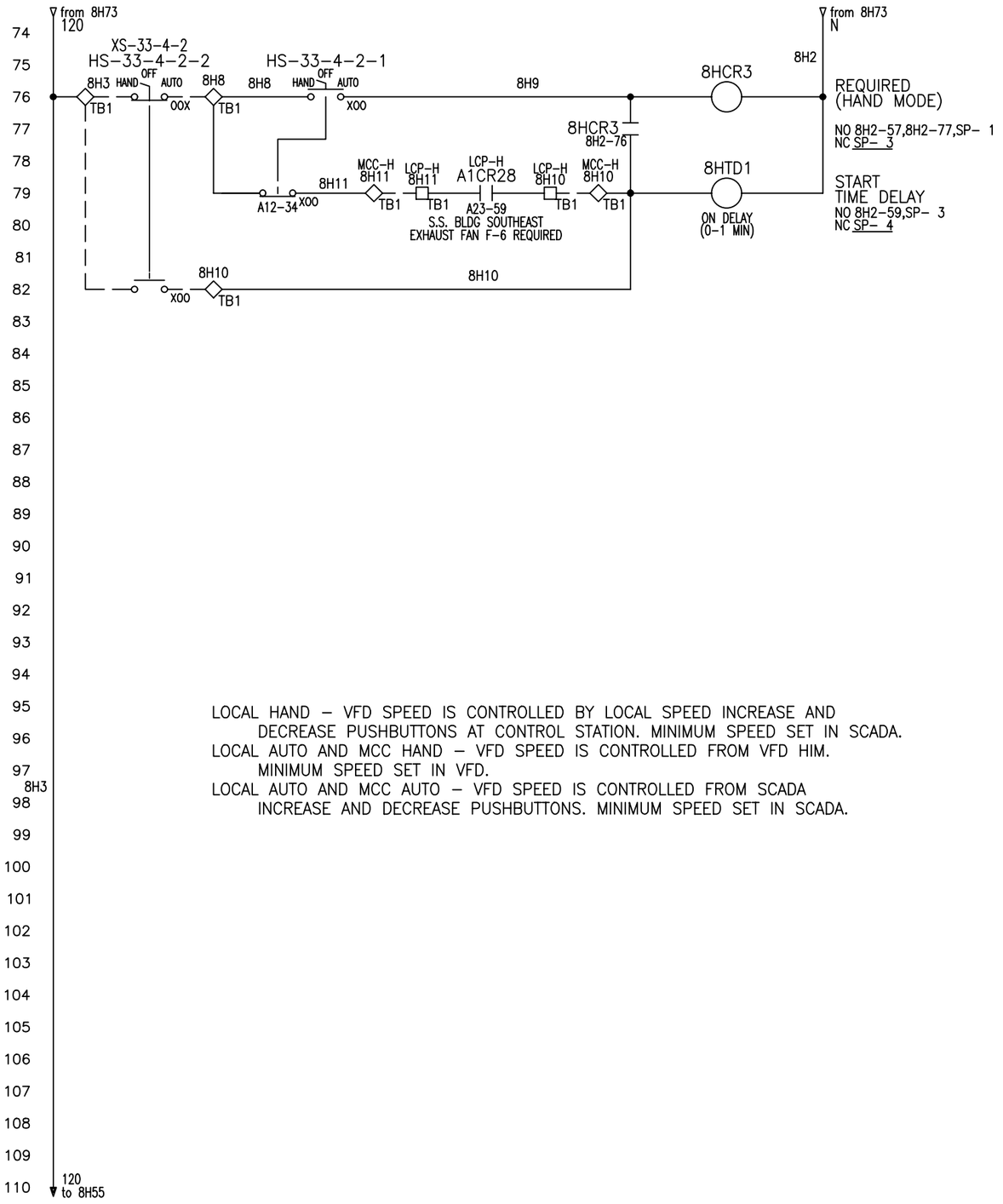
REV	DESCRIPTION	DATE	INIT
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SECTION 8H
LOCATION LCP-BEACON
TYPE 101
PAGE 8H1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





LOCAL HAND – VFD SPEED IS CONTROLLED BY LOCAL SPEED INCREASE AND DECREASE PUSHBUTTONS AT CONTROL STATION. MINIMUM SPEED SET IN SCADA.
LOCAL AUTO AND MCC HAND – VFD SPEED IS CONTROLLED FROM VFD HIM. MINIMUM SPEED SET IN VFD.
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WWTF SLUDGE DRYER
BUILDING H
MCC-H

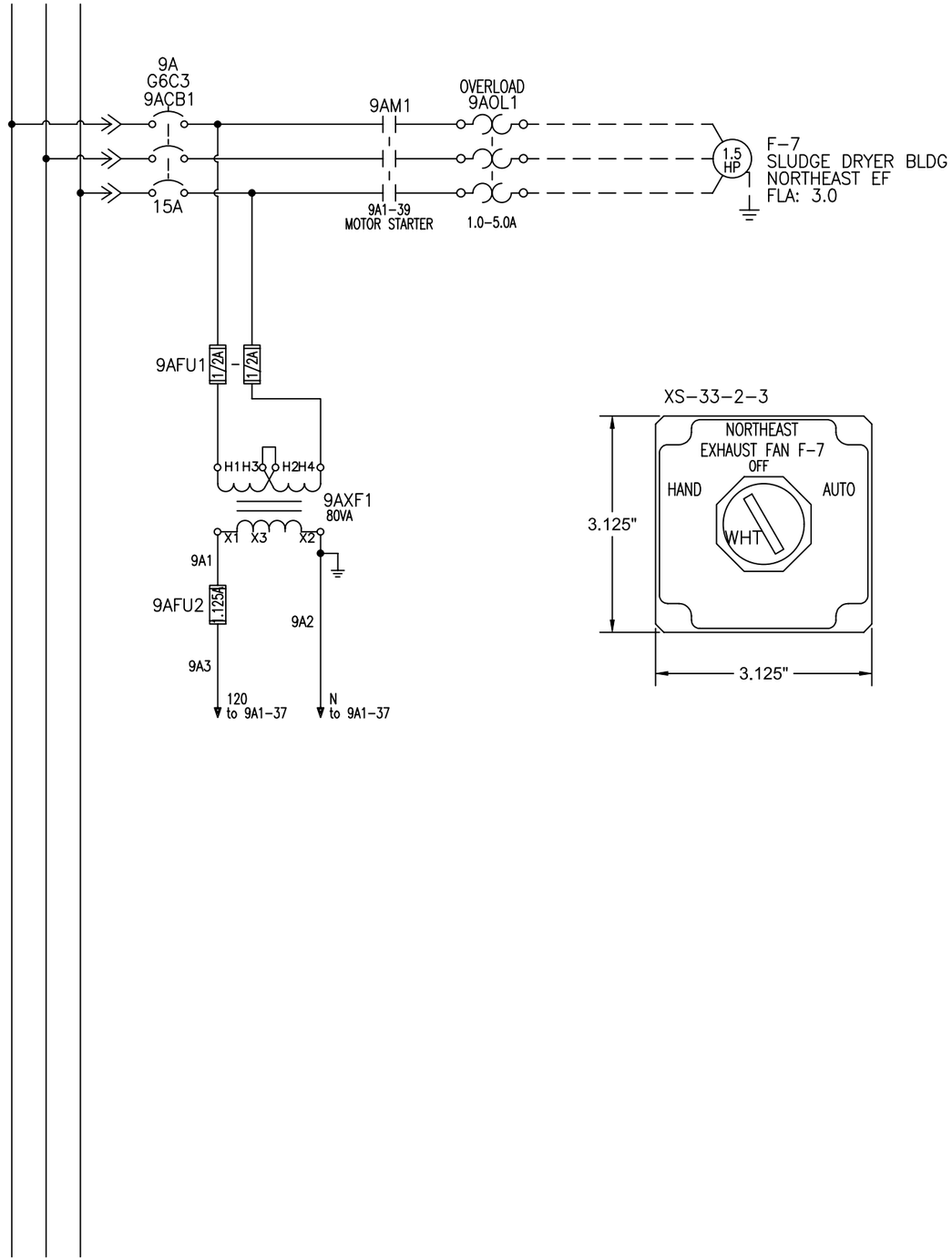
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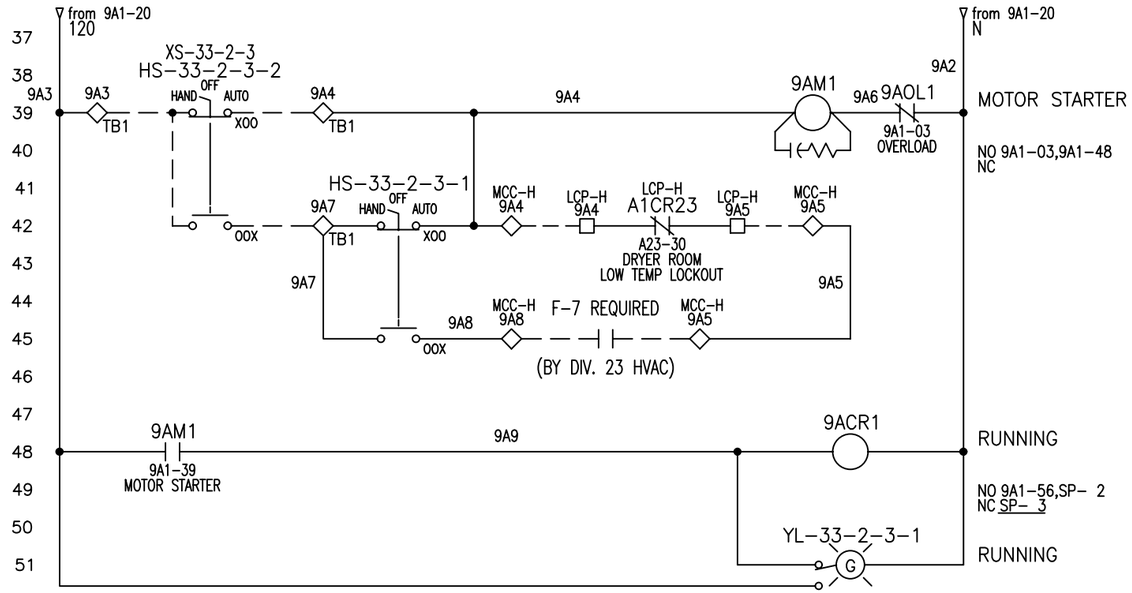
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SECTION 8H
LOCATION LCP-BEACON
TYPE 101
PAGE 8H2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI







TO DIVISION 23 HVAC CONTROLS
FOR DL-4 AND DF-7 INTERLOCKS

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
MCC-H

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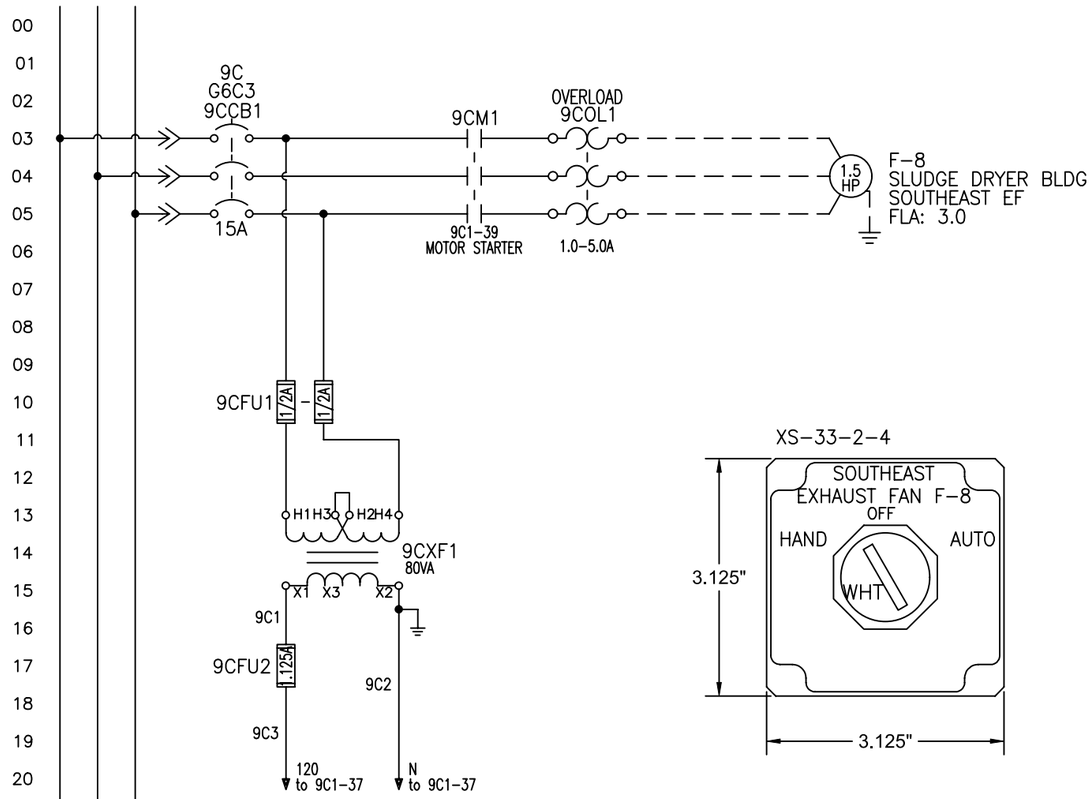
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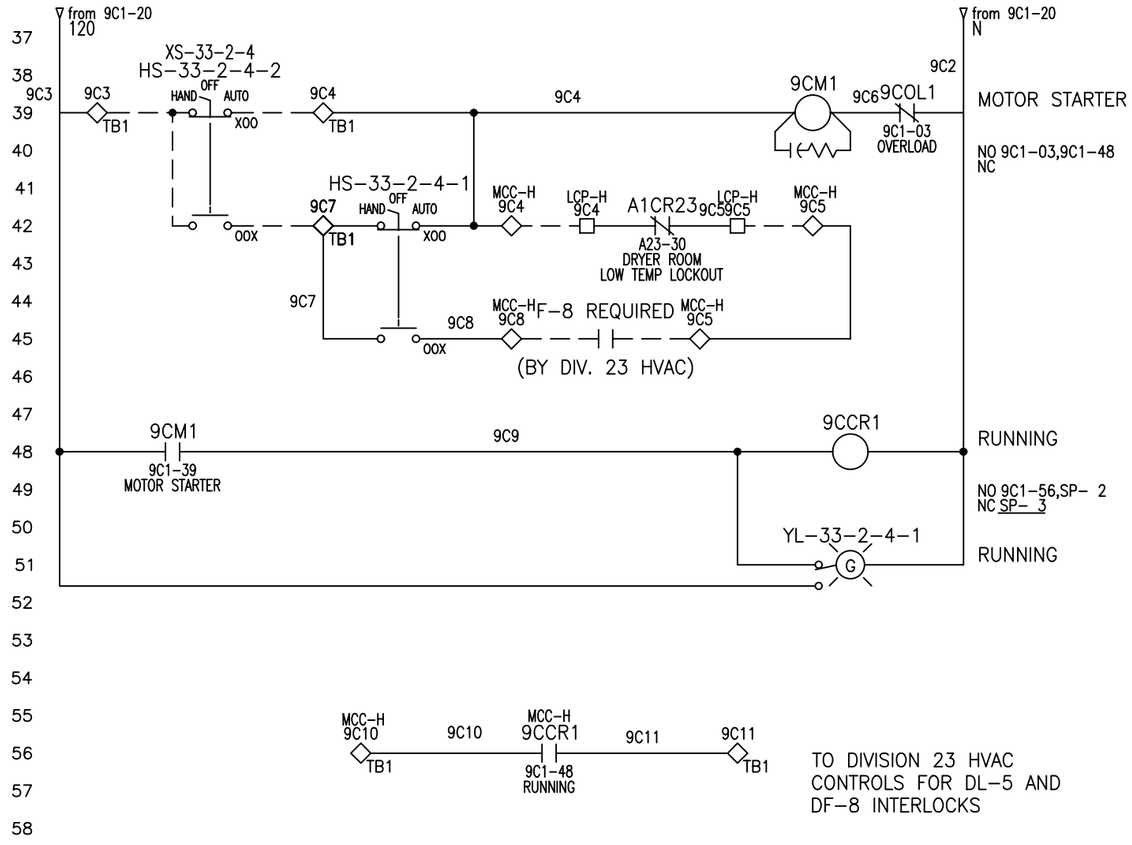
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SECTION 9A
LOCATION LCP-BEACON
TYPE 101
PAGE 9A1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





TO DIVISION 23 HVAC
CONTROLS FOR DL-5 AND
DF-8 INTERLOCKS

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
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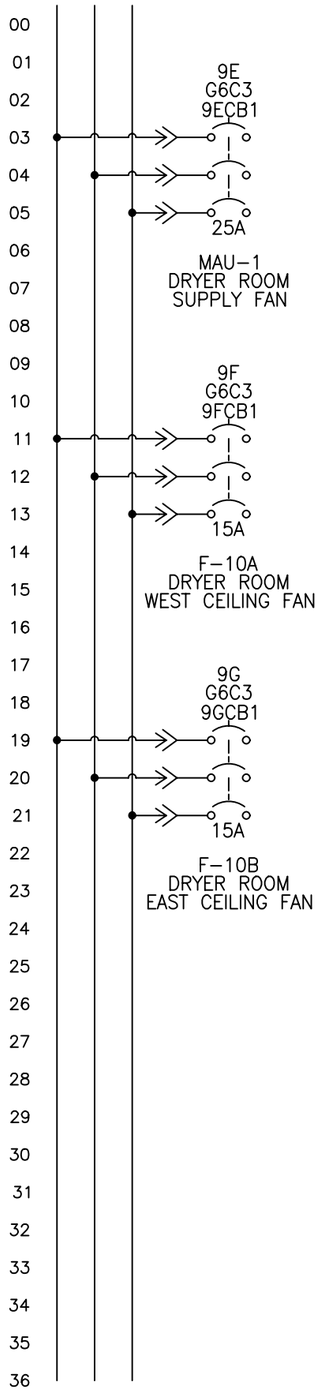
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SECTION 9C
LOCATION LCP-BEACON
TYPE 101
PAGE 9C1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
MCC-H

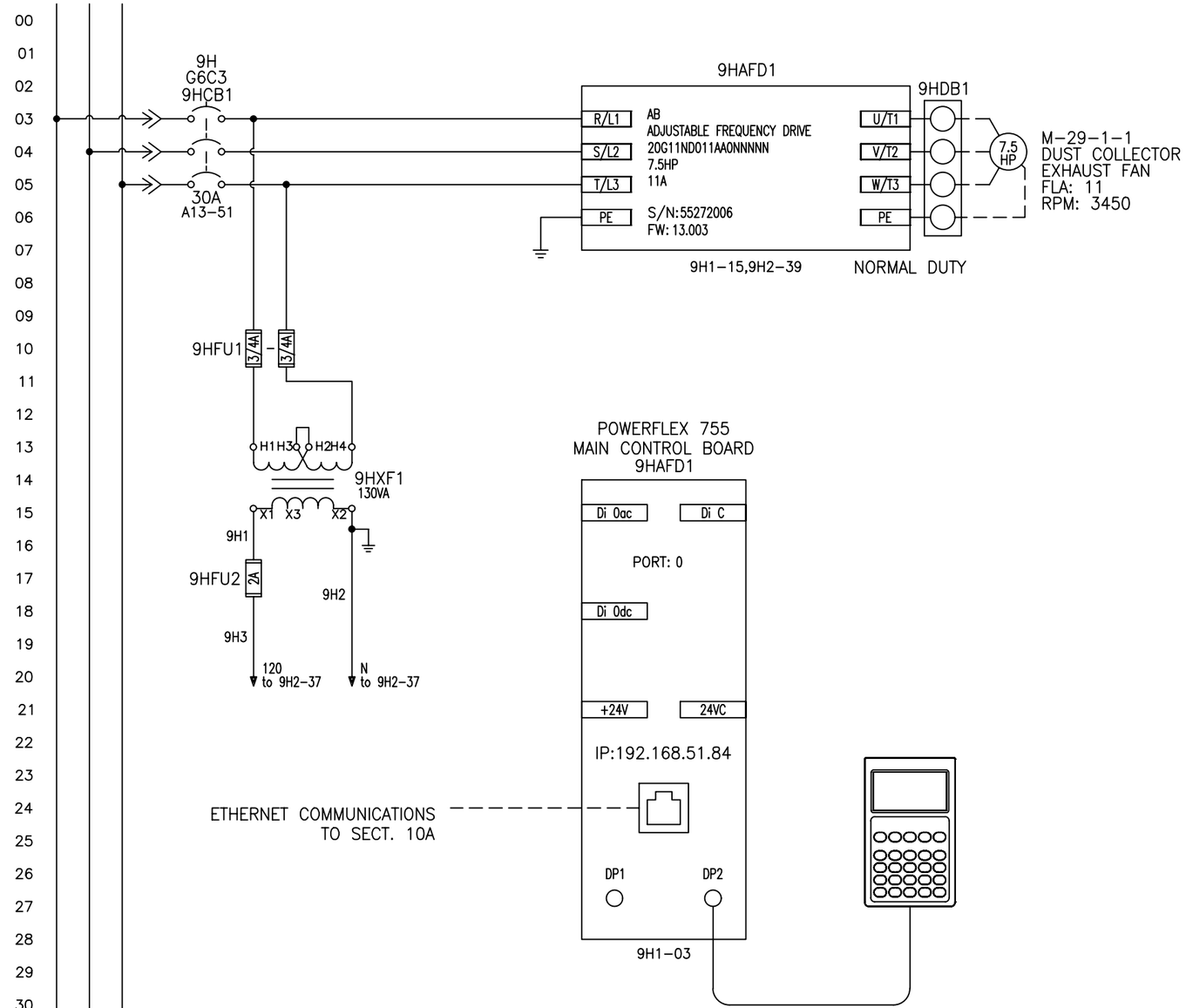
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A	RELEASED	04/17	AO

SECTION 9E
LOCATION LCP-BEACON
TYPE 101
PAGE 9E1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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APP	K.ATWOOD	DATE 01/18/16

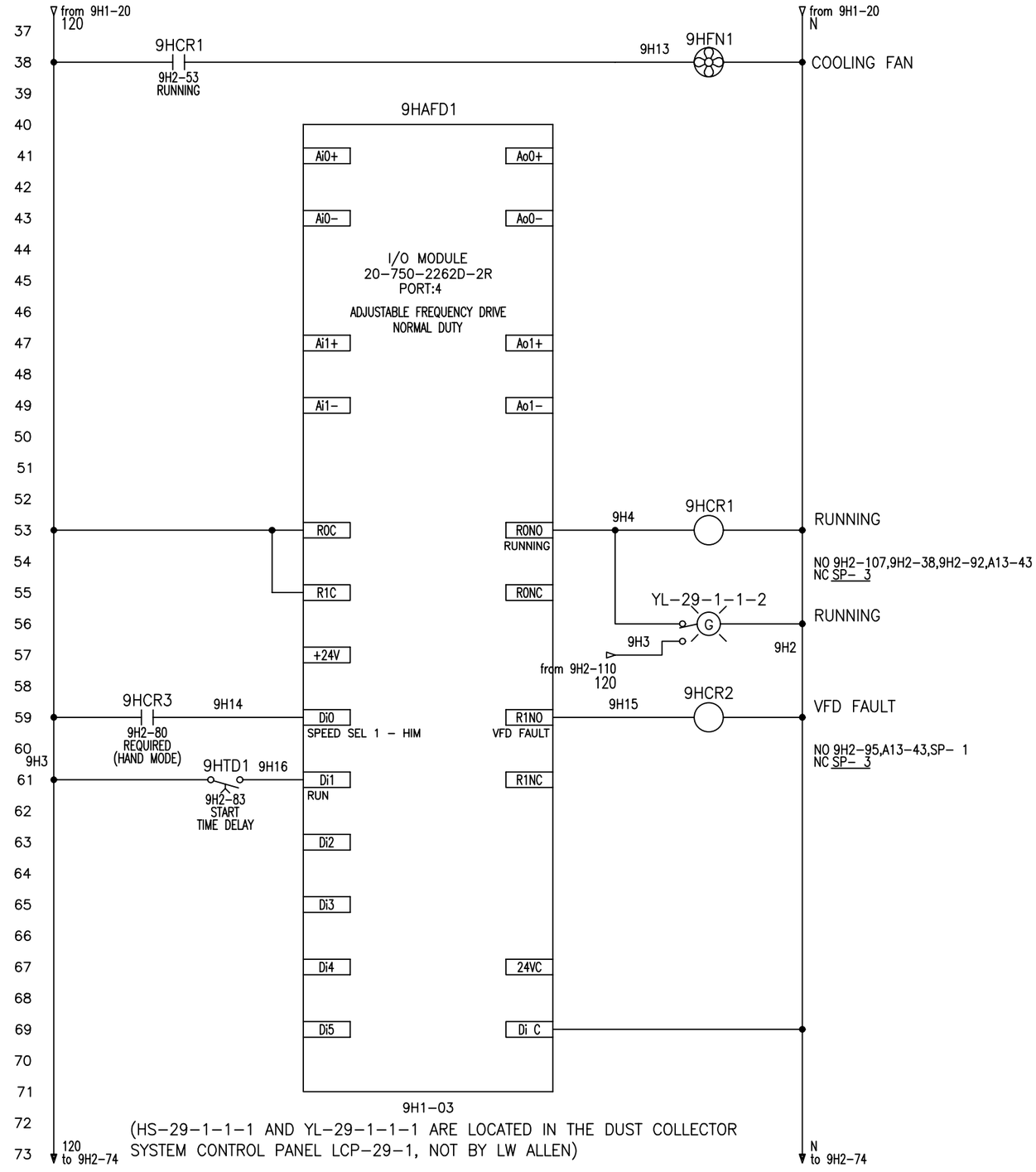
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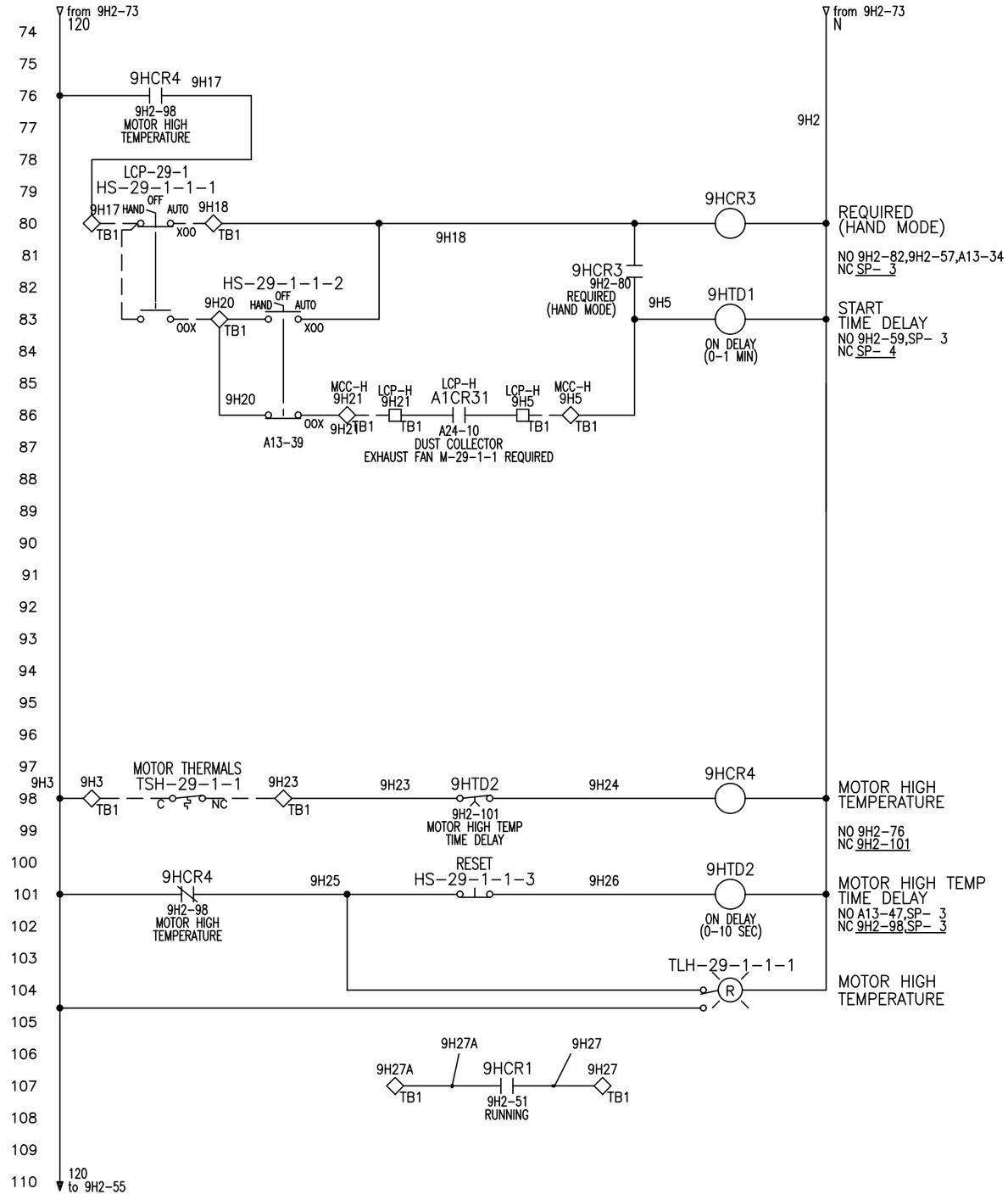
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SECTION 9H
LOCATION LCP-BEACON
TYPE 101
PAGE 9H1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

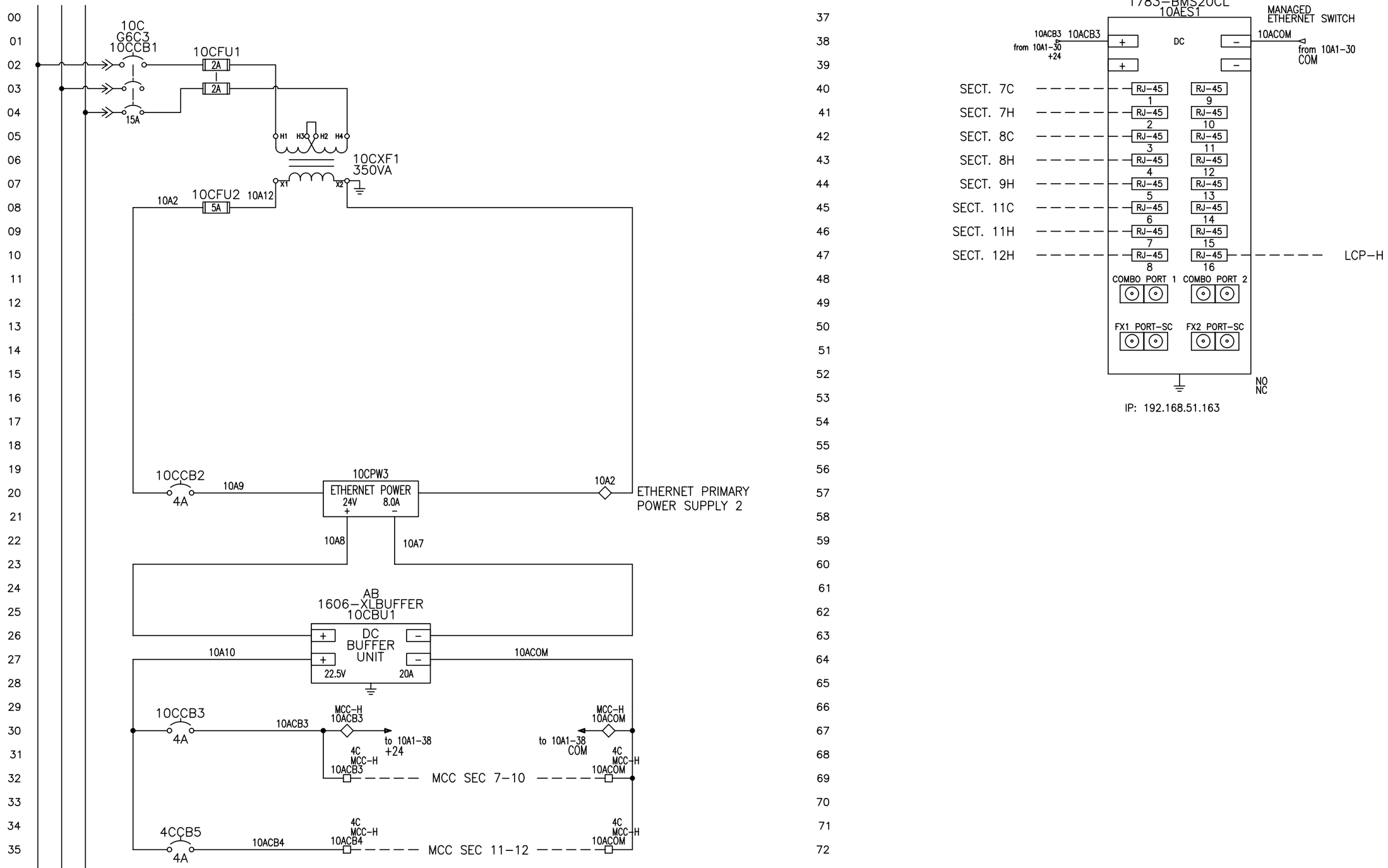
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B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
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SECTION 9H
LOCATION LCP-BEACON
TYPE 101
PAGE 9H2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
MCC−H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
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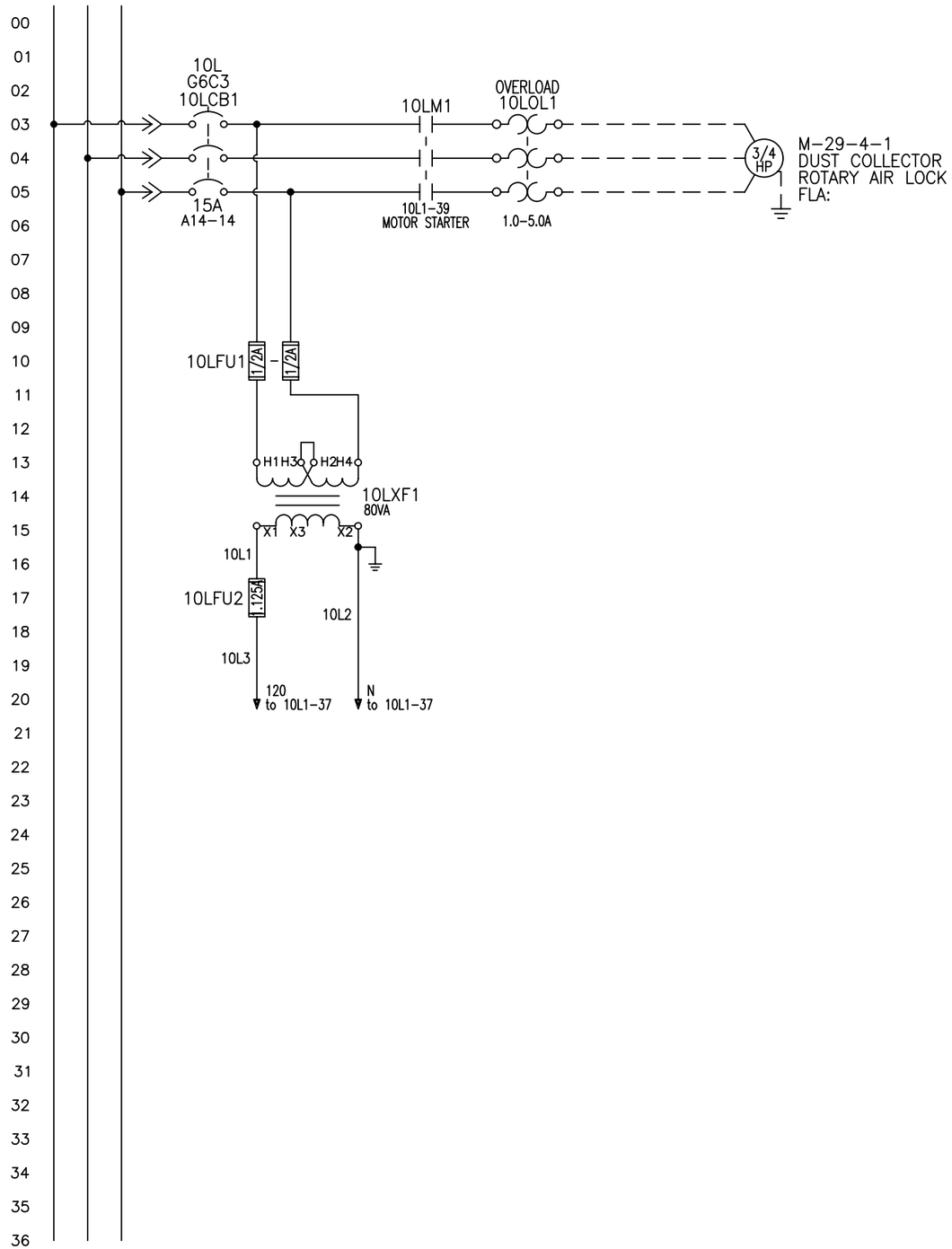
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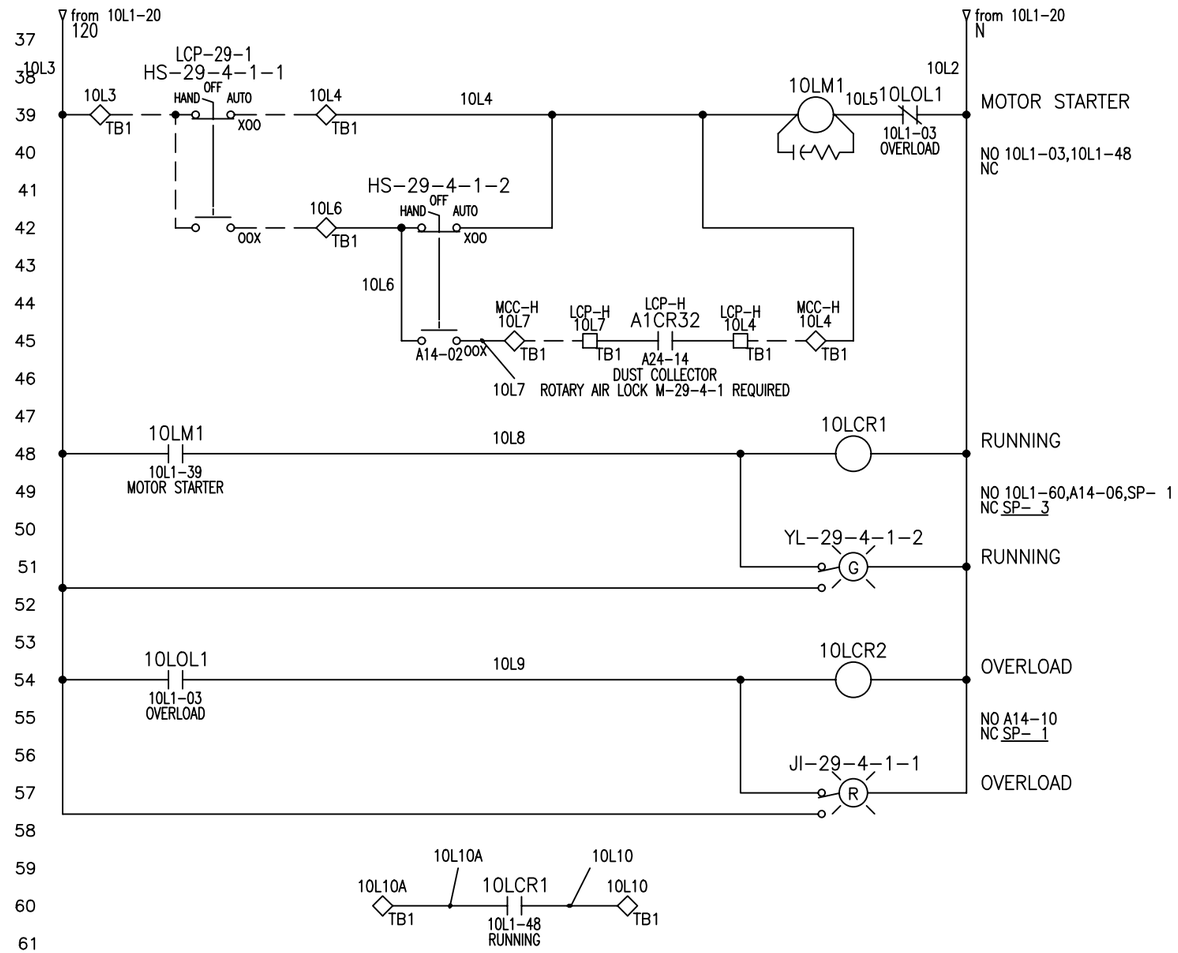
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SECTION 10A
LOCATION LCP−BEACON
TYPE 101
PAGE 10A1 OF 116

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DRAWING D16007−C
PROJECT WISCONSIN DELLS, WI





(HS-29-4-1-1 AND YL-29-4-1-1 ARE LOCATED IN THE DUST COLLECTOR SYSTEM CONTROL PANEL LCP-29-1, NOT BY LW ALLEN)

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

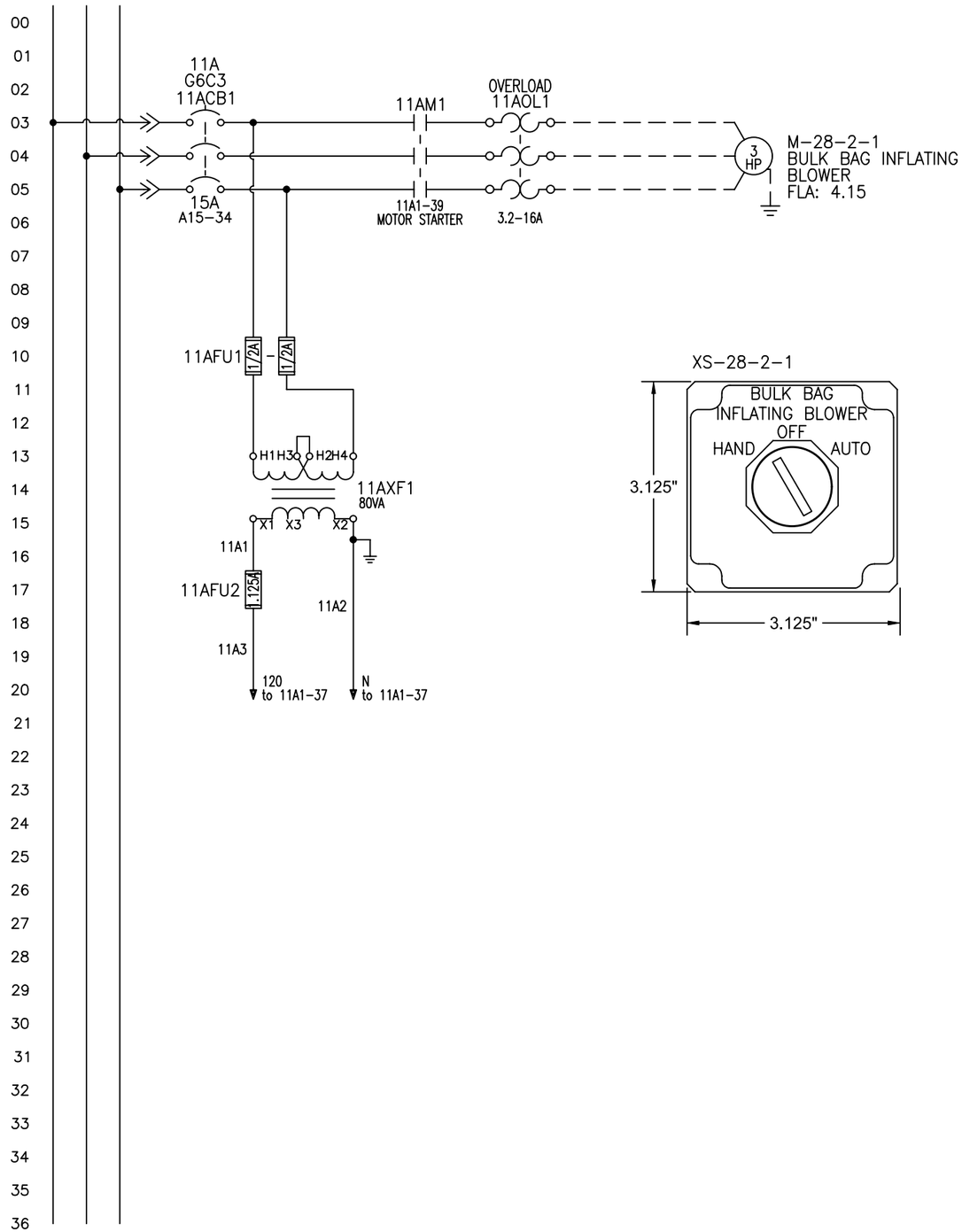
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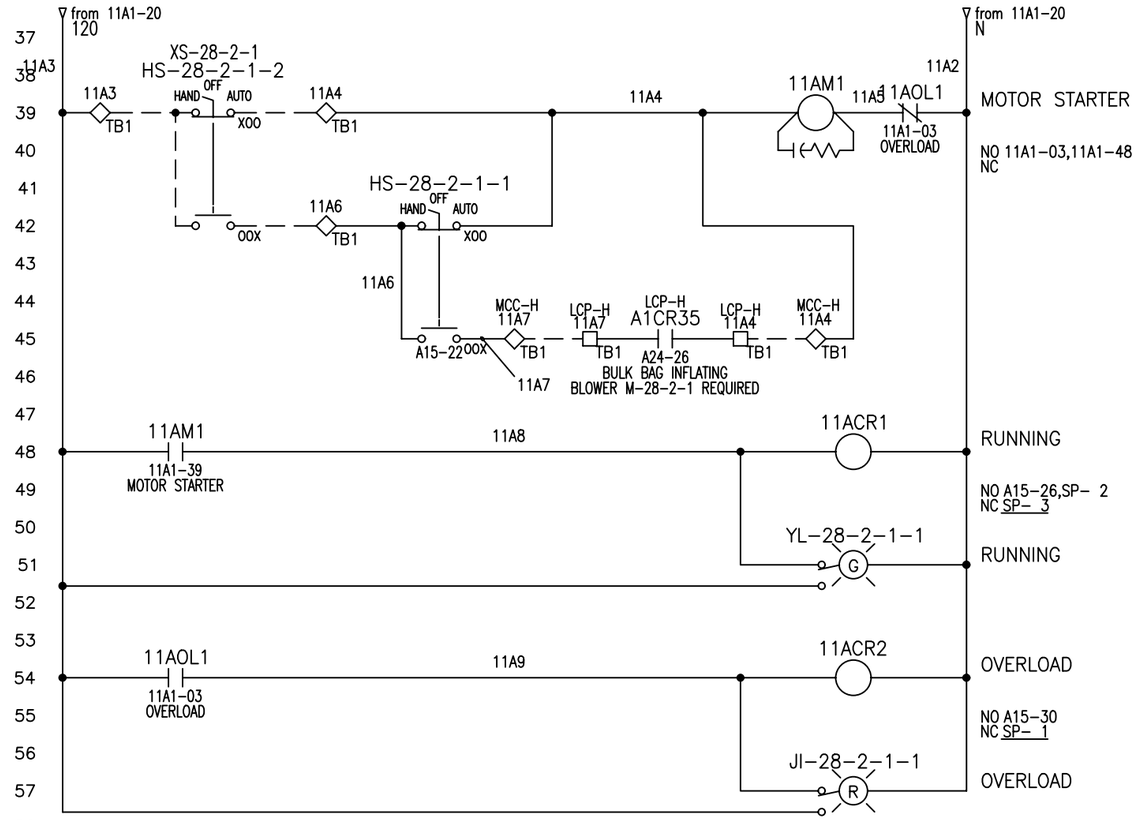
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SECTION 10L
LOCATION LCP-BEACON
TYPE 101
PAGE 10L1 OF 116

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4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
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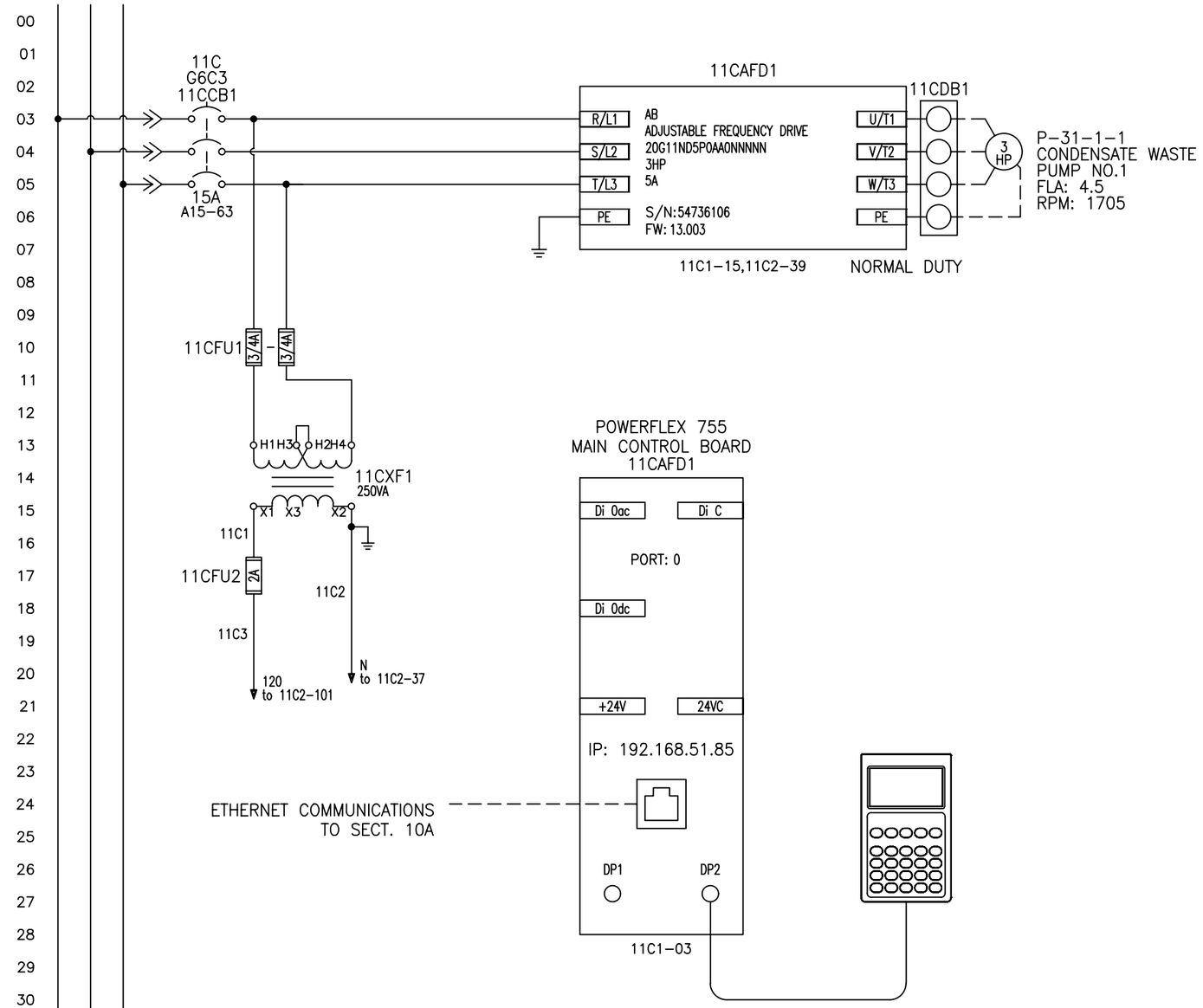
WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16	F					L				
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SECTION 11A
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ALTRONEX CONTROL SYSTEMS
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WWTF SLUDGE DRYER
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MCC–H

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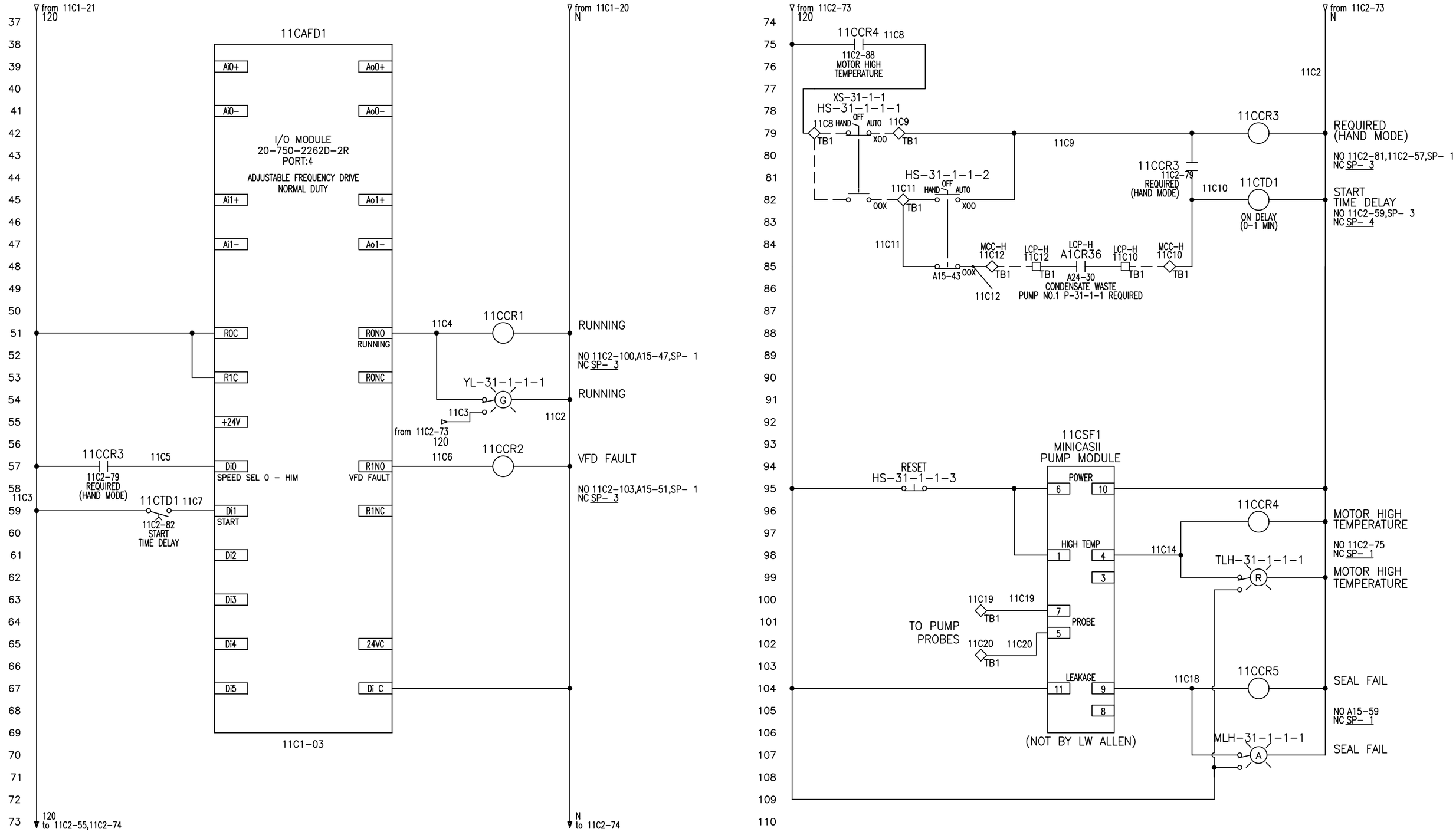
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SECTION 11C
LOCATION LCP–BEACON
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PAGE 11C1 OF 116

ALTRONEX CONTROL SYSTEMS
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DRAWING D16007–C
PROJECT WISCONSIN DELLS, WI



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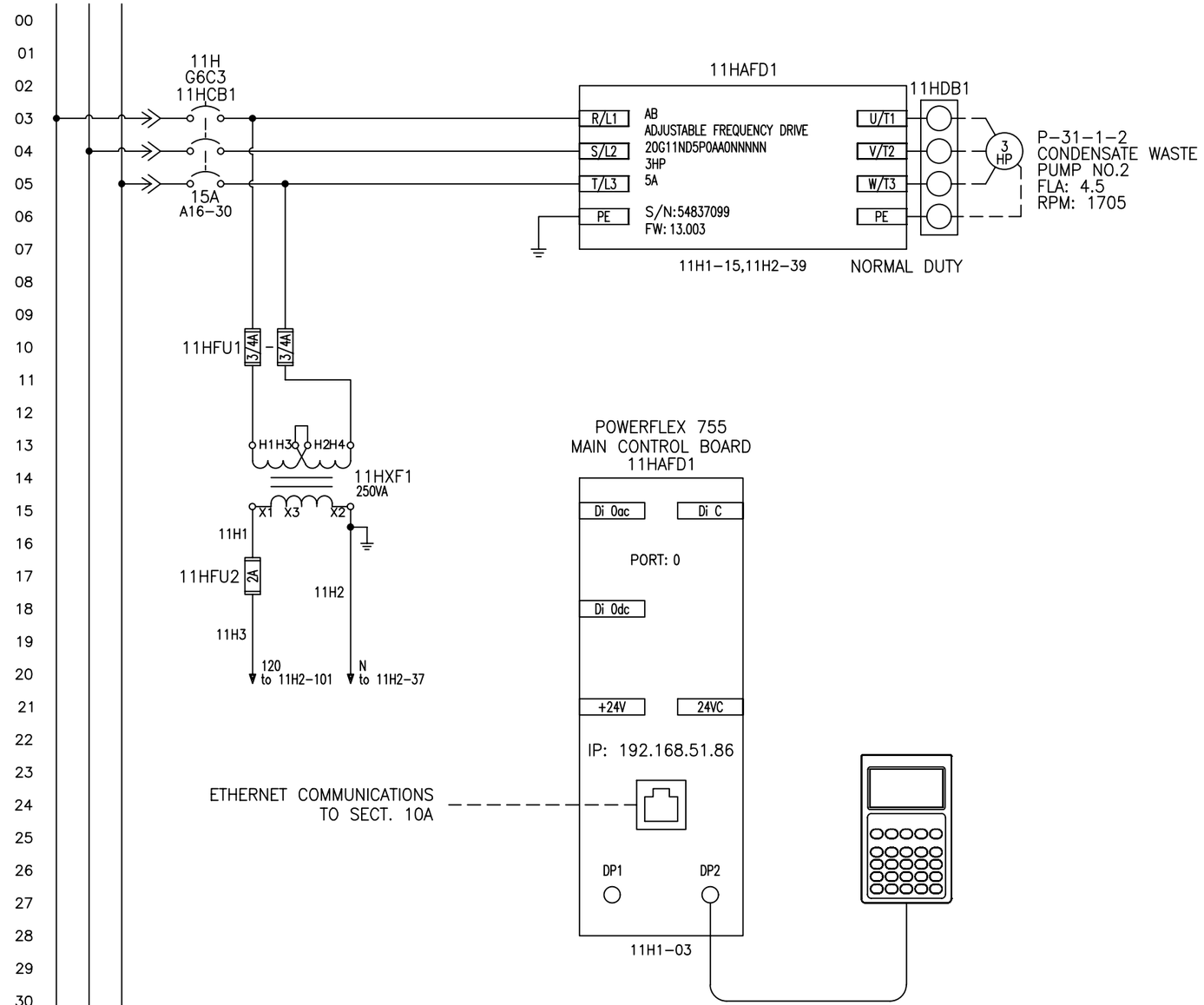
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SECTION 11C
LOCATION LCP-BEACON
TYPE 101
PAGE 11C2 OF 116

ALTRONEX CONTROL SYSTEMS
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MCC-H

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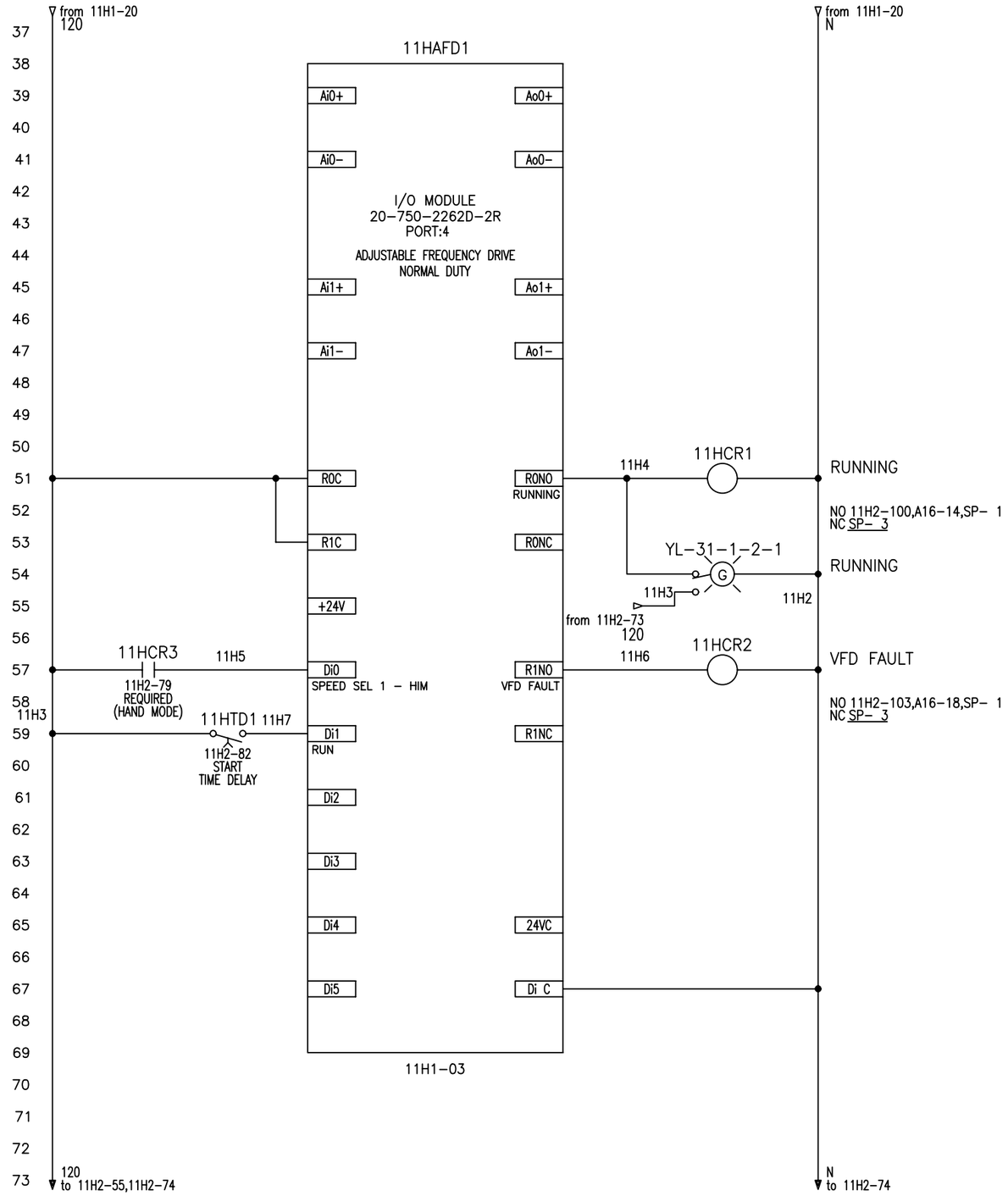
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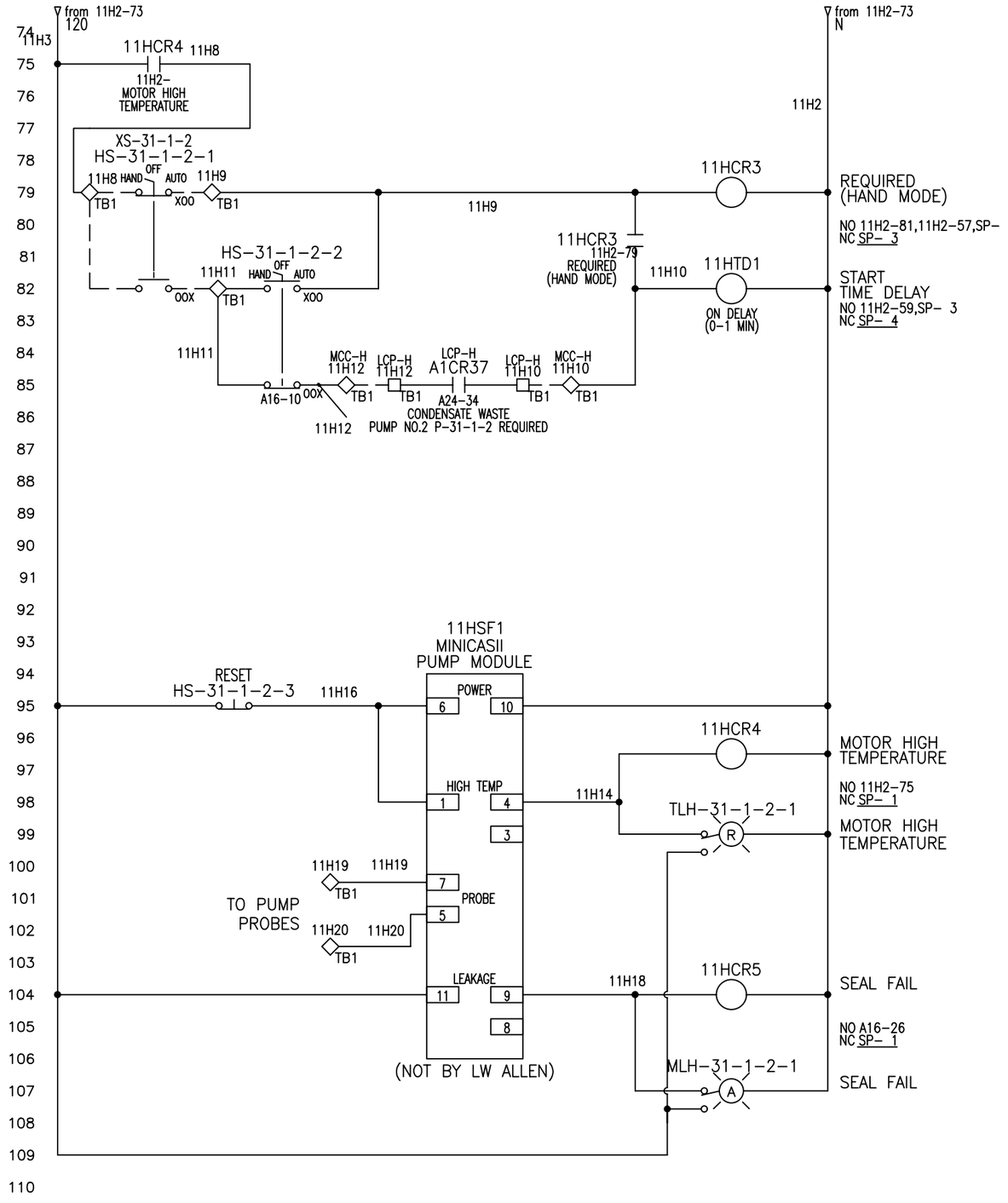
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SECTION 11H
LOCATION LCP-BEACON
TYPE 101
PAGE 11H1 OF 116

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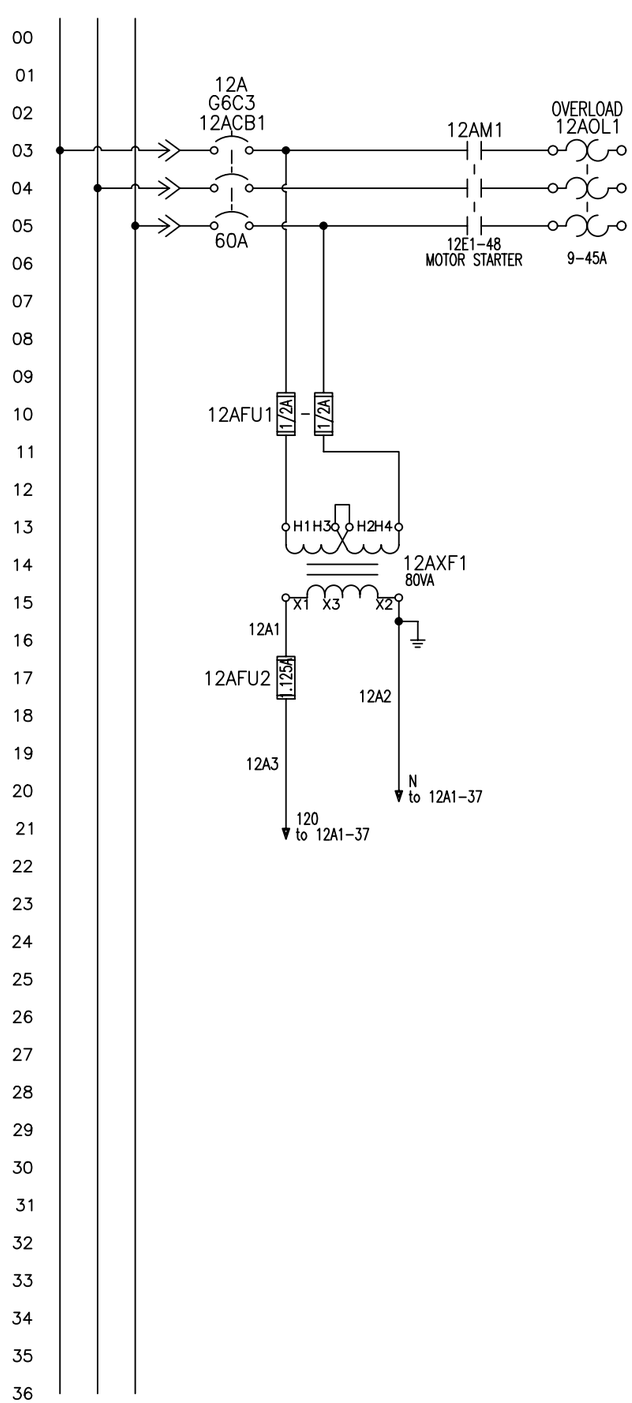
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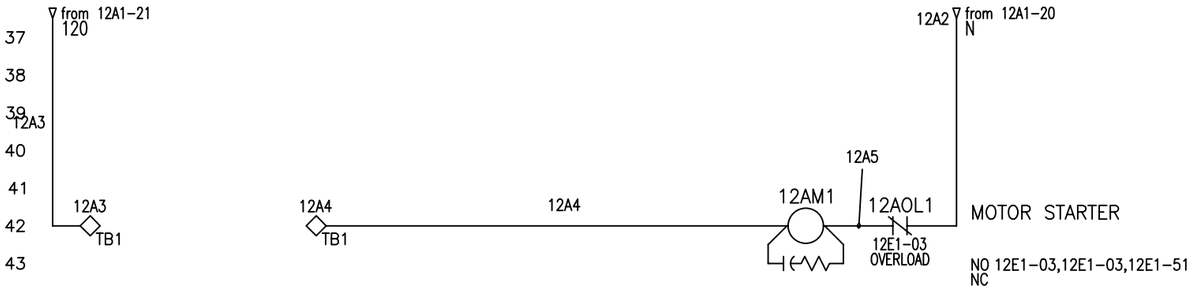
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SECTION 11H
LOCATION LCP-BEACON
TYPE 101
PAGE 11H2 OF 116

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4633 TOMPKINS DRIVE MADISON, WI 53716
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WWTF SLUDGE DRYER
BUILDING H

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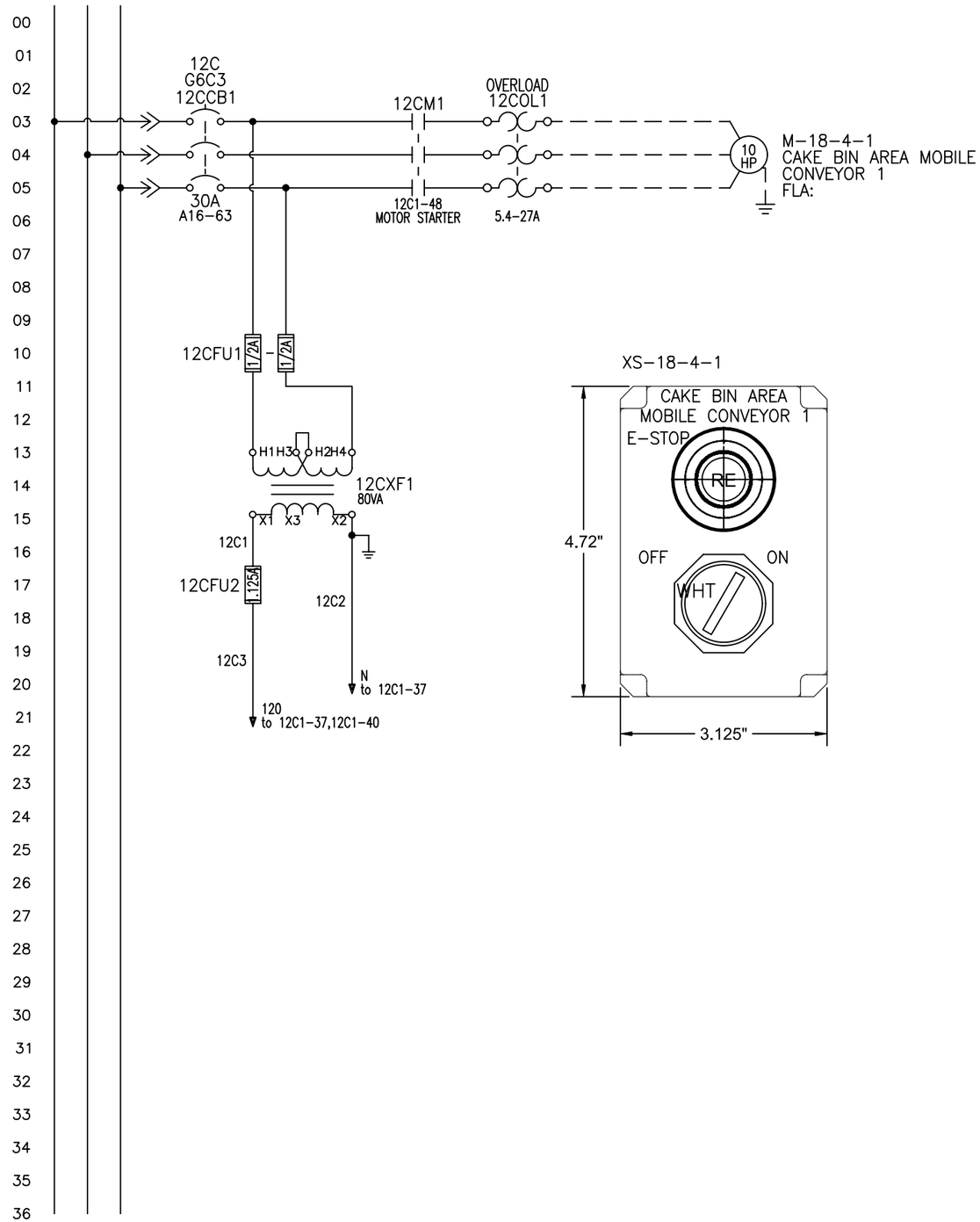
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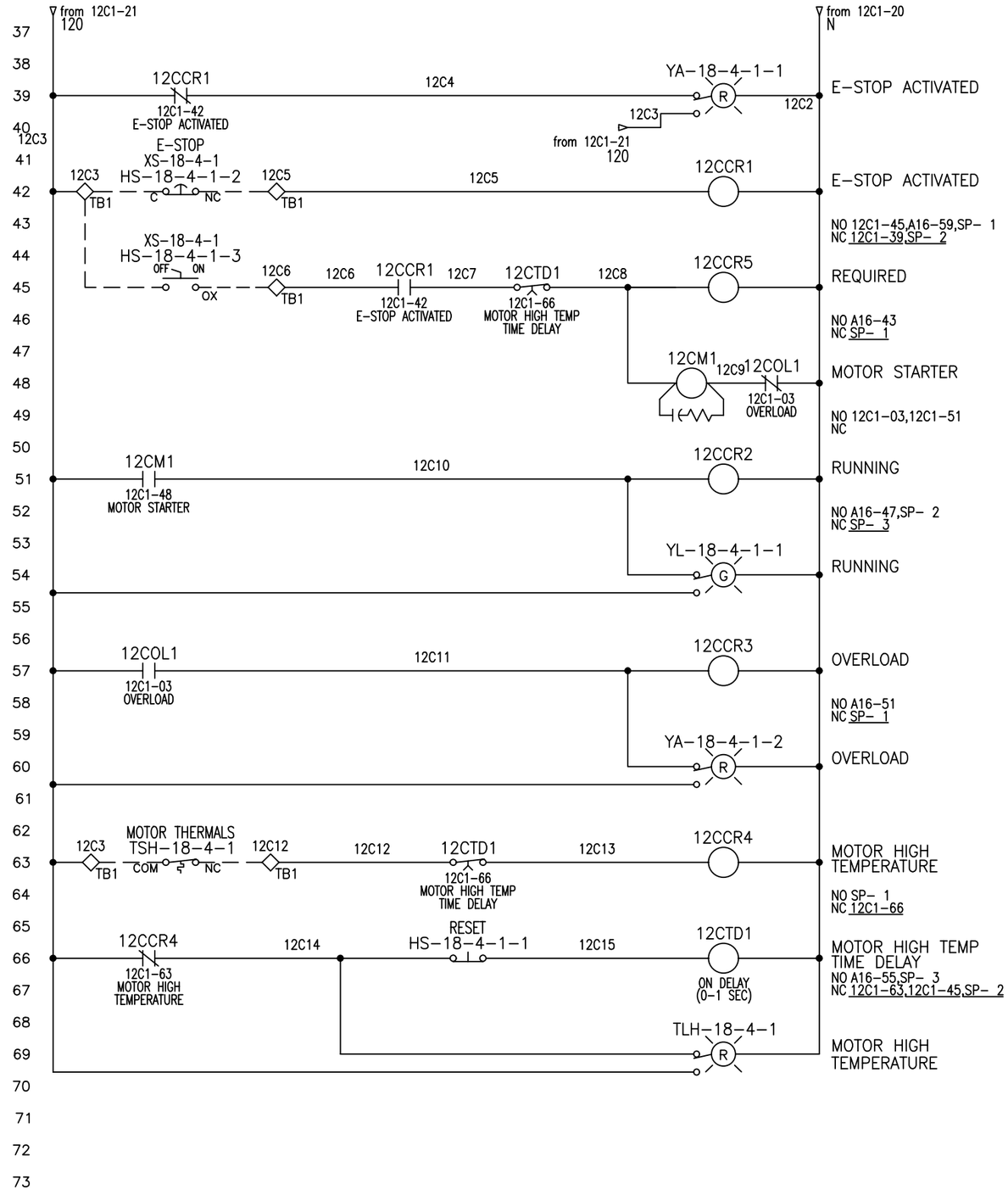
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SECTION 12A
LOCATION LCP-BEACON
TYPE 101
PAGE 12A1 OF 116

ALTRONEX CONTROL SYSTEMS
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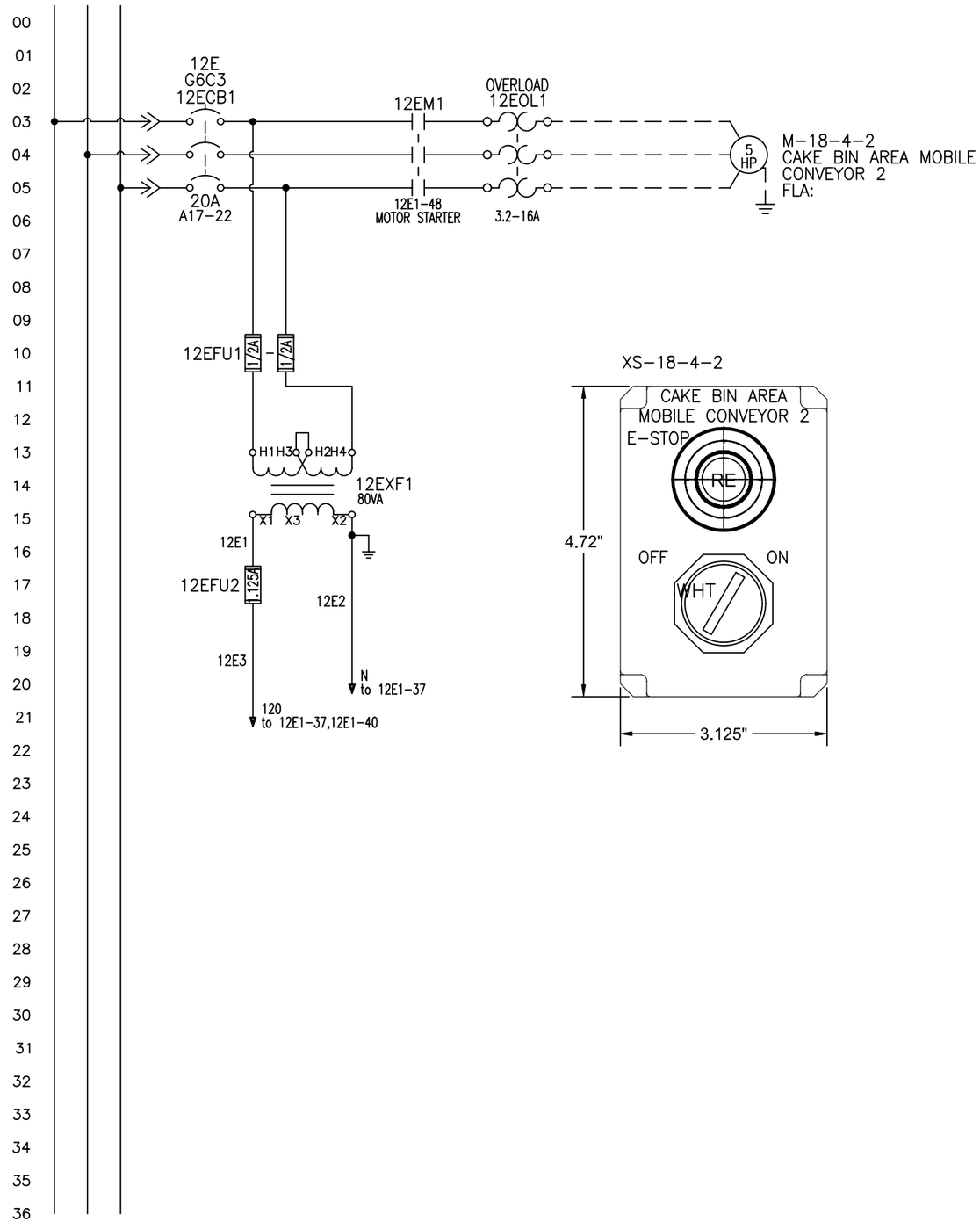
WWTF SLUDGE DRYER
BUILDING H
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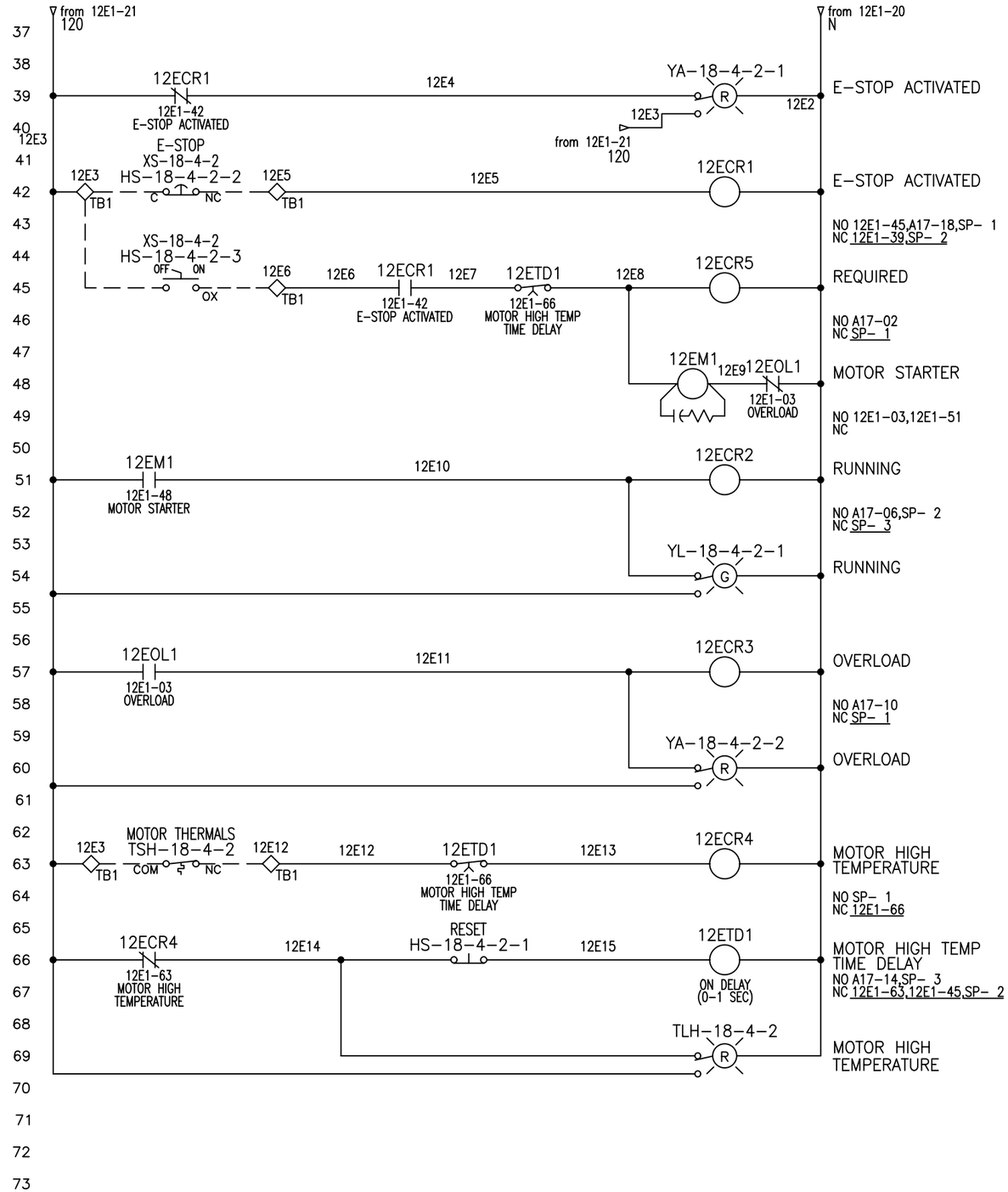
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SECTION 12C
LOCATION LCP-BEACON
TYPE 101
PAGE 12C 1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI





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WWTF SLUDGE DRYER
BUILDING H
MCC-H

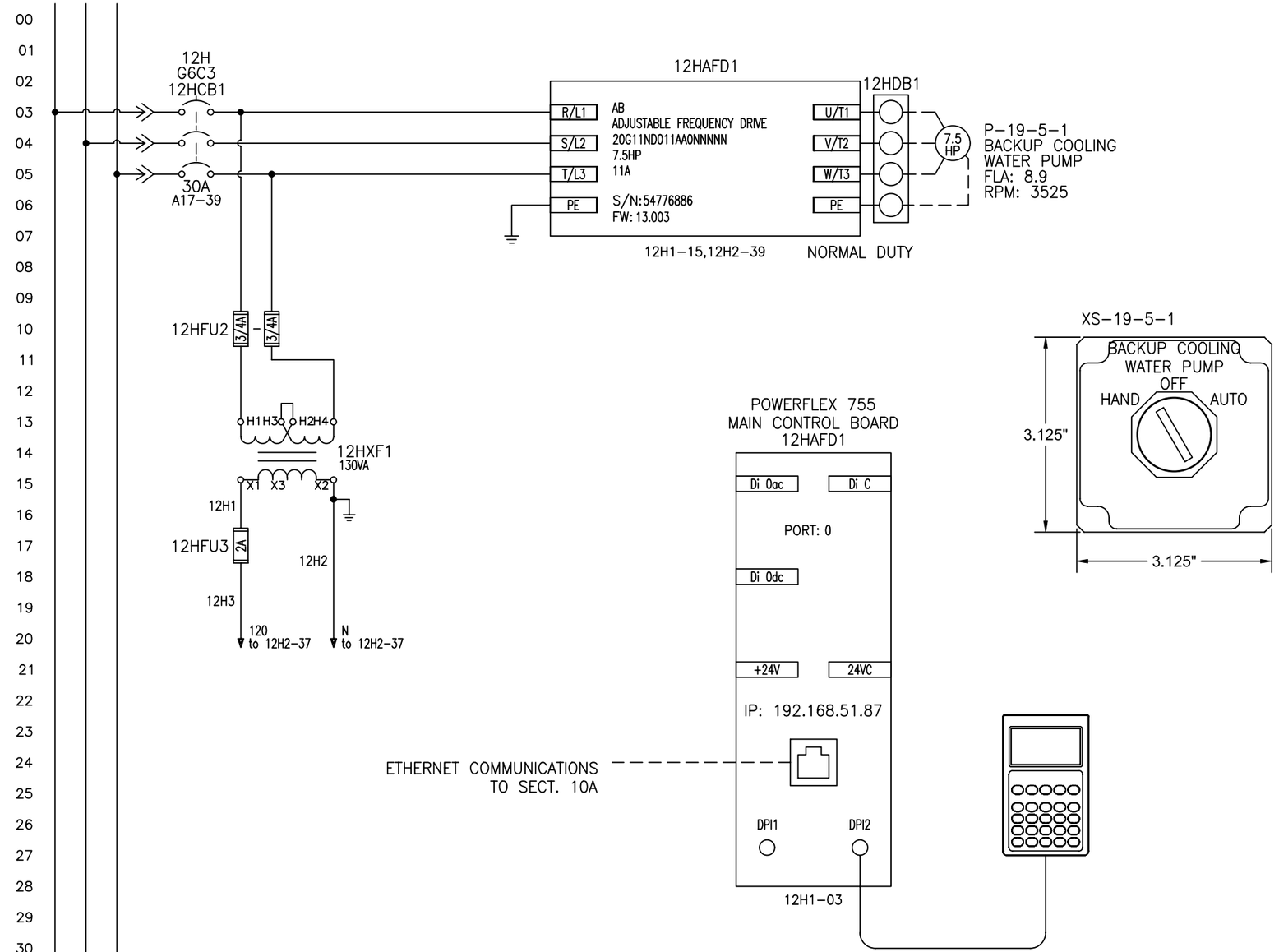
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SECTION 12E
LOCATION LCP-BEACON
TYPE 101
PAGE 12E1 OF 116

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
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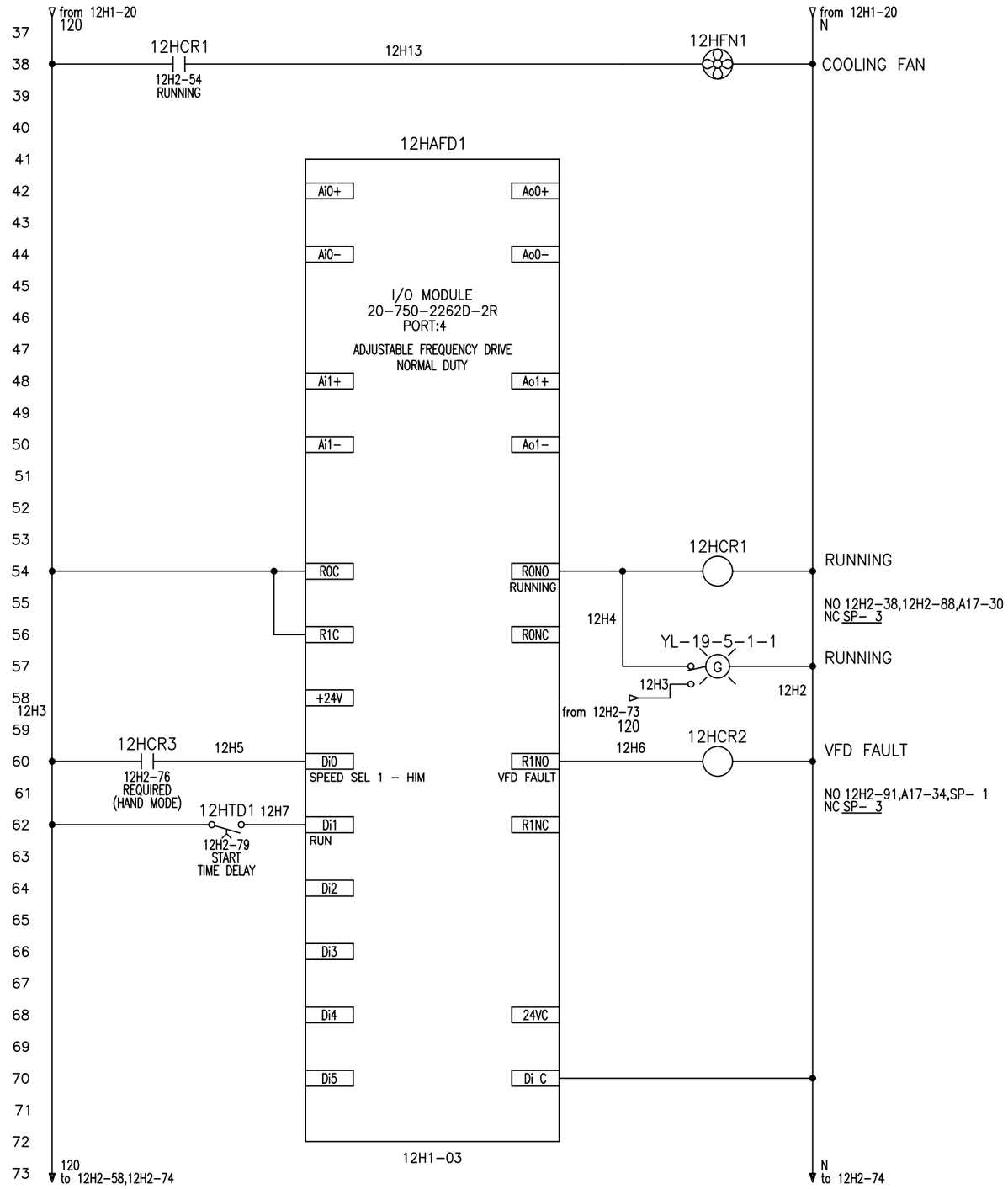
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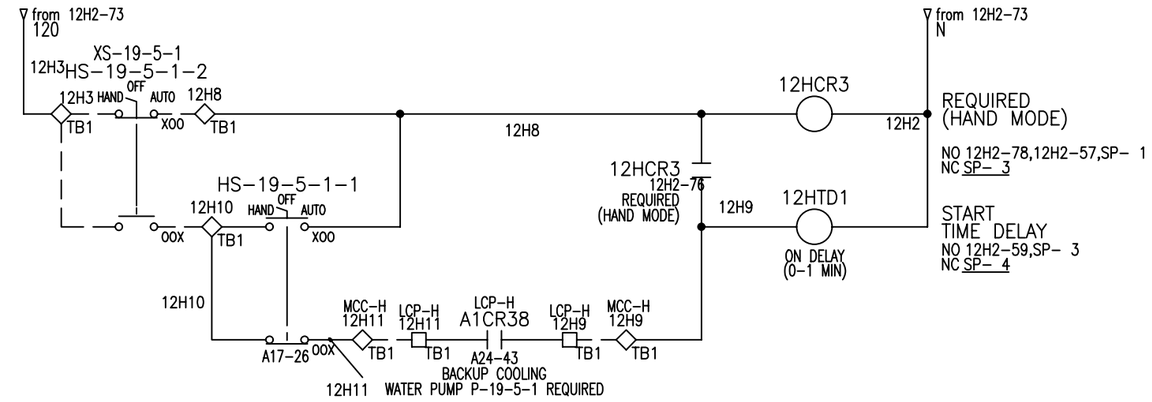
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SECTION 12H
LOCATION LCP-BEACON
TYPE 101
PAGE 12H 16 OF 116

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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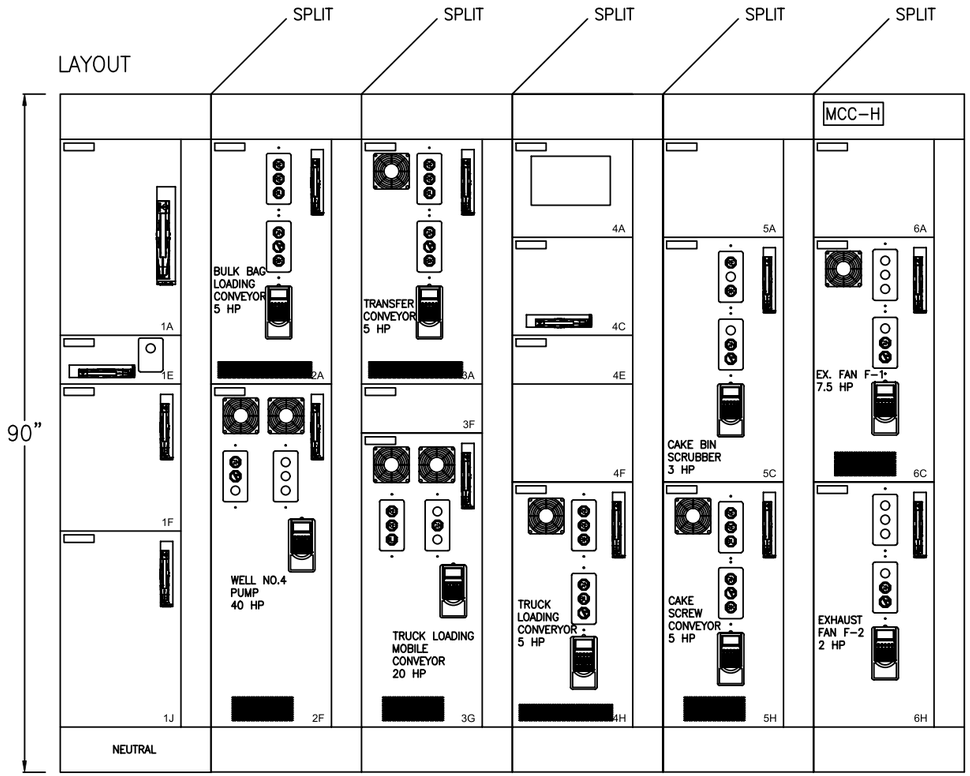
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PAGE 12H2 OF 116

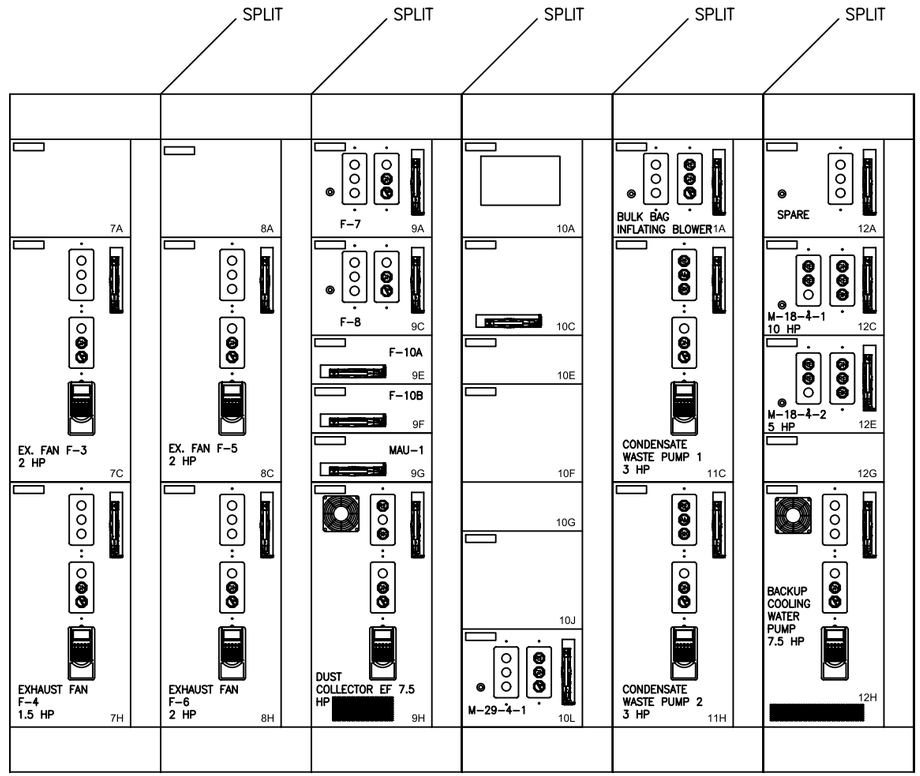
ALTRONEX CONTROL SYSTEMS
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

LAYOUT



(WEST ELEVATION)

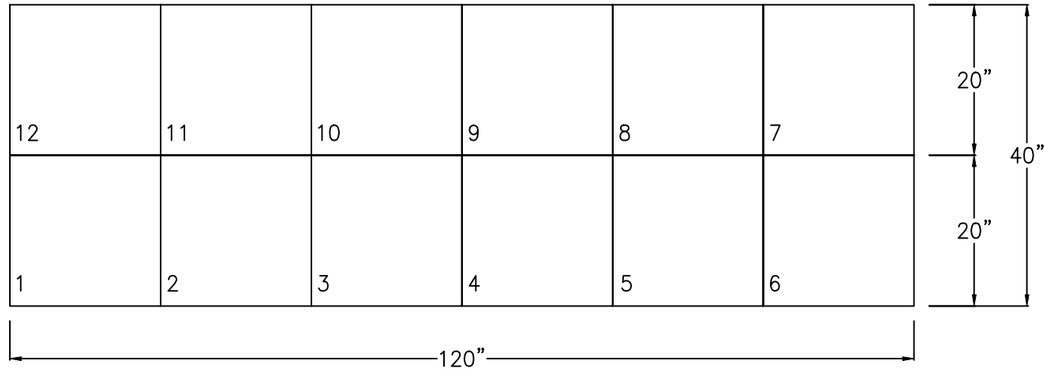


(EAST ELEVATION)

MCC–H

1. ALLEN BRADLEY BULLETIN 2100 CENTERLINE MOTOR CONTROL CENTER (S/N:6503474040/000200)
2. NEMA 1G ENCLOSURE ASA 49 EXTERIOR COLOR (MEDIUM GRAY)
3. 600 AMP TIN PLATED COPPER HORIZONTAL BUS
4. SECTION 1 600 AMP TIN PLATED VERTICAL BUS, SECTIONS 2–12 300 AMP TIN PLATED COPPER VERTICAL BUS
5. $\frac{1}{4}$” X 2” COPPER GROUND BUS
6. 42,000 AIC BUS BRACING AND ALL PROTECTIVE DEVICES
7. CLASS IIB WIRING
8. WIREWAY TIE BAR
9. AUTOMATIC SHUTTERS

FOOTPRINT



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WWTF SLUDGE DRYER
BUILDING H
MCC–H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION
LOCATION LCP–BEACON
TYPE 101
PAGE L1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222–8622 www.altronex.com

DRAWING D16007–C
PROJECT WISCONSIN DELLS, WI

NAMEPLATE LEGEND:

INST	TAGNAME	DESC1	DESC2	DESC3
1A		MAIN	CIRCUIT	BREAKER
1E		SURGE	PROTECTION	DEVICE
1F		LCP-23-1-2	DRYER VFD	CONTROL PANEL
1J		SLUDGE DRYER BLDG NORTH	LIGHTING & APPLIANCE	PANEL HH-1
2A	M-28-1-1	BULK BAG LOADING	CONVEYOR	
2A	TLH-28-1-1-1	MOTOR HIGH TEMP		
2A	YA-28-1-1-1	E-STOP		
2A	YL-28-1-1-3	FORWARD RUNNING		
2A	YL-28-1-1-4	REVERSE RUNNING		
2A	HS-28-1-1-1	HAND OFF AUTO		
2A	HS-28-1-1-2	RESET		
2F	M-19-4-1	WELL NO.4 PUMP		
2F	YL-19-4-1-1	RUNNING		
2F	HS-19-4-1	HAND OFF AUTO		
3A	M-27-1-1	TRANSFER	CONVEYOR	
3A	TLH-27-1-1-1	MOTOR HIGH TEMP		
3A	YA-27-1-1-1	E-STOP		
3A	YL-27-1-1-2	FORWARD RUNNING		
3A	YL-27-1-1-3	REVERSE RUNNING		
3A	HS-27-1-1-1	HAND OFF AUTO		
3A	HS-27-1-1-2	RESET		
3G	M-27-4-1	TRUCK LOADING	MOBILE CONVEYOR	
3G	TLH-27-4-1-1	MOTOR HIGH TEMP		
3G	YA-27-4-1-1	E-STOP		
3G	YL-27-4-1-1	RUNNING		
3G	HS-27-4-1-1	RESET		
4A		ETHERNET SWITCH 1		
4C		ETHERNET	POWER	SUPPLY
4H	M-27-3-1	TRUCK LOADING	CONVEYOR	
4H	TLH-27-3-1-1	MOTOR HIGH TEMP		
4H	YA-27-3-1-1	E-STOP		
4H	YL-27-3-1-2	FORWARD RUNNING		
4H	YL-27-3-1-3	REVERSE RUNNING		
4H	HS-27-3-1-1	HAND OFF AUTO		
4H	HS-27-3-1-2	RESET		
5C	M-30-1-1	CAKE BIN SCRUBBER	INLET AIR BLOWER	
5C	TLH-30-1-1-1	MOTOR HIGH TEMP		
5C	YL-30-1-1-1	RUNNING		
5C	HS-30-1-1-1	HAND OFF AUTO		
5C	HS-30-1-1-2	RESET		
5H	M-18-3-1	CAKE SCREW	CONVEYOR	
5H	TLH-18-3-1-1	MOTOR HIGH TEMP		
5H	YA-18-3-1-1	E-STOP		
5H	YL-18-3-1-1	FORWARD RUNNING		
5H	YL-18-3-1-2	REVERSE RUNNING		
5H	HS-18-3-1-1	HAND OFF AUTO		
5H	HS-18-3-1-3	RESET		
6C	F-1	SLUDGE DRYER BLDG	THERMAL HEATER ROOM	EXHAUST FAN
6C	YL-33-1-1-1	RUNNING		
6C	HS-33-1-1-1	HAND OFF AUTO		
6H	F-2	SLUDGE DRYER BLDG	DRYER ROOM	(CAKE BIN AREA)
6H	YL-33-2-1-1	RUNNING		
6H	HS-33-2-1-1	HAND OFF AUTO		
7C	F-3	SLUDGE DRYER BLDG	DRYER ROOM	(DRYER AREA) EF
7C	YL-33-2-2-1	RUNNING		
7C	HS-33-2-2-1	HAND OFF AUTO		
7H	F-4	SLUDGE STORAGE BLDG	TRUCK LOADING	EXHAUST FAN
7H	YL-33-3-1-1	RUNNING		
7H	HS-33-3-1-1	HAND OFF AUTO		
8C	F-5	SLUDGE STORAGE BLDG	NORTHEAST	EXHAUST FAN
8C	YL-33-4-1-1	RUNNING		
8C	HS-33-4-1-1	HAND OFF AUTO		
8H	F-6	SLUDGE STORAGE BLDG	SOUTHEAST	EXHAUST FAN
8H	YL-33-4-2-1	RUNNING		
8H	HS-33-4-2-1	HAND OFF AUTO		
9A	F-7	SLUDGE DRYER BLDG	NORTHEAST	EXHAUST FAN
9A	HS-33-2-3-1	HAND OFF AUTO		
9C	F-8	SLUDGE DRYER BLDG	SOUTHEAST	EXHAUST FAN
9C	HS-33-2-4	HAND OFF AUTO		
9E	MAU-1	DRYER ROOM	SUPPLY FAN	
9F	F-10A	DRYER ROOM	WEST CEILING FAN	
9G	F-10B	DRYER ROOM	EAST CEILING FAN	
9H	M-29-1-1	DUST COLLECTOR	EXHAUST FAN	
9H	TLH-29-1-1-1	MOTOR HIGH TEMP		
9H	YL-29-1-1-2	RUNNING		
9H	HS-29-1-1-2	HAND OFF AUTO		
9H	HS-29-1-1-3	RESET		
10A		ETHERNET SWITCH 2		
10C		ETHERNET	POWER	SUPPLY
10L	M-29-4-1	DUST COLLECTOR	ROTARY AIR LOCK	
10L	YL-29-4-1-2	RUNNING		
10L	JI-29-4-1-1	OVERLOAD		
10L	HS-29-4-1-2	HAND OFF AUTO		
11A	M-28-2-1	BULK BAG INFLATING	BLOWER	
11A	YL-28-2-1	RUNNING		
11A	JI-28-2-1	OVERLOAD		
11A	HS-28-2-1-1	HAND OFF AUTO		
11C	P-31-1-1	CONDENSATE WASTE	PUMP NO.1	
11C	TLH-31-1-1-1	MOTOR HIGH TEMP		
11C	YL-31-1-1-1	RUNNING		
11C	MLH-31-1-1-1	SEAL FAIL		
11C	HS-31-1-1-2	HAND OFF AUTO		
11C	HS-31-1-1-3	RESET		
11H	P-31-1-2	CONDENSATE WASTE	PUMP NO.2	
11H	TLH-31-1-2-1	MOTOR HIGH TEMP		
11H	YL-31-1-2-1	RUNNING		
11H	MLH-31-1-2-1	SEAL FAIL		
11H	HS-31-1-2-2	HAND OFF AUTO		
11H	HS-31-1-2-3	RESET		

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WWTF SLUDGE DRYER BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
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E			
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REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION
LOCATION LCP-BEACON
TYPE 101
PAGE L2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

NAMEPLATES CONTINUED:

12A	SPARE	MOTOR STARTER		
12C	M-18-4-1	CAKE BIN AREA	MOBILE CONVEYOR 1	
12C	TLH-18-4-1	MOTOR HIGH TEMP		
12C	YA-18-4-1-1	E-STOP		
12C	YA-18-4-1-2	OVERLOAD		
12C	YL-18-4-1-1	RUNNING		
12C	HS-18-4-1-1	RESET		
12H	P-19-5-1	BACKUP COOLING	WATER PUMP	
12H	YL-19-5-1-1	RUNNING		
12H	HS-19-5-1-1	HAND OFF AUTO		

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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SECTION

LOCATION
LCP-BEACON

TYPE
101

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ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D16007-C

PROJECT
WISCONSIN DELLS, WI

Installation: 1A		Location: MCC-H			
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
1ACB1	1		140G-M6H3-D60	AB	CIRCUIT BREAKER, ELECTRONIC LSI TIP UNIT, In = 600 AMP, 3 POLE

Installation: 1E		Location: MCC-H			
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
1EFU1	2		FNQ-R-3/4	BUSSMANN	FUSE - CLASS CC
1EDS1	1		AJT-30	MERSEN	FUSE, CLASS J, 30 A, 600VAC
1EFU2	1		TRM-1	MERSEN	MIDGET FUSE, 1 A, 250 VAC
1ELT1	1		800FP-P3	AB	GREEN PILOT LIGHT, NEMA 4/4X/13, 22.5mm, 120VAC,
1ESPD1	1		4983-DS277-803	AB	SURGE PROTECTION DEVICE, 480/277Y, 3 PH, 80 KA
1EXF1	1		5636-169-01	AB	CONTROL CIRCUIT TRANSFORMER, TYPE SN

Installation: 1F		Location: MCC-H			
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
1FCB1	1		140G-J6F3-D20	AB	ADJUSTABLE THERMAL-MAGNETIC BREAKER, 140-200 A THERMAL, 1000-2000 MAG., 3 POLE

Installation: 1J		Location: MCC-H			
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
1JCB1	1		140G-K6H3-D30	AB	CIRCUIT BREAKER, ELECTRONIC LSI TRIP UNIT, In = 300AMP, 3 POLE

Installation: 2A		Location: MCC-H			
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
2ACB1	1		140G-G6C3-C20	AB	THERMAL-MAGNETIC BREAKER, 20 AMP TRIP, 3 POLE
2ACR8	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
2ACR1 2ACR2 2ACR3 2ACR4 2ACR5 2ACR6 2ACR7	7	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
2AAFD1	1	*1	20G11ND8P0AA0NNNNN	AB	POWERFLEX 755, 480VAC, 5HP, 8 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*2	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
2AFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
2AFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-28-1-1-4	1		800T-QTH2B	AB	BLUE PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-28-1-1-3	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
TLH-28-1-1-1 YA-28-1-1-1	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-28-1-1-2	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
HS-28-1-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
2ATD1 2ATD2 2ATD3	3	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
2AXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

BILL OF MATERIALS

Installation: 2F		Location: MCC-H			
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
2FCB1	1		140G-G6C3-D12	AB	THERMAL-MAGNETIC BREAKER, 125 AMP TRIP, 3 POLE
2FCR1 2FCR2 2FCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
2FAFD1	1	*1	20G11ND052AA0NNNNN	AB	POWERFLEX 755, 480VAC, 40HP, 52 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
2AFN1 2FFN1 2FFN2 3AFN1 4HFN1 5HFN1	6		SP100A-1123XBT.GN	SUNON	FAN, 120X120X38 mm, 117 CFM
2FFU3	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
2FFU2	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-19-4-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-19-4-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
2FTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
2FXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
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REV	DESCRIPTION	DATE	INIT
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REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
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G			

SECTION

LOCATION
LCP-BEACON

TYPE
101

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ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D16007-C

PROJECT
WISCONSIN DELLS, WI

BILL OF MATERIALS

Installation: 3A Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
3ACB1	1		140G-G6C3-C20	AB	THERMAL-MAGNETIC BREAKER, 20 AMP TRIP, 3 POLE
3ACR7	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
3ACR1 3ACR2 3ACR3 3ACR4 3ACR5 3ACR6	6	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
3AAFD1	1	*1	20G11ND8P0AA0NNNNN	AB	POWERFLEX 755, 480VAC, 5HP, 8 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*2	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
3AFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
3AFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-27-1-1-2	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
TLH-27-1-1-1 YA-27-1-1-1	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-27-1-1-3	1		800T-QTH2B	AB	BLUE PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-27-1-1-2	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
HS-27-1-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
3ATD1 3ATD2 3ATD3	3	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
3AXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 3G Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
3GCB1	1		140G-G6C3-C60	AB	THERMAL-MAGNETIC BREAKER, 60 AMP TRIP, 3 POLE
3GCR5	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
3GCR1 3GCR2 3GCR3 3GCR4	4	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
3GAFD1	1	*1	20G11ND034AA0NNNNN	AB	POWERFLEX 755, 480VAC, 25HP, 34 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
3GFN1 3GFN2	2		SP100A-1123XBT.GN	SUNON	FAN, 120X120X38 mm, 117 CFM
3GFU2	1		TRM-3-1/2	MERSEN	MIDGET FUSE, 3-1/2 A, 250 VAC
3GFU1	2		ATQR-1/4	MERSEN	MIDGET FUSE, CLASS CC, 1/4 A, 600 VAC
TLH-27-4-1-1 YA-27-4-1-1	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-27-4-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-27-4-1-1	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
3GTD1 3GTD2	2	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
3GXF1	1		B250BTZ13RBF	MICRON	CONTROL TRANSFORMER, 240X480 PRI, 120 SEC, 250VA

Installation: 4A Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
4AES1	1		1783-BMS20CL	AB	

Installation: 4C Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
4CCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
4CCB2 4CCB3 4CCB4 4CCB5	4		1489-A1C040	AB	CIRCUIT BREAKER, BULLETIN 1489 SERIES
4CFU1	1		ATQR-7	FERRAZ SHAWMUT	
4CFU1	1		ATQR-2	MERSEN	MIDGET FUSE, CLASS CC, 2 A, 600 VAC
4CFU2	1		TRM-5	MERSEN	MIDGET FUSE, 5 A, 250 VAC
4CPW1	1		1606-XLSDNET8	AB	24 VDC, 8 A, POWER SUPPLY
4CBU1	1		1606-XLBUFFER	AB	22.5 VDC FIXED BUFFER UNIT, 24-28.8V/20A
	10		3001035	PHOENIX CONTACT	STANDARD IEC TERMINAL BLOCK - UK 2,5 B
4CXF1	1		1497-F-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

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F			
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REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
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SECTION

LOCATION
LCP-BEACON

TYPE
101

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ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D16007-C

PROJECT
WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: 4H Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
4HCB1	1		140G-G6C3-C20	AB	THERMAL-MAGNETIC BREAKER, 20 AMP TRIP, 3 POLE
4HCR7	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
4HCR1 4HCR2 4HCR3 4HCR4 4HCR5 4HCR6	6	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
4HAFD1	1	*1	20G11ND8P0AA0NNNNN	AB	POWERFLEX 755, 480VAC, 5HP, 8 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*2	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
4HFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
4HFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-27-3-1-2	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-27-3-1-3	1		800T-QTH2B	AB	BLUE PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
TLH-27-3-1-1 YA-27-3-1-1	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-27-3-1-2	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
HS-27-3-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
4HTD1 4HTD2 4HTD3	3	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
4HXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 5C Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
5CCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
5CCR1 5CCR2 5CCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
5CCR4	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
5CAFD1	1	*1	20G11ND5P0AA0NNNNN	AB	POWERFLEX 755, 480VAC, 3HP, 5 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
5CFU2	1		TRM-1	MERSEN	MIDGET FUSE, 1 A, 250 VAC
5CFU1	2		ATQR-1/2	MERSEN	MIDGET FUSE, CLASS CC, 1/2 A, 600 VAC
TLH-30-1-1-1	1		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-30-1-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-30-1-1-2	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
HS-30-1-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
5CTD1 5CTD2	2	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
5CXF1	1		1497-B-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION
LOCATION LCP-BEACON
TYPE 101
PAGE L6 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: 5H Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
5HCB1	1		140G-G6C3-C20	AB	THERMAL-MAGNETIC BREAKER, 20 AMP TRIP, 3 POLE
5HCR7	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
5HCR1 5HCR2 5HCR3 5HCR4 5HCR5 5HCR6	6	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
5HAFD1	1	*1	20G11ND8P0AA0NNNNN	AB	POWERFLEX 755, 480VAC, 5HP, 8 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*2	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
5HFU2	1		TRM-2-1/2	MERSEN	MIDGET FUSE, 2-1/2 A, 250 VAC
5HFU1	2		ATQR-1	MERSEN	MIDGET FUSE, CLASS CC, 1 A, 600 VAC
YL-18-3-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-18-3-1-2	1		800T-QTH2B	AB	BLUE PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
TLH-18-3-1-1 YA-18-3-1-1	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-18-3-1-3	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
HS-18-3-1-1	1		800T-N2KF4B	AB	SELECTOR SW - 4 POS MAINT, NEMA 4/13
5HTD1 5HTD2 5HTD3	3	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
5HXF1	1		1497-D-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 6C Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
6CCB1	1		140G-G6C3-C30	AB	THERMAL-MAGNETIC BREAKER, 30 AMP TRIP, 3 POLE
6CCR1 6CCR2 6CCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
6CAFD1	1	*1	20G11ND011AA0NNNNN	AB	POWERFLEX 755, 480VAC, 7.5HP, 11 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
6CFN1	1		SP100A-1123XBT.GN	SUNON	FAN, 120X120X38 mm, 117 CFM
6CFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
6CFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-33-1-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-33-1-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
6CTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
6CXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 6H Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
6HCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
6HCR1 6HCR2 6HCR3 6HCR4	4	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
6HAFD1	1	*1	20G11ND3P4AA0NNNNN	AB	POWERFLEX 755, 480VAC, 2HP, 3.4 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
6HFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
6HFU1 7CFU2	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-33-2-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-33-2-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
6HTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
	8		3001035	PHOENIX	
6HXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION
LOCATION LCP-BEACON
TYPE 101
PAGE L7 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS

Installation: 7C Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
7CCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
7CCR1 7CCR2 7CCR3 7CCR4	4	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
7CAFD1	1	*1	20G11ND3P4AA0NNNNN	AB	POWERFLEX 755, 480VAC, 2HP, 3.4 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
7CFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
7CFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-33-2-2-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-33-2-2-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
7CTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
7CXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 7H Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
7HCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
7HCR1 7HCR2 7HCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
7HAFD1	1	*1	20G11ND5P0AA0NNNNN	AB	POWERFLEX 755, 480VAC, 3HP, 5 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
7HFU2	1		TRM-1-1/4	MERSEN	MIDGET FUSE, 1-1/4 A, 250 VAC
7HFU1	2		ATQR-1/2	MERSEN	MIDGET FUSE, CLASS CC, 1/2 A, 600 VAC
YL-33-3-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-33-3-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
7HTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
7HXF1	1		1497-B-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 8C Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
8CCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
8CCR1 8CCR2 8CCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
8CAFD1	1	*1	20G11ND3P4AA0NNNNN	AB	POWERFLEX 755, 480VAC, 2HP, 3.4 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
8CFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
7CFU2 8CFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-33-4-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-33-4-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
8CTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
8CXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 8H Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
8HCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
8HCR1 8HCR2 8HCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
8HAFD1	1	*1	20G11ND3P4AA0NNNNN	AB	POWERFLEX 755, 480VAC, 2HP, 3.4 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
8HFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
7CFU2 8HFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-33-4-2-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-33-4-2-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
8HTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
8HXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION

LOCATION
LCP-BEACON

TYPE
101

PAGE
L8 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D16007-C

PROJECT
WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: 9A Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
9ACB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
9ACR1	1	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
9AFU2	1		TRM-1-1/8	MERSEN	MIDGET FUSE, 1-1/8 A, 250 VAC
9AFU1	2		ATQR-1/2	MERSEN	MIDGET FUSE, CLASS CC, 1/2 A, 600 VAC
YL-33-2-3-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
9AM1	1		509-BOD	AB	FULL VOLTAGE MOTOR STARTER - 3 POLES, NEMA SIZE 1
9AOL1	1		592-EECC	AB	NEMA SIZE 0-2, E1 PLUS SOLID-STATE OVERLOAD RELAY, 3-PHASE, 1.0-5.0 AMPS
HS-33-2-3-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
9AXF1	1		1497-B-BASX-3-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497, 80VA

Installation: 9C Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
9CCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
9CCR1	1	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
9CFU2	1		TRM-2-1/4	MERSEN	MIDGET FUSE, 2-1/4 A, 250 VAC
10GFU1 9CFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
YL-33-2-4-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
9CM1	1		500F-BOD930	AB	NEMA CONTACTOR - 3 POWER POLES, NEMA SIZE 1
9COL1	1		592-EECC	AB	NEMA SIZE 0-2, E1 PLUS SOLID-STATE OVERLOAD RELAY, 3-PHASE, 1.0-5.0 AMPS
HS-33-2-4-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
9CXF1	1		1497-B-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 9E Location: MCC-H

QTY	SUB	CATALOG	MFG	DESCRIPTION
1		140G-G6C3-C25	AB	THERMAL-MAGNETIC BREAKER, 25 AMP TRIP, 3 POLE

Installation: 9F Location: MCC-H

QTY	SUB	CATALOG	MFG	DESCRIPTION
1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE

Installation: 9G Location: MCC-H

QTY	SUB	CATALOG	MFG	DESCRIPTION
1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE

BILL OF MATERIALS
Installation: 9H Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
9HCB1	1		140G-G6C3-C30	AB	THERMAL-MAGNETIC BREAKER, 30 AMP TRIP, 3 POLE
9HCR4	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
9HCR1 9HCR2 9HCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
9HAFD1	1	*1	20G11ND011AAONNNNN	AB	POWERFLEX 755, 480VAC, 7.5HP, 11 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
9HFN1	1		SP100A-1123XBT.GN	SUNON	FAN, 120X120X38 mm, 117 CFM
9HFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC
9HFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
TLH-29-1-1-1	1		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-29-1-1-2	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
HS-29-1-1-3	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
HS-29-1-1-2	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
9HTD1 9HTD2	2	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
9HXF1	1		1497-C-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 10A Location: MCC-H

QTY	SUB	CATALOG	MFG	DESCRIPTION
1		1783-BMS20CL	AB	

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION
LOCATION LCP-BEACON
TYPE 101
PAGE L9 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: 10L Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
10LCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
10LCR2	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
10LCR1	1	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
10LFU2	1		TRM-1-1/8	MERSEN	MIDGET FUSE, 1-1/8 A, 250 VAC
10LFU1	2		ATQR-1/2	MERSEN	MIDGET FUSE, CLASS CC, 1/2 A, 600 VAC
JI-29-4-1-1	1		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-29-4-1-2	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
10LM1	1		500F-B0D930	AB	NEMA CONTACTOR - 3 POWER POLES, NEMA SIZE 1
10LOL1	1		592-EECC	AB	NEMA SIZE 0-2, E1 PLUS SOLID-STATE OVERLOAD RELAY, 3-PHASE, 1.0-5.0 AMPS
HS-29-4-1-2	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
10LXF1	1		1497-B-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 11A Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
11ACB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
11ACR2	1	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
11ACR1	1	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
11AFU2	1		TRM-1-1/8	MERSEN	MIDGET FUSE, 1-1/8 A, 250 VAC
11AFU1	2		ATQR-1/2	MERSEN	MIDGET FUSE, CLASS CC, 1/2 A, 600 VAC
JI-28-2-1-1	1		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-28-2-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
11AM1	1		509-B0D	AB	FULL VOLTAGE MOTOR STARTER - 3 POLES, NEMA SIZE 1
11AOL1	1		592-EEDC	AB	NEMA SIZE 0-2, E1 PLUS SOLID-STATE OVERLOAD RELAY, 3-PHASE, 3.2-16 AMPS
HS-28-2-1-1	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
11AXF1	1		1497-B-BASX-3-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497, 80VA

BILL OF MATERIALS
Installation: 11C Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
11CAFD1	1	*1	20G11ND5P0AA0NNNNN	AB	POWERFLEX 755, 480VAC, 3HP, 5 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
11CCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
HS-31-1-1-3	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
HS-31-1-1-2	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
MLH-31-1-1-1	1		800T-QTH2A	AB	AMBER PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-31-1-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
TLH-31-1-1-1	1		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
11CXF1	1		1497-E-BASX-3-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497, 250VA
11CTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
11CCR4 11CCR5	2	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
11CCR1 11CCR2 11CCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
11CFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
11CFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION
LOCATION LCP-BEACON
TYPE 101
PAGE L10 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: 11H Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
11HAFD1	1	*1	20G11ND5P0AA0NNNNNN	AB	POWERFLEX 755, 480VAC, 3HP, 5 AMP
		*1	20-HIM-A6	AB	HIM FOR POWERFLEX 753/755
		*1	20-750-2262D-2R	AB	I/O MODULE, POWERFLEX 753, 120 VAC
11HCB1	1		140G-G6C3-C15	AB	THERMAL-MAGNETIC BREAKER, 15 AMP TRIP, 3 POLE
HS-31-1-2-3	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
HS-31-1-2-2	1		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
MLH-31-1-2-1	1		800T-QTH2A	AB	AMBER PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-31-1-2-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
TLH-31-1-2-1	1		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
11HXF1	1		1497-E-BASX-3-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497, 250VA
11HTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
11HCR4 11HCR5	2	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
11HCR1 11HCR2 11HCR3	3	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
11HFU1	2		ATQR-3/4	MERSEN	MIDGET FUSE, CLASS CC, 3/4 A, 600 VAC
11HFU2	1		TRM-2	MERSEN	MIDGET FUSE, 2 A, 250 VAC

Installation: 12A Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
12ACB1	1		140G-G6C3-C50	AB	THERMAL-MAGNETIC BREAKER, 50 AMP TRIP, 3 POLE
12AFU2	1		TRM-1-1/8	MERSEN	MIDGET FUSE, 1-1/8 A, 250 VAC
12AFU1	2		ATQR-1/2	MERSEN	MIDGET FUSE, CLASS CC, 1/2 A, 600 VAC
12AM1	1		509-COD	AB	FULL VOLTAGE MOTOR STARTER - 3 POLES, NEMA SIZE 2
12AOL1	1		592-EEFC	AB	NEMA SIZE 0-2, E1 PLUS SOLID-STATE OVERLOAD RELAY, 3-PHASE, 9-45 AMPS
12AXF1	1		1497-B-BASX-3-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497, 80VA

Installation: 12C Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
12CCB1	1		140G-G6C3-C30	AB	THERMAL-MAGNETIC BREAKER, 30 AMP TRIP, 3 POLE
12CCR3 12CCR4 12CCR5	3	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
12CCR1 12CCR2	2	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
12CFU2	1		TRM-1	MERSEN	MIDGET FUSE, 1 A, 250 VAC
12CFU1	2		ATQR-1/2	MERSEN	MIDGET FUSE, CLASS CC, 1/2 A, 600 VAC
TLH-18-4-1 YA-18-4-1-2	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-18-4-1-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
12CM1	1		509-BOD	AB	FULL VOLTAGE MOTOR STARTER - 3 POLES, NEMA SIZE 1
12COL1	1		592-EEEC	AB	NEMA SIZE 0-2, E1 PLUS SOLID-STATE OVERLOAD RELAY, 3-PHASE, 5.4-27 AMPS
HS-18-4-1-1	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
12CTD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
12CXF1	1		1497-B-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

Installation: 12E Location: MCC-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
12ECB1	1		140G-G6C3-C20	AB	THERMAL-MAGNETIC BREAKER, 20 AMP TRIP, 3 POLE
12ECR3 12ECR4 12ECR5	3	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
12ECR1 12ECR2	2	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
12EFU2	1		TRM-1	MERSEN	MIDGET FUSE, 1 A, 250 VAC
12EFU1	2		ATQR-1/2	MERSEN	MIDGET FUSE, CLASS CC, 1/2 A, 600 VAC
TLH-18-4-2 YA-18-4-2-2	2		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YL-18-4-2-1	1		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
12EM1	1		509-BOD	AB	FULL VOLTAGE MOTOR STARTER - 3 POLES, NEMA SIZE 1
12EOL1	1		592-EEDC	AB	NEMA SIZE 0-2, E1 PLUS SOLID-STATE OVERLOAD RELAY, 3-PHASE, 3.2-16 AMPS
HS-18-4-2-1	1		800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
12ETD1	1	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET
12EXF1	1		1497-B-BASX-0-N	AB	CONTROL CIRCUIT TRANSFORMER, TYPE 1497

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION
LOCATION LCP-BEACON
TYPE 101
PAGE L11 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: Location: REMOTE

TAGS	QTY	SUB	CATALOG	MFG	DESCRIPTION
XS-28-3-1 XS-28-3-2 XS-28-3-3 XS-28-3-4 XS-28-3-5	5	*1	Q1PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 1 HOLE
		*1	800T-A2D1	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NO, BLACK
XS-18-2-1-1 XS-22-5-1	2	*1	Q1PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 1 HOLE
		*1	800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO

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WWTF SLUDGE DRYER
BUILDING H
MCC-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION
LOCATION LCP-BEACON
TYPE 101
PAGE L12 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

TO 120 VAC, 1 PHASE, 60 HZ SUPPLY
MAIN DISCONNECT EXTERNAL TO PANEL
PROVIDED BY OTHERS

WARNING:
DANGEROUS VOLTAGE WITHIN.
DE-ENERGIZE ALL POWER
SOURCES PRIOR TO
ENTERING

L1

A1CB1
10A

N

G

GROUND PER
NEC

A1SU1
120VAC

SURGE PROTECTION
DEVICE

A1CR1

CONTROL POWER
AVAILABLE

NO A2-13,A2-13,A4-03
NC A2-13,A2-13,SP- 1

A1PW1

SERVICE
RECEPTACLE

A1061

120
to A1-37

N
to A1-37

from A1-36
120

A1061

120
to A2-00

from A1-36
N

N
to A2-00

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A1-73
120

from A1-73
N

A1PW2

UPS
RECEPTACLE

(FIELD INSTALLED)

A1UPS1

1~

1~

700VA

A2061

A2071

NO
NC A4-07

A1061

N

A1CR1
A1-11
CONTROL POWER
AVAILABLE

A2131

A1CR1
A1-11
CONTROL POWER
AVAILABLE

A1CR1
A1-11
CONTROL POWER
AVAILABLE

A2132

A1CR1
A1-11
CONTROL POWER
AVAILABLE

A1PW6

CAMERA
RECEPTACLE

MEANWELL
DR-120-24
A1PW3

POWER SUPPLY
24V 5A
+ -

A
to A2-37

B
to A2-37

A2221

A2222

AB
1769-L36ERM
COMPACTLOGIX
PROCESSOR
2 ETHERNET
PLCA21

TO
ETHERNET
SWITCH

RJ45
COM 0
RJ45
COM 1

IP: 192.168.51.11

+24
to A2-61,A3-02

COM
to A2-63,A3-02

from A2-22
A

from A2-22
B

AB
1769-PA2
COMPACTLOGIX
POWER SUPPLY
PLCA22

PWR OUT +24VDC
PWR OUT COM
120/240VAC (L1)
VAC COM (L2)
GND

AB
1769-PA2
COMPACTLOGIX
POWER SUPPLY
PLCA23

PWR OUT +24VDC
PWR OUT COM
120/240VAC (L1)
VAC COM (L2)
GND

AB
1769-PA2
COMPACTLOGIX
POWER SUPPLY
PLCA24

PWR OUT +24VDC
PWR OUT COM
120/240VAC (L1)
VAC COM (L2)
GND

A2131

A2132

AB
2711P-T10C4D8
PANELVIEW PLUS 6
10" TOUCH SCREEN
ETH & RS-232 COMMS
PLCA25

A2221

from A2-36
+24

A2222

from A2-36
COM

GND

TO
ETHERNET
SWITCH

RJ-45
COMM 0

DB9-M
COMM 1

USB
COMM 2

USB
COMM 3

IP: 192.168.51.111

DRIVER:
BAUD:
PARITY:
NODE:

A
to A5-00

B
to A5-00

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION
A1

LOCATION
LCP-BEACON

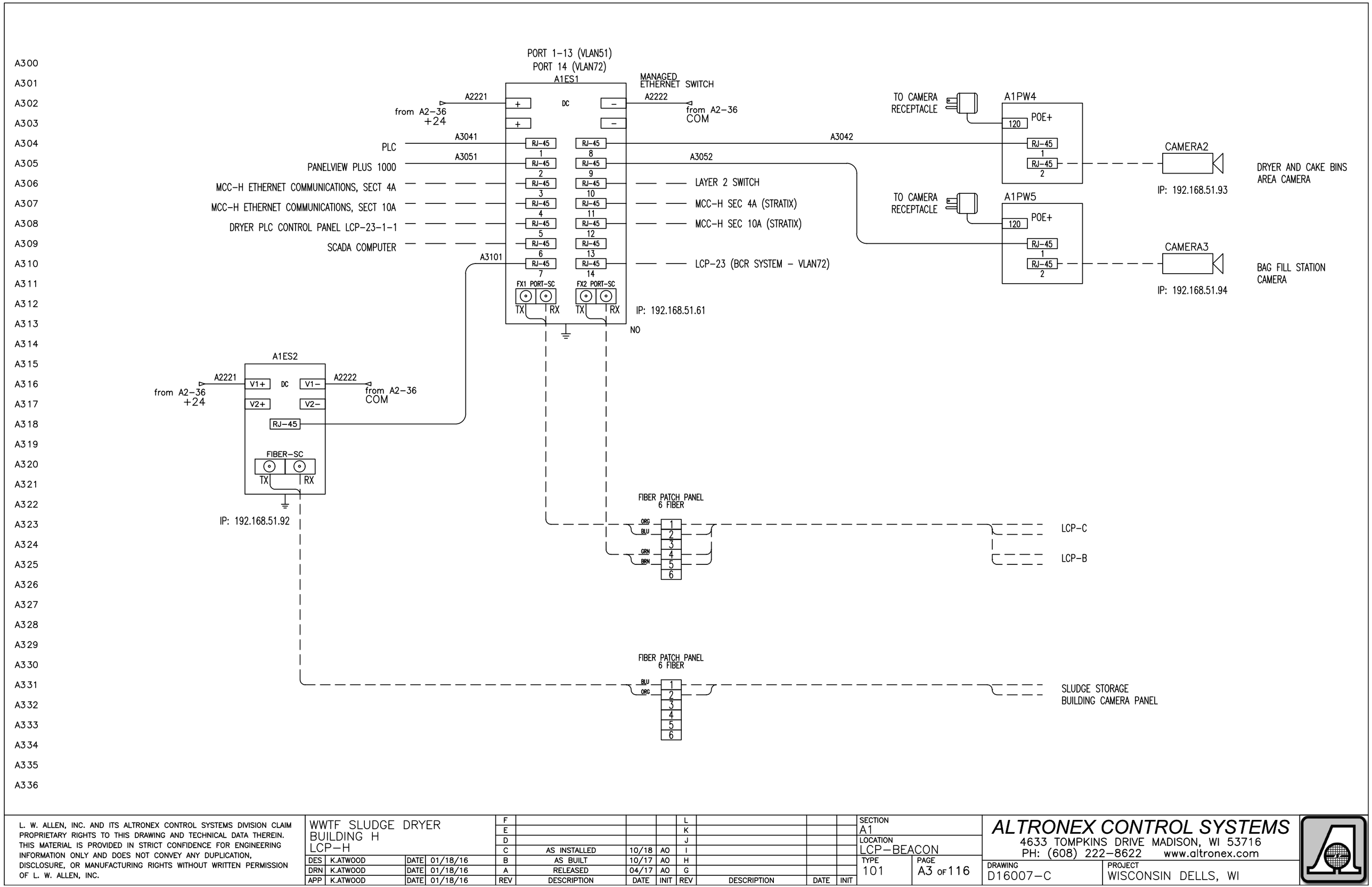
TYPE
101

PAGE
A2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D16007-C

PROJECT
WISCONSIN DELLS, WI



L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

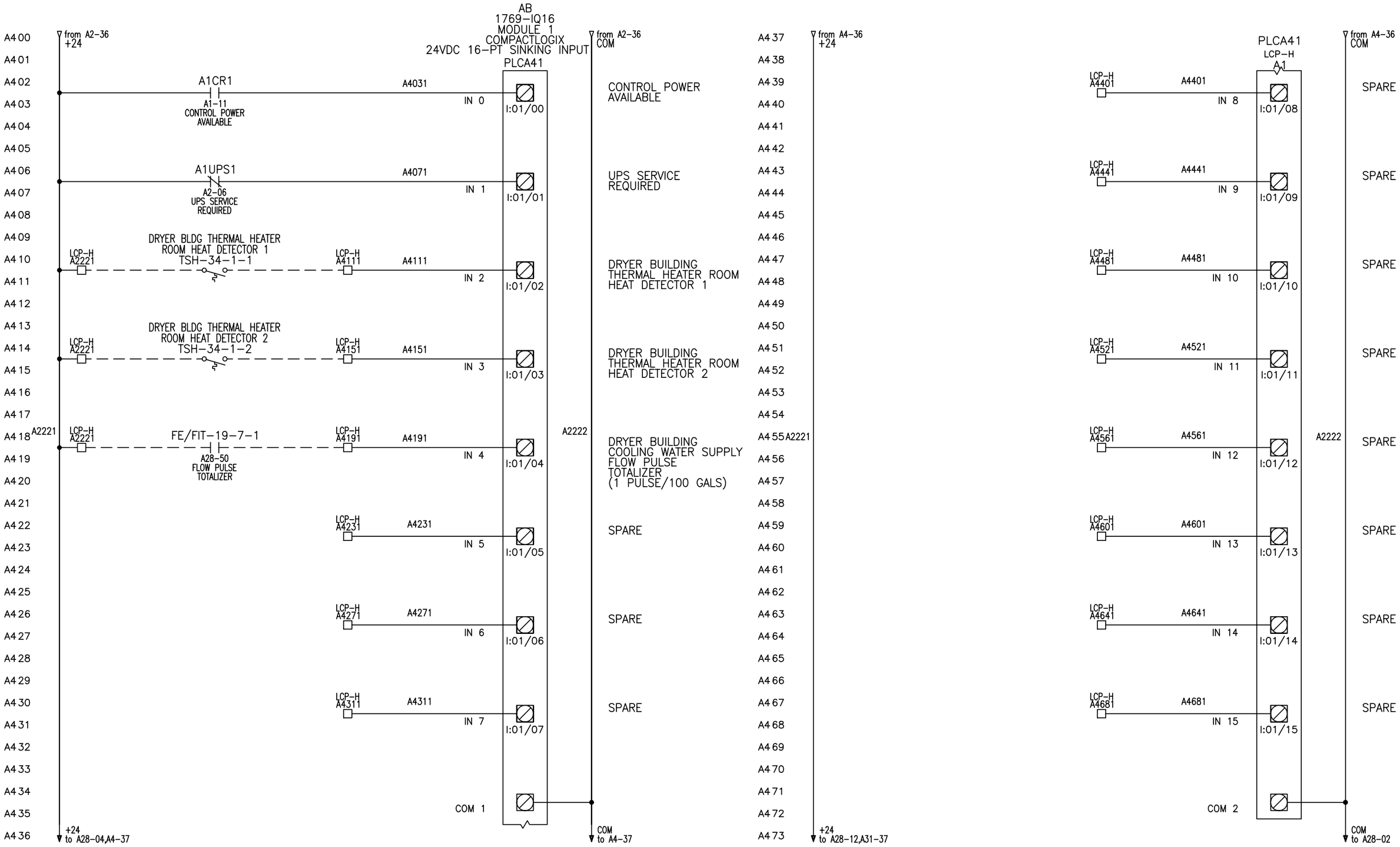
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B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
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SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A3 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
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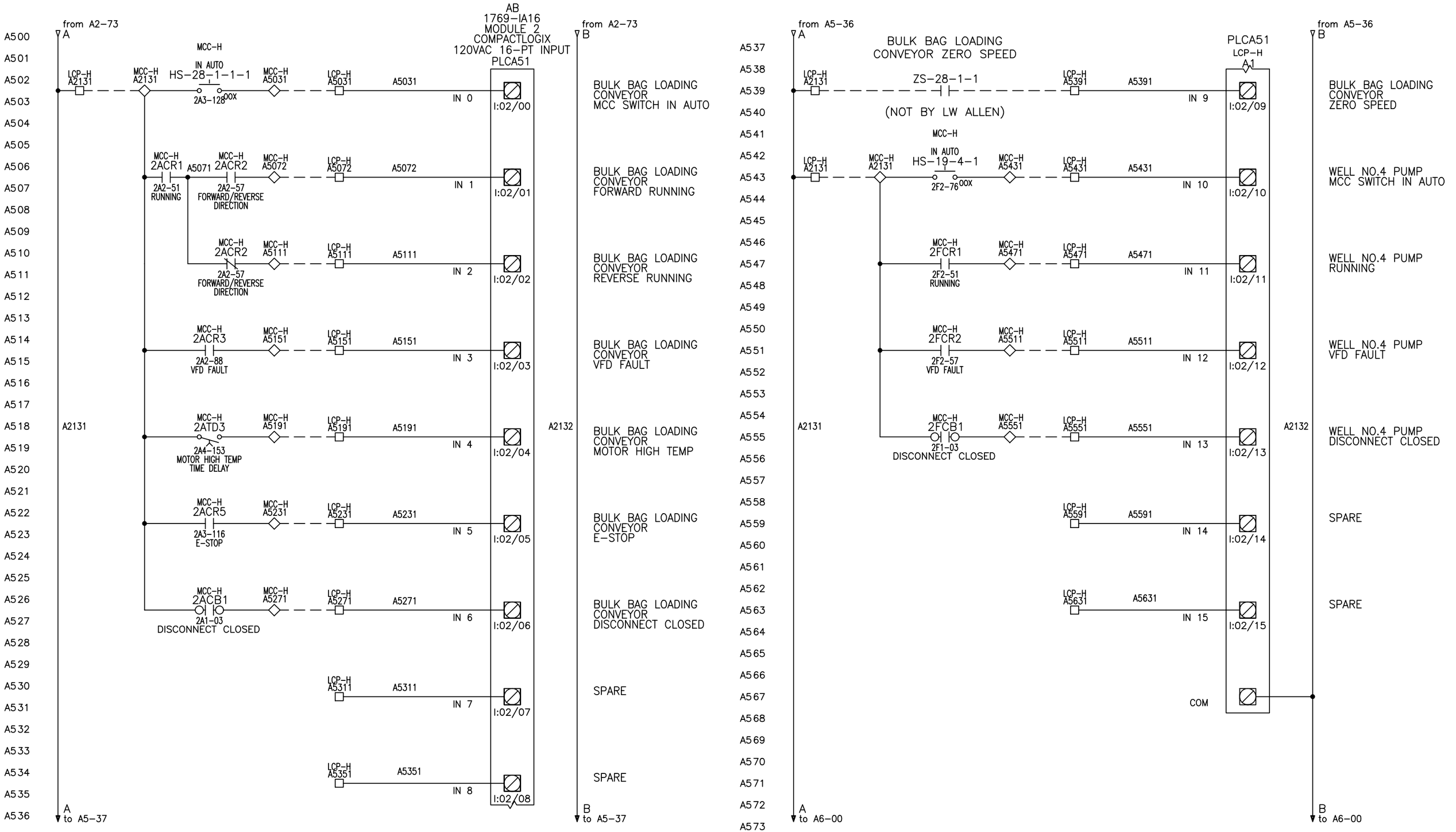
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REV	DESCRIPTION	DATE	INIT
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K			
J			
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G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A4 OF 116

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
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APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
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REV	DESCRIPTION	DATE	INIT
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K			
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H			
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SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A5 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A5-73
A

AB
1769-IA16
MODULE 3
COMPACTLOGIX
120VAC 16-PT INPUT
PLCA61

DRYER BLDG COOLING H20
SUPPLY LOW PRESSURE
PSL-19-6-1
SET AT 45 PSI

LCP-H A2131 — LCP-H A6031 — A6031 — IN 0 — I:03/00

MCC-H
IN AUTO
HS-27-1-1-1
3A3-128 OOX

LCP-H A2131 — MCC-H A2131 — MCC-H A6071 — LCP-H A6071 — A6071 — IN 1 — I:03/01

MCC-H 3ACR1 — 3A2-51 RUNNING
A6111
MCC-H 3ACR2 — 3A2-57 FORWARD/REVERSE DIRECTION
MCC-H A6112 — LCP-H A6112 — A6112 — IN 2 — I:03/02

MCC-H 3ACR2 — 3A2-57 FORWARD/REVERSE DIRECTION
MCC-H A6151 — LCP-H A6151 — A6151 — IN 3 — I:03/03

A2131
MCC-H 3ACR3 — 3A2-88 VFD FAULT
MCC-H A6191 — LCP-H A6191 — A6191 — IN 4 — I:03/04

MCC-H 3ATD3 — 3A4-153 MOTOR HIGH TEMP TIME DELAY
MCC-H A6231 — LCP-H A6231 — A6231 — IN 5 — I:03/05

3ACR4 — 3A3-113 E-STOP
MCC-H A6271 — LCP-H A6271 — A6271 — IN 6 — I:03/06

MCC-H 3ACB1 — 3A1-03 DISCONNECT CLOSED
MCC-H A6311 — LCP-H A6311 — A6311 — IN 7 — I:03/07

LCP-H A6351 — A6351 — IN 8 — I:03/08

A
to A6-37

from A5-73
B

DRYER BUILDING COOLING WATER SUPPLY LOW PRESSURE

TRANSFER CONVEYOR MCC SWITCH IN AUTO

TRANSFER CONVEYOR FORWARD RUNNING

TRANSFER CONVEYOR REVERSE RUNNING

A2132
TRANSFER CONVEYOR VFD FAULT

TRANSFER CONVEYOR MOTOR HIGH TEMP

TRANSFER CONVEYOR E-STOP

TRANSFER CONVEYOR DISCONNECT CLOSED

SPARE

B
to A6-37

from A6-36
A

PLCA61
LCP-H
A1

LCP-H A6391 — A6391 — IN 9 — I:03/09

TRANSFER CONVEYOR
ZERO SPEED
LCP-H A2131 — ZS-27-1-1 — LCP-H A6431 — A6431 — IN 10 — I:03/10
(NOT BY LW ALLEN)

TRANSFER CONVEYOR
ROLLER GATE NO.1
XS-27-2-1
CLOSE
OPEN AUTO
LCP-H A2131 — OOX — LCP-H A6471 — A6471 — IN 11 — I:03/11

A2131
X00 — LCP-H A6511 — A6511 — IN 12 — I:03/12

TRANSFER CONVEYOR
ROLLER GATE 1 OPEN
GV-27-2-1-1
LCP-H A2131 — LCP-H A6551 — A6551 — IN 13 — I:03/13
(NOT BY LW ALLEN)

TRANSFER CONVEYOR
ROLLER GATE 1 CLOSED
GV-27-2-1-2
LCP-H A6591 — A6591 — IN 14 — I:03/14
(NOT BY LW ALLEN)

LCP-H A6631 — A6631 — IN 15 — I:03/15

COM

A
to A7-00

from A6-36
B

SPARE

TRANSFER CONVEYOR
ROLLER GATE NO.1
GV-27-2-1
IN AUTO
FROM XS-27-2-1

TRANSFER CONVEYOR
ROLLER GATE NO.1
GV-27-2-1
OPEN COMMAND
FROM XS-27-2-1

A2132
TRANSFER CONVEYOR
ROLLER GATE NO.1
GV-27-2-1
OPEN

TRANSFER CONVEYOR
ROLLER GATE NO.1
GV-27-2-1
CLOSED

SPARE

B
to A7-00

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

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SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A6 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A6-73
A

AB
1769-IA16
MODULE 4
COMPACTLOGIX
120VAC 16-PT INPUT
PLCA71

from A6-73
B

from A7-36
A

from A7-36
3F

PLCA71
LCP-H
A1

from A7-36
B

A700
A701
A702
A703
A704
A705
A706
A707
A708
A709
A710
A711
A712
A713
A714
A715
A716
A717
A718
A719
A720
A721
A722
A723
A724
A725
A726
A727
A728
A729
A730
A731
A732
A733
A734
A735
A736

TRANSFER CONVEYOR ROLLER GATE NO. 2 XS-27-2-2
CLOSE / OPEN / AUTO
00X
X00
LCP-H A2131
LCP-H A7021 A7021 IN 0 I:04/00
LCP-H A7061 A7061 IN 1 I:04/01

TRANSFER CONVEYOR ROLLER GATE 2 OPEN GV-27-2-2-1
LCP-H A2131
LCP-H A7101 A7101 IN 2 I:04/02

TRANSFER CONVEYOR ROLLER GATE 2 CLOSED GV-27-2-2-2
LCP-H A2131
LCP-H A7141 A7141 IN 3 I:04/03

A2131
LCP-H A2131
MCC-H A2131
MCC-H 3GCR4
3G2-82 REQUIRED
MCC-H A7181
LCP-H A7181 A7181 IN 4 I:04/04

MCC-H 3GCR1
3G2-51 RUNNING
MCC-H A7221
LCP-H A7221 A7221 IN 5 I:04/05

MCC-H 3GCR2
3G2-57 VFD FAULT
MCC-H A7261
LCP-H A7261 A7261 IN 6 I:04/06

MCC-H 3GTD2
3G2-100 MOTOR HIGH TEMP TIME DELAY
MCC-H A7301
LCP-H A7301 A7301 IN 7 I:04/07

3GCR3
3G2-76 E-STOP ACTIVATED
MCC-H A7341
LCP-H A7341 A7341 IN 8 I:04/08

A2132
TRANSFER CONVEYOR ROLLER GATE NO.2 GV-27-2-2 IN AUTO FROM XS-27-2-2
TRANSFER CONVEYOR ROLLER GATE NO.2 GV-27-2-2 OPEN COMMAND FROM XS-27-2-2
TRANSFER CONVEYOR ROLLER GATE NO.2 GV-27-2-2 OPEN
TRANSFER CONVEYOR ROLLER GATE NO.2 GV-27-2-2 CLOSED
TRUCK LOADING MOBILE CONVEYOR REQUIRED
TRUCK LOADING MOBILE CONVEYOR RUNNING
TRUCK LOADING MOBILE CONVEYOR VFD FAULT
TRUCK LOADING MOBILE CONVEYOR MOTOR HIGH TEMP
TRUCK LOADING MOBILE CONVEYOR E-STOP

A737
A738
A739
A740
A741
A742
A743
A744
A745
A746
A747
A748
A749
A750
A751
A752
A753
A754
A755
A756
A757
A758
A759
A760
A761
A762
A763
A764
A765
A766
A767
A768
A769
A770
A771
A772
A773

A2131
MCC-H 3GCB1
3G1-03 DISCONNECT CLOSED
MCC-H A7391
LCP-H A7391 A7391 IN 9 I:04/09

LCP-H A7431 A7431 IN 10 I:04/10

LCP-H A7471 A7471 IN 11 I:04/11

SPEED INCREASE XS-27-4-1 HS-27-4-1-3
LCP-H A2131
LCP-H A7511 A7511 IN 12 I:04/12

SPEED DECREASE XS-27-4-1 HS-27-4-1-4
A2131
LCP-H A7551 A7551 IN 13 I:04/13

LCP-H A7591 A7591 IN 14 I:04/14

LCP-H A7631 A7631 IN 15 I:04/15

COM

A2132
TRUCK LOADING MOBILE CONVEYOR DISCONNECT CLOSED
SPARE
SPARE
TRUCK LOADING MOBILE CONVEYOR SPEED INCREASE
TRUCK LOADING MOBILE CONVEYOR SPEED DECREASE
SPARE
SPARE
SPARE

A to A7-37
3F to A7-37
B to A7-37
A to A8-00
B to A8-00

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

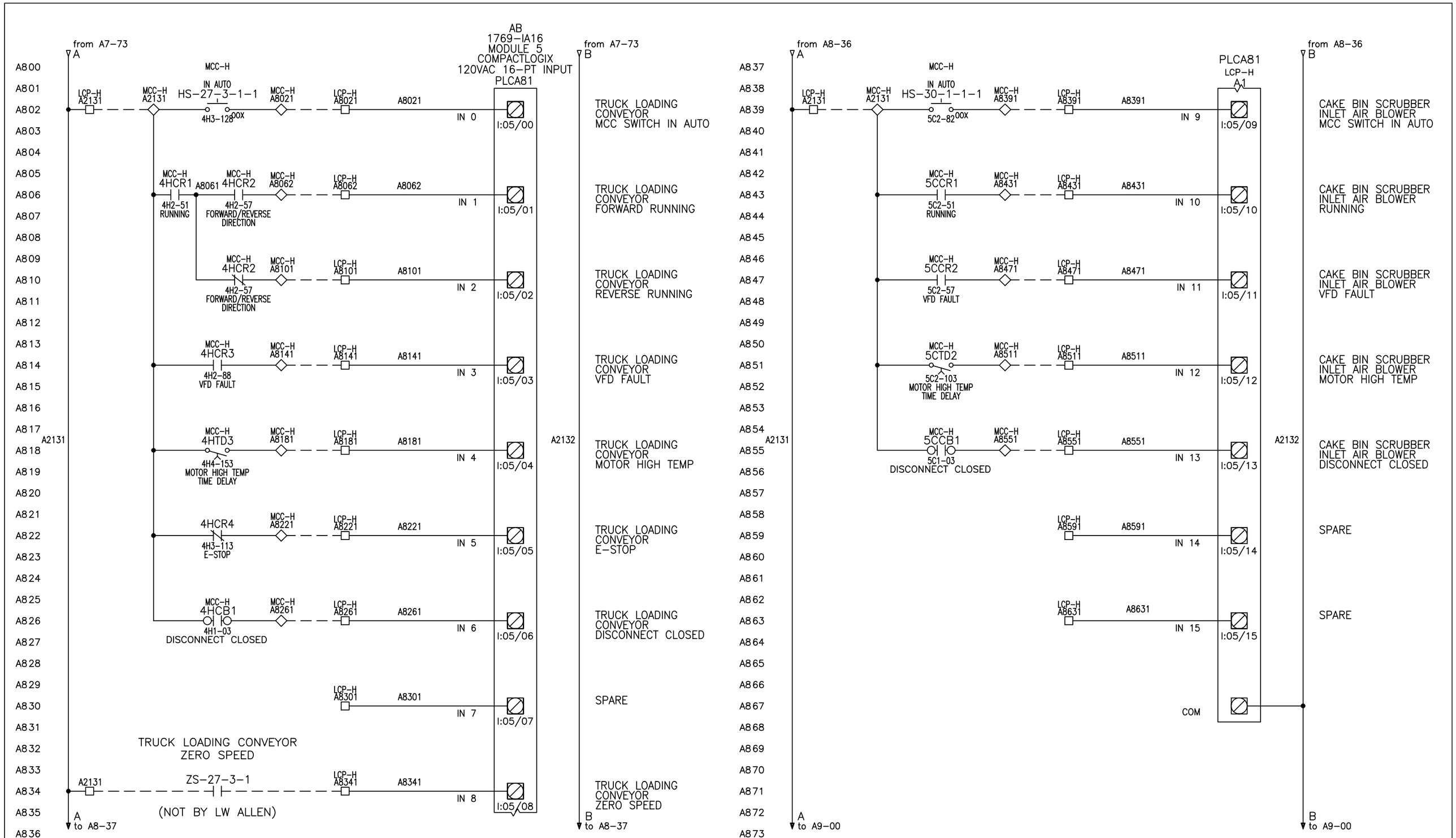
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SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A7 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

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SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A8 OF 116

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4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A8-73
A

AB
1769-IA16
MODULE 6
COMPACTLOGIX
120VAC 16-PT INPUT
PLCA91

from A8-73
B

from A9-36
A

from A9-36
5H

PLCA91
LCP-H
A1

from A9-36
B

A900
A901
A902 — LCP-H A9021 — A9021 — IN 0 — I:06/00 — SPARE
A903
A904
A905 — SPEED INCREASE XS-30-1-1 HS-30-1-1-4 — LCP-H A2131
A906 — LCP-H A9061 — A9061 — IN 1 — I:06/01 — CAKE BIN SCRUBBER INLET AIR BLOWER SPEED INCREASE
A907
A908
A909 — SPEED DECREASE XS-30-1-1 HS-30-1-1-5
A910 — LCP-H A9101 — A9101 — IN 2 — I:06/02 — CAKE BIN SCRUBBER INLET AIR BLOWER SPEED DECREASE
A911
A912
A913 — MCC-H IN AUTO HS-18-3-1-1 — LCP-H A2131 — MCC-H A2131 — MCC-H A9141 — LCP-H A9141 — A9141
A914 — 5H3-130 OOX — IN 3 — I:06/03 — CAKE SCREW CONVEYOR IN AUTO
A915
A916
A917 — A2131 — MCC-H 5HCR1 — A9181 — MCC-H 5HCR2 — MCC-H A9182 — LCP-H A9182 — A9182
A918 — 5H2-51 RUNNING — 5H2-57 FORWARD/REVERSE DIRECTION — IN 4 — I:06/04 — A2132 — CAKE SCREW CONVEYOR FORWARD RUNNING
A919
A920
A921 — MCC-H 5HCR2 — MCC-H A9221 — LCP-H A9221 — A9221
A922 — 5H2-57 FORWARD/REVERSE DIRECTION — IN 5 — I:06/05 — CAKE SCREW CONVEYOR REVERSE RUNNING
A923
A924
A925 — MCC-H 5HCR3 — MCC-H A9261 — LCP-H A9261 — A9261
A926 — 5H2-88 VFD FAULT — IN 6 — I:06/06 — CAKE SCREW CONVEYOR VFD FAULT
A927
A928
A929 — MCC-H 5HTD3 — MCC-H A9301 — LCP-H A9301 — A9301
A930 — 5H4-153 MOTOR HIGH TEMP TIME DELAY — IN 7 — I:06/07 — CAKE SCREW CONVEYOR MOTOR HIGH TEMP
A931
A932
A933 — 5HCR4 — MCC-H A9341 — LCP-H A9341 — A9341
A934 — 5H3-113 E-STOP — IN 8 — I:06/08 — CAKE SCREW CONVEYOR E-STOP
A935
A936

A937
A938 — A2131 — MCC-H 5HCB1 — MCC-H A9391 — LCP-H A9391 — A9391
A939 — 5H1-03 DISCONNECT CLOSED — IN 9 — I:06/09 — CAKE SCREW CONVEYOR DISCONNECT CLOSED
A940
A941
A942 — LCP-H A9431 — A9431
A943 — IN 10 — I:06/10 — SPARE
A944
A945 — CAKE SCREW CONVEYOR ZERO SPEED
A946
A947 — LCP-H A2131 — ZS-18-3-1 — LCP-H A9471 — A9471 — IN 11 — I:06/11 — CAKE SCREW CONVEYOR ZERO SPEED
A948 — (NOT BY LW ALLEN)
A949
A950
A951 — LCP-H A9511 — A9511 — IN 12 — I:06/12 — SPARE
A952
A953
A954
A955 — A2131 — LCP-H A9551 — A9551 — IN 13 — I:06/13 — A2132 — SPARE
A956
A957
A958
A959 — LCP-H A9591 — A9591 — IN 14 — I:06/14 — SPARE
A960
A961
A962
A963 — LCP-H A9631 — A9631 — IN 15 — I:06/15 — SPARE
A964
A965
A966
A967 — COM
A968
A969
A970
A971
A972
A973

A to A9-37
5H to A9-37
B to A9-37
A to A10-00
B to A10-00

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WWTF SLUDGE DRYER
BUILDING H
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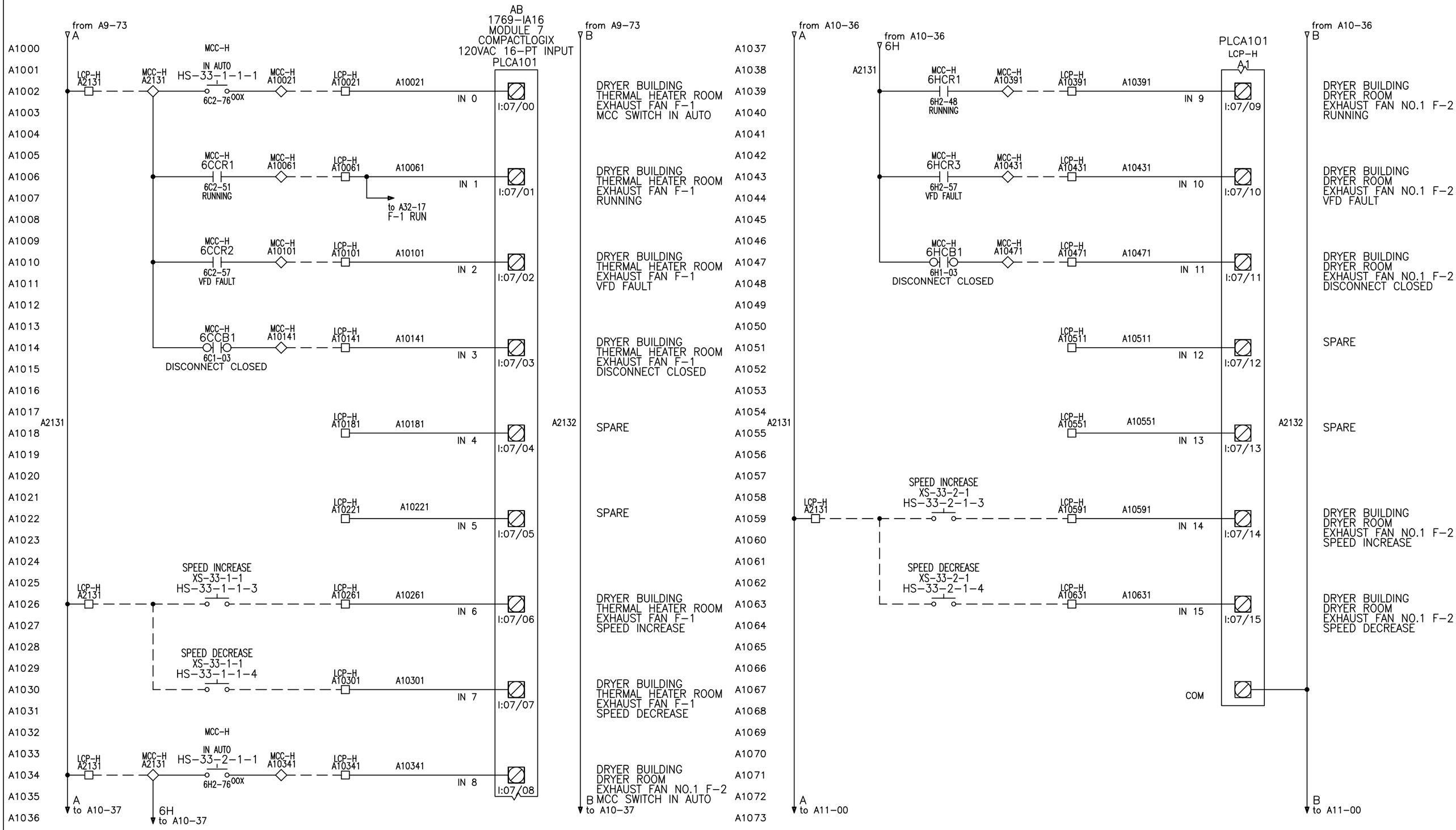
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REV	DESCRIPTION	DATE	INIT
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SECTION: A1
LOCATION: LCP-BEACON
TYPE: 101
PAGE: A9 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING: D16007-C
PROJECT: WISCONSIN DELLS, WI



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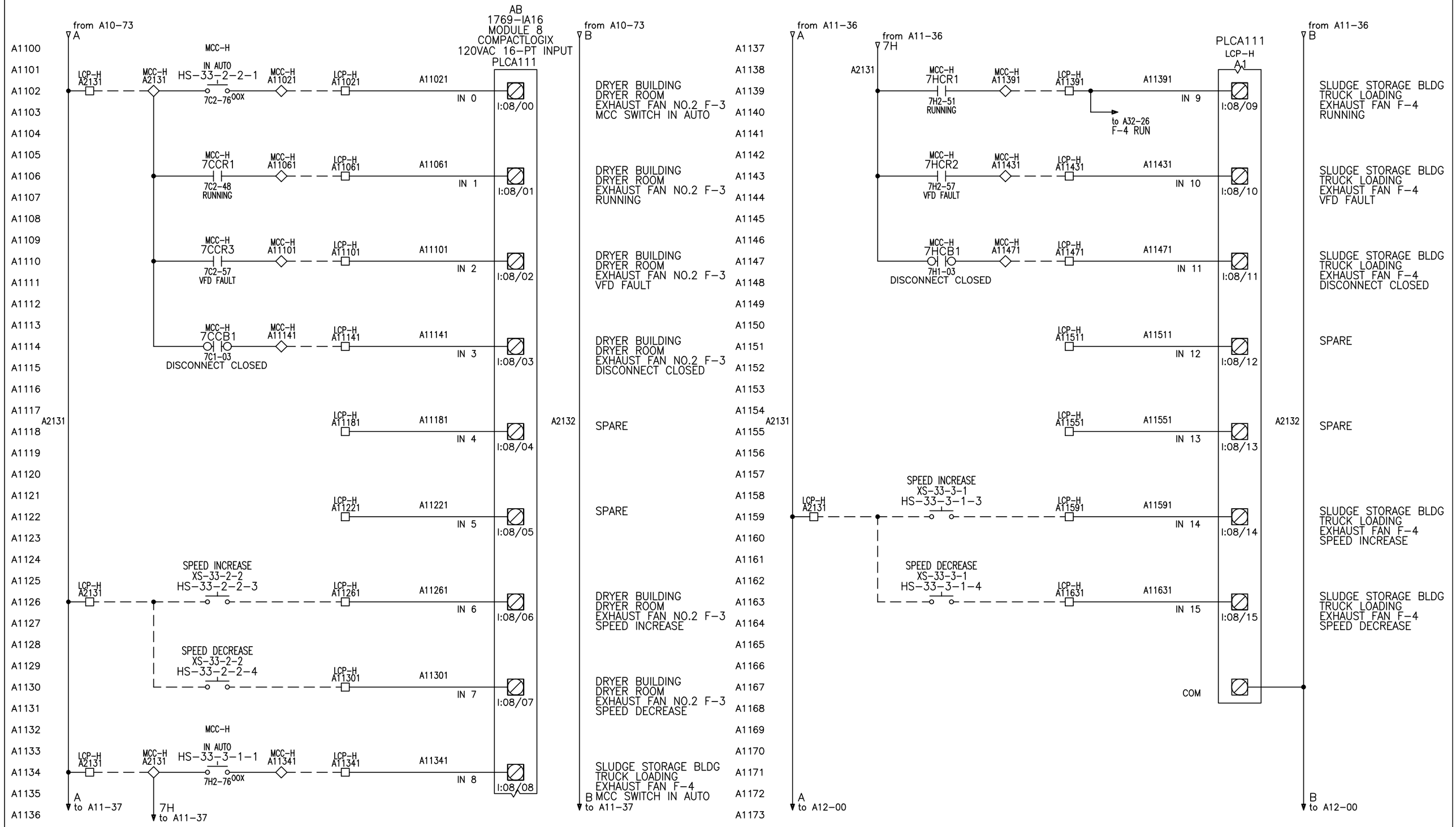
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WWTF SLUDGE DRYER
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LCP-H

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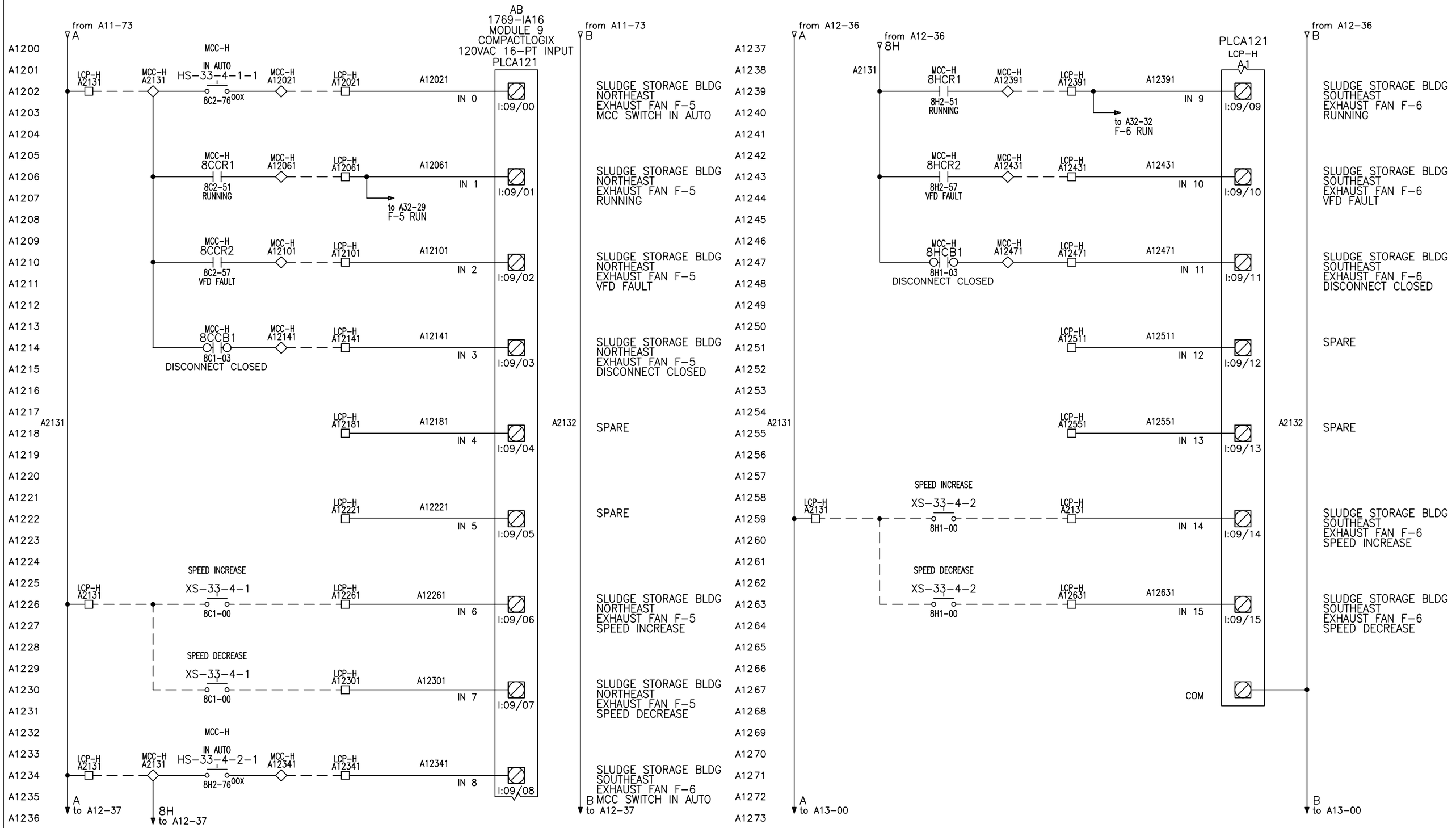
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L			
K			
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

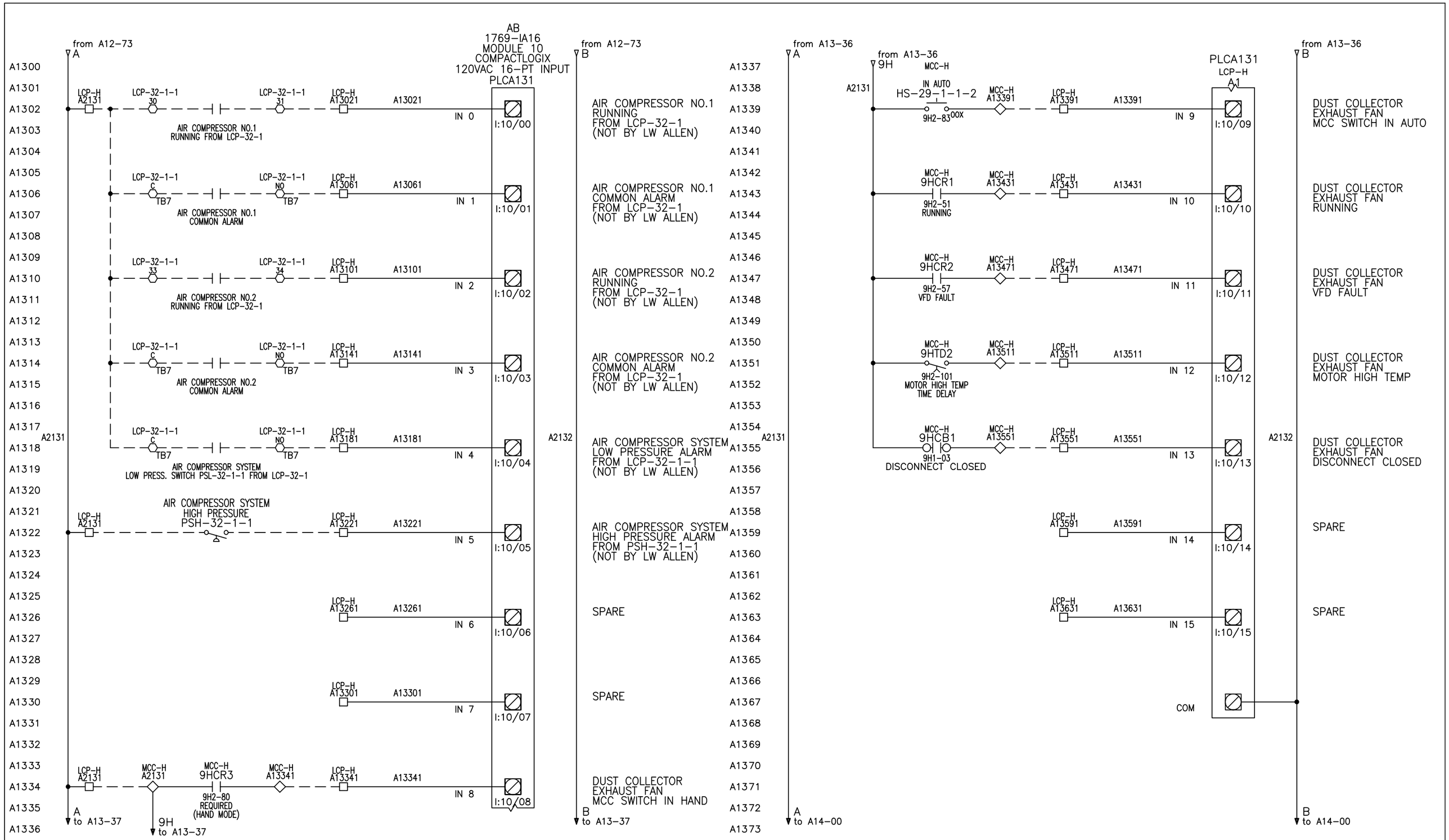
REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A12 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

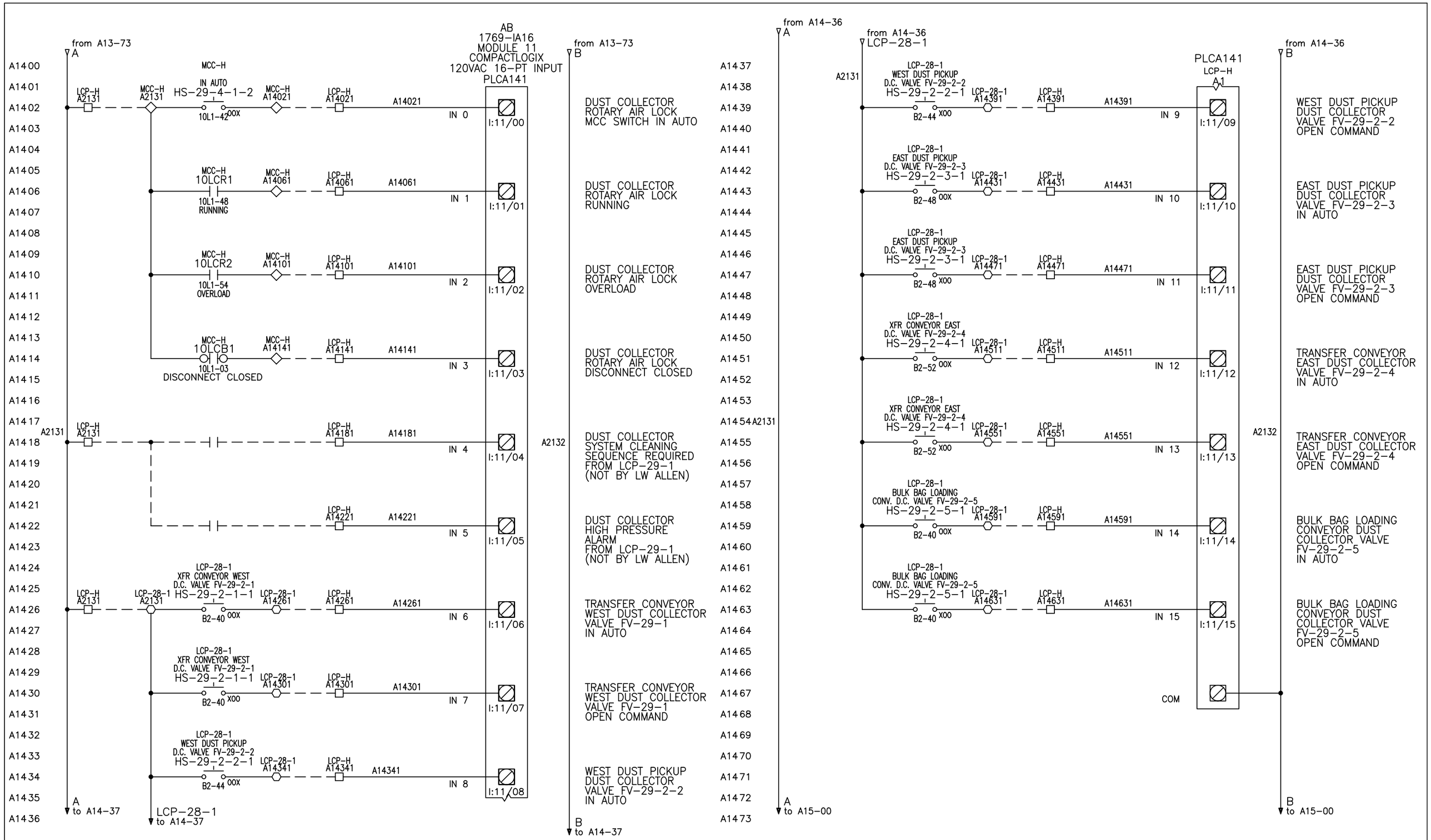
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DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A13 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A14 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A14-73
A

AB
1769-IA16
MODULE 12
COMPACTLOGIX
120VAC 16-PT INPUT
PLCA151

A1500
A1501
A1502 — LCP-H A2131 — ? — ? — LCP-H A15021 — A15021 — IN 0 — I:12/00
A1503
A1504
A1505
A1506 — LCP-H A2131 — ? — ? — LCP-H A15061 — A15061 — IN 1 — I:12/01
A1507
A1508
A1509
A1510 — ? — ? — LCP-H A15101 — A15101 — IN 2 — I:12/02
A1511
A1512
A1513
A1514 — ? — ? — LCP-H A15141 — A15141 — IN 3 — I:12/03
A1515
A1516
A1517
A2131
A1518 — ? — ? — LCP-H A15181 — A15181 — IN 4 — I:12/04
A1519
A1520
A1521 — MCC-H — IN AUTO
A1522 — LCP-H A2131 — MCC-H A2131 — HS-28-2-1-1 — MCC-H A15221 — LCP-H A15221 — A15221 — IN 5 — I:12/05
11A1-42 OOX
A1523
A1524
A1525
A1526 — MCC-H 11ACR1 — MCC-H A15261 — LCP-H A15261 — A15261 — IN 6 — I:12/06
11A1-48 RUNNING
A1527
A1528
A1529
A1530 — MCC-H 11ACR2 — MCC-H A15301 — LCP-H A15301 — A15301 — IN 7 — I:12/07
11A1-54 OVERLOAD
A1531
A1532
A1533
A1534 — MCC-H 11ACB1 — MCC-H A15341 — LCP-H A15341 — A15341 — IN 8 — I:12/08
11A1-03 DISCONNECT CLOSED
A1535
A1536

A
to A15-37

from A14-73
B

A2132
A1537 — OPEN INLET AIR DAMPERS (DL-2A & DL-2B) FROM LCP-25-(1) OR (2) (NOT BY LW ALLEN)
A1538
A1539
A1540
A1541
A1542 — NITROGEN GENERATOR SYSTEM AIR COMPRESSOR IN AUTO
A1543
A1544
A1545
A1546
A1547 — NITROGEN GENERATOR SYSTEM AIR COMPRESSOR HIGH TEMPERATURE
A1548
A1549
A1550
A1551 — NITROGEN GENERATOR SYSTEM AIR COMPRESSOR SYSTEM MALFUNCTION
A1552
A1553
A1554
A2131
A1555 — NITROGEN GENERATOR SYSTEM AIR COMPRESSOR FAIL/PURITY ALARM
A1556
A1557
A1558
A1559 — BULK BAG INFLATING BLOWER IN AUTO
A1560
A1561
A1562
A1563 — BULK BAG INFLATING BLOWER RUNNING
A1564
A1565
A1566
A1567 — BULK BAG INFLATING BLOWER OVERLOAD
A1568
A1569
A1570
A1571 — BULK BAG INFLATING BLOWER DISCONNECT CLOSED
A1572
A1573

B
to A15-37

from A15-36
A

PLCA151
LCP-H
A1

A1537
A1538
A1539 — LCP-H A2131 — WARM CONDENSATE WETWELL HIGH LEVEL LSHH-31-2-1 — LCP-H A15391 — A15391 — IN 9 — I:12/09
A1540
A1541
A1542 — MCC-H IN AUTO
A1543 — LCP-H A2131 — MCC-H A2131 — HS-31-1-1-2 — MCC-H A15431 — LCP-H A15431 — A15431 — IN 10 — I:12/10
11C2-82 OOX
A1544
A1545
A1546
A1547 — MCC-H 11CCR1 — MCC-H A15471 — LCP-H A15471 — A15471 — IN 11 — I:12/11
11C2-51 RUNNING
A1548
A1549
A1550
A1551 — MCC-H 11CCR2 — MCC-H A15511 — LCP-H A15511 — A15511 — IN 12 — I:12/12
11C2-57 VFD FAULT
A1552
A1553
A1554
A2131
A1555 — MCC-H 11CTD2 — MCC-H A15551 — LCP-H A15551 — A15551 — IN 13 — I:12/13
11C2-91 MOTOR HIGH TEMP TIME DELAY
A1556
A1557
A1558
A1559 — MCC-H 11CCR5 — MCC-H A15591 — LCP-H A15591 — A15591 — IN 14 — I:12/14
11C2-104 SEAL FAIL
A1560
A1561
A1562
A1563 — MCC-H 11CCB1 — MCC-H A15631 — LCP-H A15631 — A15631 — IN 15 — I:12/15
11C1-03 DISCONNECT CLOSED
A1564
A1565
A1566
A1567 — COM
A1568
A1569
A1570
A1571
A1572
A1573

A
to A16-00

from A15-36
B

A2132
CONDENSATE WASTE WETWETLL HIGH LEVEL
CONDENSATE WASTE PUMP NO.1 MCC SWITCH IN AUTO
CONDENSATE WASTE PUMP NO.1 RUNNING
CONDENSATE WASTE PUMP NO.1 VFD FAULT
CONDENSATE WASTE PUMP NO.1 MOTOR HIGH TEMP
CONDENSATE WASTE PUMP NO.1 SEAL FAIL
CONDENSATE WASTE PUMP NO.1 DISCONNECT CLOSED

B
to A16-00

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
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APP	K.ATWOOD	DATE	01/18/16

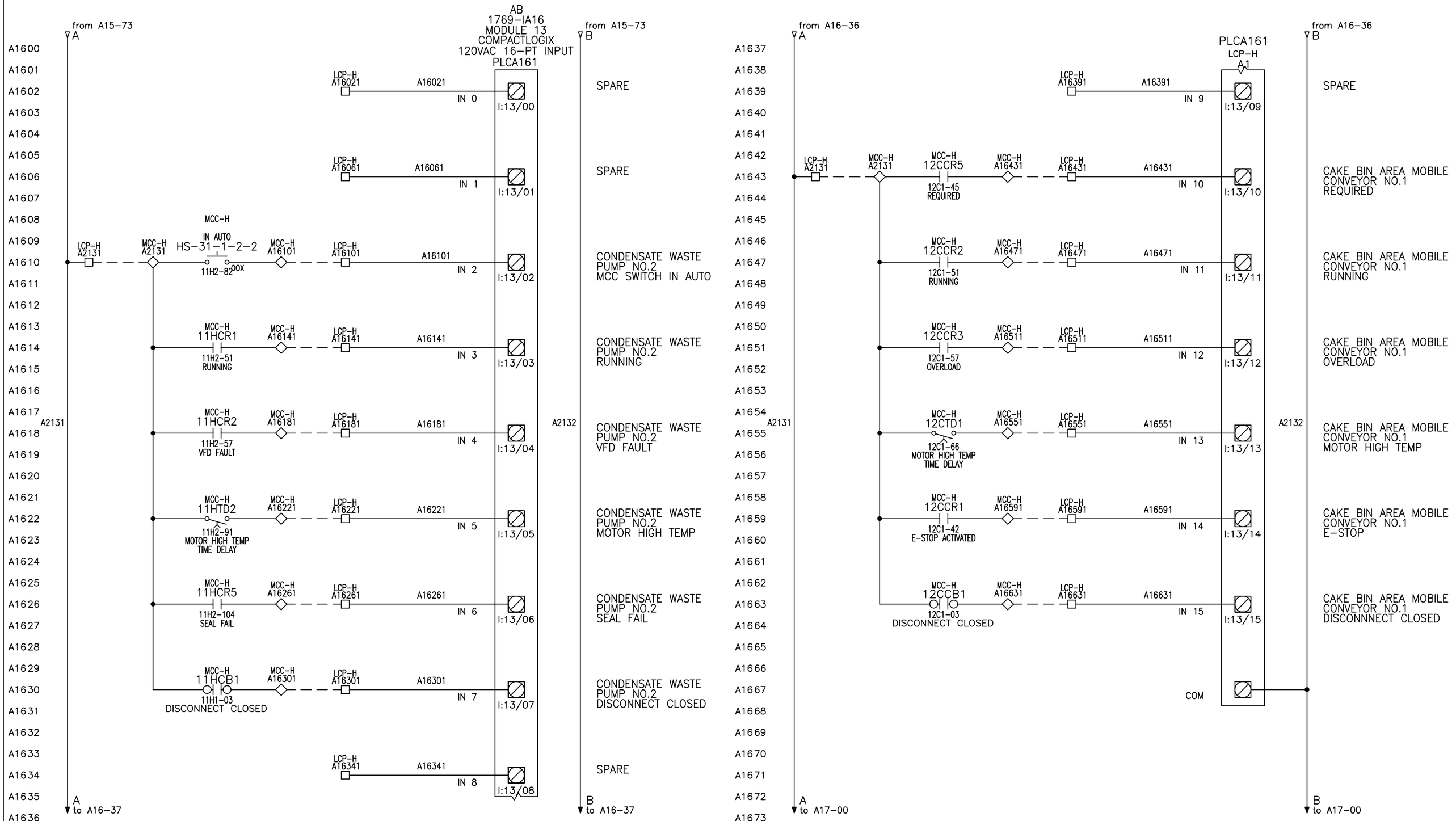
REV	DESCRIPTION	DATE	INIT
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C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A15 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
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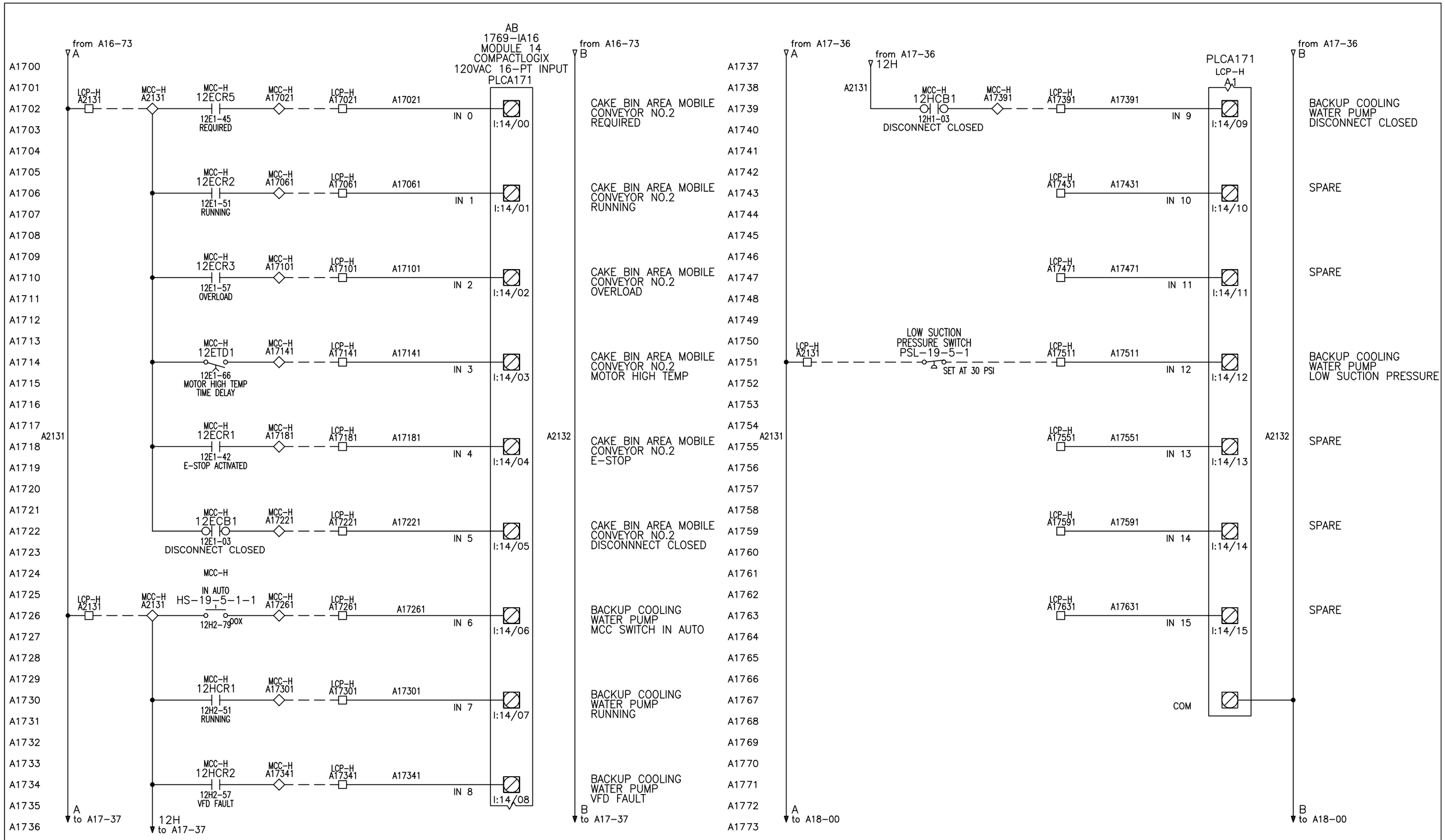
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D			
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A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
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G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A16 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

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APP	K.ATWOOD	DATE	01/18/16

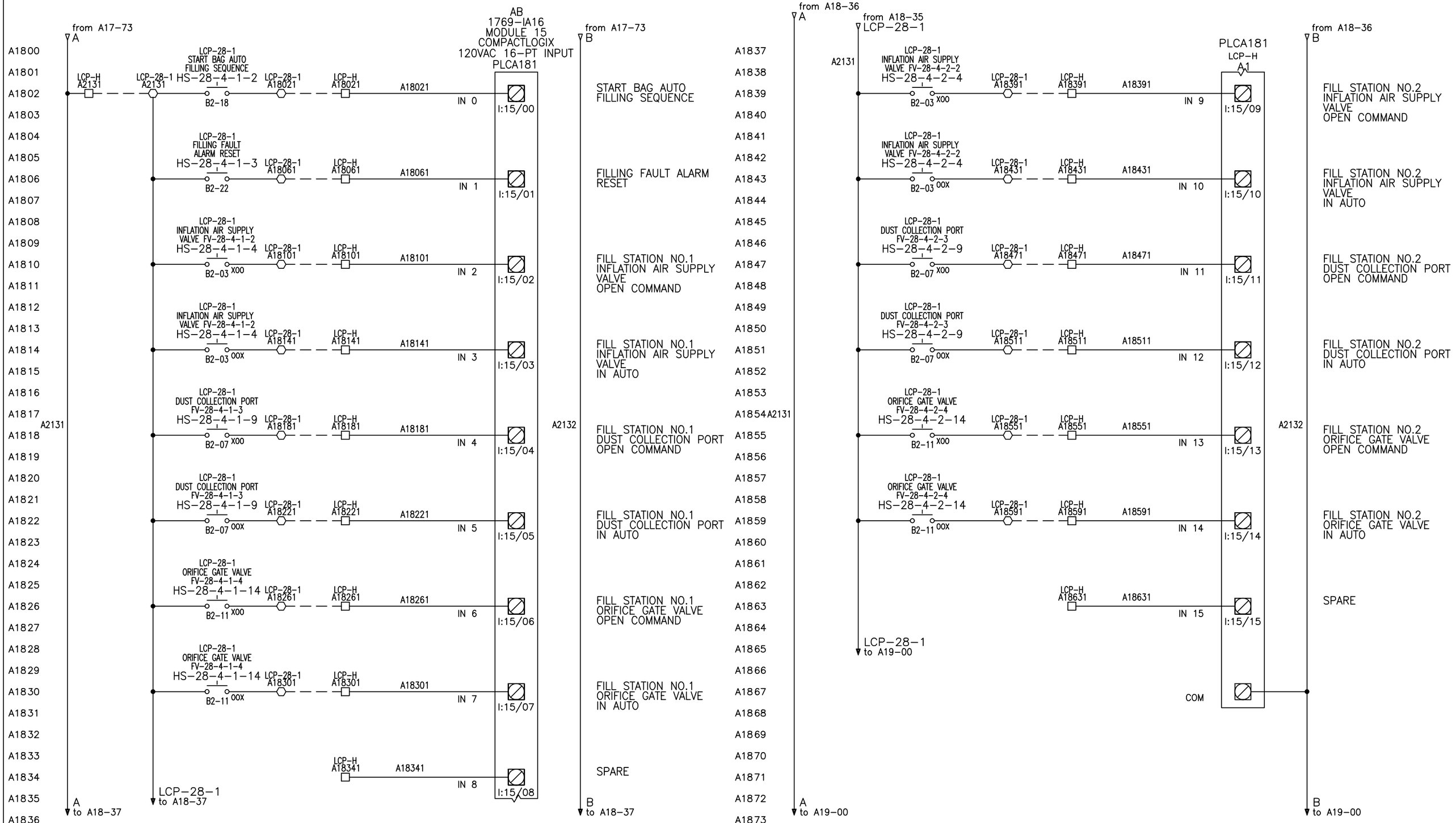
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C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
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H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A17 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

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APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A18 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A18-73
A

from A18-65
LCP-28-1

AB
1769-IA16
MODULE 16
COMPACTLOGIX
120VAC 16-PT INPUT
PLCA191

from A18-73
B

A1900 A1901 A1902 A1903 A1904 A1905 A1906 A1907 A1908 A1909 A1910 A1911 A1912 A1913 A1914 A1915 A1916 A1917 A2131 A1918 A1919 A1920 A1921 A1922 A1923 A1924 A1925 A1926 A1927 A1928 A1929 A1930 A1931 A1932 A1933 A1934 A1935 A1936

A2131

LCP-28-1
INFLATION AIR SUPPLY
VALVE FV-28-4-3-2
HS-28-4-3-4 LCP-28-1 A19021 — LCP-H A19021 — A19021
B2-03 X00 — IN 0 — I:16/00

LCP-28-1
INFLATION AIR SUPPLY
VALVE FV-28-4-3-2
HS-28-4-3-4 LCP-28-1 A19061 — LCP-H A19061 — A19061
B2-03 00X — IN 1 — I:16/01

LCP-28-1
DUST COLLECTION PORT
FV-28-4-3-3
HS-28-4-3-9 LCP-28-1 A19101 — LCP-H A19101 — A19101
B2-07 X00 — IN 2 — I:16/02

LCP-28-1
DUST COLLECTION PORT
FV-28-4-3-3
HS-28-4-3-9 LCP-28-1 A19141 — LCP-H A19141 — A19141
B2-07 00X — IN 3 — I:16/03

LCP-28-1
ORIFICE GATE VALVE
FV-28-4-3-4
HS-28-4-3-14 LCP-28-1 A19181 — LCP-H A19181 — A19181
B2-11 X00 — IN 4 — I:16/04

LCP-28-1
ORIFICE GATE VALVE
FV-28-4-3-4
HS-28-4-3-14 LCP-28-1 A19221 — LCP-H A19221 — A19221
B2-11 00X — IN 5 — I:16/05

LCP-H A19261 — A19261
IN 6 — I:16/06

LCP-28-1
INFLATION AIR SUPPLY
VALVE FV-28-4-4-2
HS-28-4-4-4 LCP-28-1 A19301 — LCP-H A19301 — A19301
B2-03 X00 — IN 7 — I:16/07

LCP-28-1
INFLATION AIR SUPPLY
VALVE FV-28-4-4-2
HS-28-4-4-4 LCP-28-1 A19341 — LCP-H A19341 — A19341
B2-03 00X — IN 8 — I:16/08

A2132

FILL STATION NO.3
INFLATION AIR SUPPLY
VALVE
OPEN COMMAND

FILL STATION NO.3
INFLATION AIR SUPPLY
VALVE
IN AUTO

FILL STATION NO.3
DUST COLLECTION PORT
OPEN COMMAND

FILL STATION NO.3
DUST COLLECTION PORT
IN AUTO

FILL STATION NO.3
ORIFICE GATE VALVE
OPEN COMMAND

FILL STATION NO.3
ORIFICE GATE VALVE
IN AUTO

SPARE

FILL STATION NO.4
INFLATION AIR SUPPLY
VALVE
OPEN COMMAND

FILL STATION NO.4
INFLATION AIR SUPPLY
VALVE
IN AUTO

A1937 A1938 A1939 A1940 A1941 A1942 A1943 A1944 A1945 A1946 A1947 A1948 A1949 A1950 A1951 A1952 A1953 A1954 A2131 A1955 A1956 A1957 A1958 A1959 A1960 A1961 A1962 A1963 A1964 A1965 A1966 A1967 A1968 A1969 A1970 A1971 A1972 A1973

from A19-36
A

from A19-36
LCP-28-1

PLCA191
LCP-H
A1

from A19-36
B

A2131

LCP-28-1
DUST COLLECTION PORT
FV-28-4-4-3
HS-28-4-4-9 LCP-28-1 A19391 — LCP-H A19391 — A19391
B2-07 X00 — IN 9 — I:16/09

LCP-28-1
DUST COLLECTION PORT
FV-28-4-4-3
HS-28-4-4-9 LCP-28-1 A19431 — LCP-H A19431 — A19431
B2-07 00X — IN 10 — I:16/10

LCP-28-1
ORIFICE GATE VALVE
FV-28-4-4-4
HS-28-4-4-14 LCP-28-1 A19471 — LCP-H A19471 — A19471
B2-11 X00 — IN 11 — I:16/11

LCP-28-1
ORIFICE GATE VALVE
FV-28-4-4-4
HS-28-4-4-14 LCP-28-1 A19511 — LCP-H A19511 — A19511
B2-11 00X — IN 12 — I:16/12

LCP-H A19551 — A19551
IN 13 — I:16/13

LCP-28-1
INFLATION AIR SUPPLY
VALVE FV-28-4-5-2
HS-28-4-5-4 LCP-28-1 A19591 — LCP-H A19591 — A19591
B2-03 X00 — IN 14 — I:16/14

LCP-28-1
INFLATION AIR SUPPLY
VALVE FV-28-4-5-2
HS-28-4-5-4 LCP-28-1 A19631 — LCP-H A19631 — A19631
B2-03 00X — IN 15 — I:16/15

COM

A2132

SPARE

FILL STATION NO.4
DUST COLLECTION PORT
OPEN COMMAND

FILL STATION NO.4
DUST COLLECTION PORT
IN AUTO

FILL STATION NO.4
ORIFICE GATE VALVE
OPEN COMMAND

FILL STATION NO.4
ORIFICE GATE VALVE
IN AUTO

FILL STATION NO.5
INFLATION AIR SUPPLY
VALVE
OPEN COMMAND

FILL STATION NO.5
INFLATION AIR SUPPLY
VALVE
IN AUTO

A
to A19-37

LCP-28-1
to A19-37

B
to A19-37

LCP-28-1
to A20-00

A
to A20-00

B
to A20-00

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

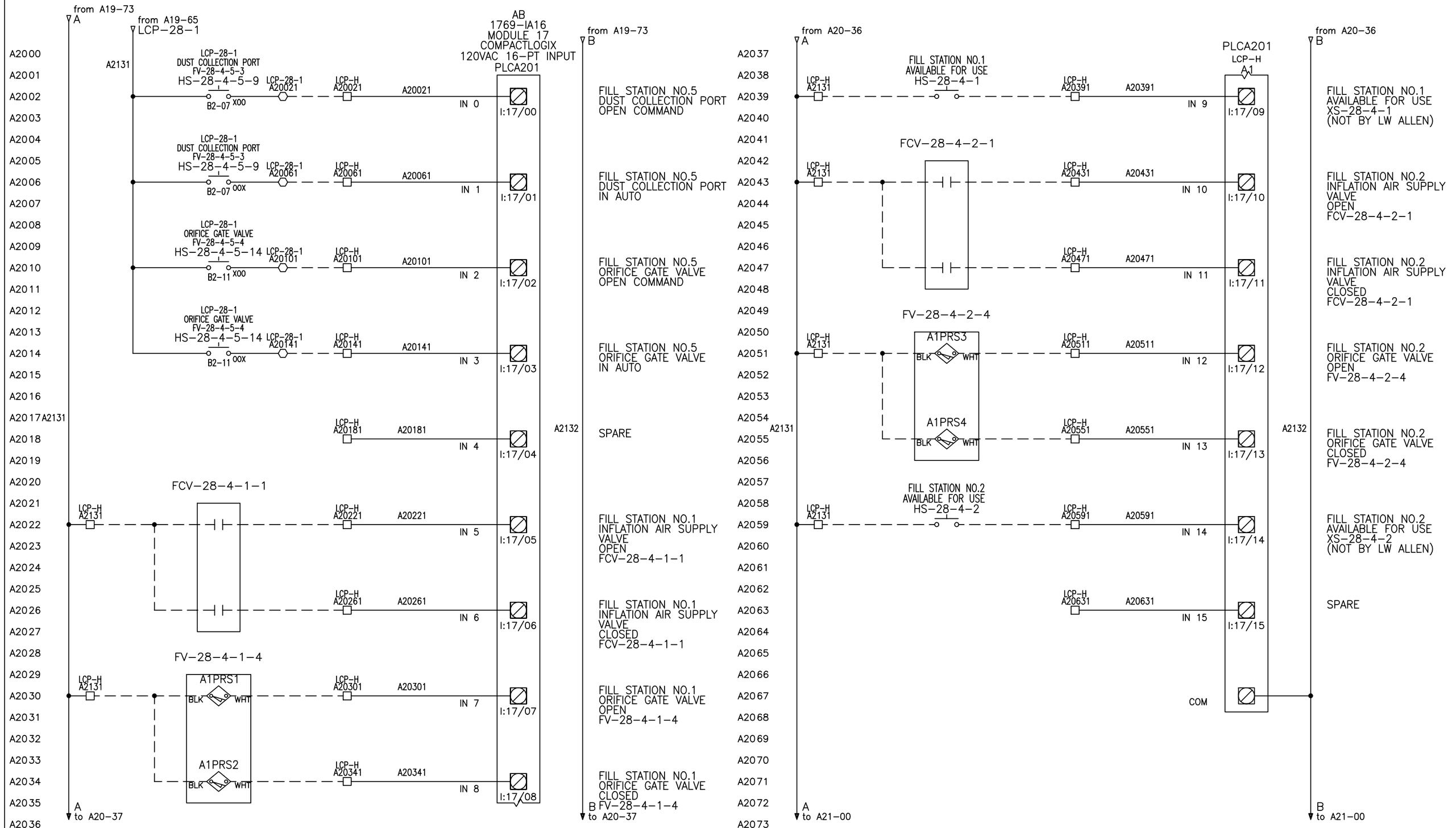
DES	K.ATWOOD	DATE	01/18/16
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APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
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B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A19 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
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DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE 01/18/16
DRN	K.ATWOOD	DATE 01/18/16
APP	K.ATWOOD	DATE 01/18/16

REV	DESCRIPTION	DATE	INIT
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REV	DESCRIPTION	DATE	INIT
L			
K			
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G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A20 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A20-73
A

AB
1769-IA16
MODULE 18
COMPACTLOGIX
120VAC 16-PT INPUT
PLCA211

FCV-28-4-3-1

LCP-H A2131 — LCP-H A21021 A21021 — IN 0 — I:18/00

LCP-H A2131 — LCP-H A21061 A21061 — IN 1 — I:18/01

FV-28-4-3-4
A1PRS5

LCP-H A2131 — LCP-H A21101 A21101 — IN 2 — I:18/02

A1PRS6

LCP-H A2131 — LCP-H A21141 A21141 — IN 3 — I:18/03

FILL STATION NO.3
AVAILABLE FOR USE
HS-28-4-3-1

A2131 — LCP-H A2131 — LCP-H A21181 A21181 — IN 4 — I:18/04

FCV-28-4-4-1

LCP-H A2131 — LCP-H A21221 A21221 — IN 5 — I:18/05

LCP-H A21261 A21261 — IN 6 — I:18/06

FV-28-4-4-4
A1PRS7

LCP-H A2131 — LCP-H A21301 A21301 — IN 7 — I:18/07

A1PRS8

LCP-H A21341 A21341 — IN 8 — I:18/08

A
to A21-37

from A20-73
B

FILL STATION NO.3
INFLATION AIR SUPPLY
VALVE
OPEN
FCV-28-4-3-1

FILL STATION NO.3
INFLATION AIR SUPPLY
VALVE
CLOSED
FCV-28-4-3-1

FILL STATION NO.3
ORIFICE GATE VALVE
OPEN
FV-28-4-3-4

FILL STATION NO.3
ORIFICE GATE VALVE
CLOSED
FV-28-4-3-4

A2132

FILL STATION NO.3
AVAILABLE FOR USE
XS-28-4-3
(NOT BY LW ALLEN)

FILL STATION NO.4
INFLATION AIR SUPPLY
VALVE
OPEN
FCV-28-4-4-1

FILL STATION NO.4
INFLATION AIR SUPPLY
VALVE
CLOSED
FCV-28-4-4-1

FILL STATION NO.4
ORIFICE GATE VALVE
OPEN
FV-28-4-4-4

FILL STATION NO.4
ORIFICE GATE VALVE
CLOSED
FV-28-4-4-4

B
to A21-37

from A21-36
A

PLCA211

FILL STATION NO.4
AVAILABLE FOR USE
HS-28-4-4-1

LCP-H A2131 — LCP-H A21391 A21391 — IN 9 — I:18/09

FCV-28-4-5-1

LCP-H A2131 — LCP-H A21431 A21431 — IN 10 — I:18/10

LCP-H A21471 A21471 — IN 11 — I:18/11

FV-28-4-5-4
A1PRS9

LCP-H A2131 — LCP-H A21511 A21511 — IN 12 — I:18/12

A1PRS10

A2131 — LCP-H A21551 A21551 — IN 13 — I:18/13

FILL STATION NO.5
AVAILABLE FOR USE
HS-28-4-5-1

LCP-H A2131 — LCP-H A21591 A21591 — IN 14 — I:18/14

LCP-H A21631 A21631 — IN 15 — I:18/15

COM

A
to A22-00

from A21-36
B

FILL STATION NO.4
AVAILABLE FOR USE
XS-28-4-4
(NOT BY LW ALLEN)

FILL STATION NO.5
INFLATION AIR SUPPLY
VALVE
OPEN
FCV-28-4-5-1

FILL STATION NO.5
INFLATION AIR SUPPLY
VALVE
CLOSED
FCV-28-4-5-1

FILL STATION NO.5
ORIFICE GATE VALVE
OPEN
FV-28-4-5-4

A2132

FILL STATION NO.5
ORIFICE GATE VALVE
CLOSED
FV-28-4-5-4

FILL STATION NO.5
AVAILABLE FOR USE
XS-28-4-5
(NOT BY LW ALLEN)

SPARE

B
to A22-00

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A21 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

AB
1769-OW16
MODULE 19
COMPACTLOGIX
16-PT RELAY OUTPUT
PLCA221

from A21-73
A

VAC/VDC 1

A2131

O:19/00 OUT 0 — A22061 — A1CR2 — PLC SCAN FAIL
NO A32-02
NC A32-05

O:19/01 OUT 1 — A22101 — A1AH1 — ALARM HORN

O:19/02 OUT 2 — A22141 — A1CR3 — BULK BAG LOADING CONVEYOR M-28-1-1 FORWARD REQUIRED — A2132
NO 2A3-134
NC SP- 1

O:19/03 OUT 3 — A22181 — A1CR4 — BULK BAG LOADING CONVEYOR M-28-1-1 REVERSE REQUIRED
NO 2A3-137
NC SP- 1

O:19/04 OUT 4 — A22221 — A1CR5 — WELL NO.4 PUMP P-19-4-1 REQUIRED
NO 2F2-82
NC SP- 1

O:19/05 OUT 5 — A22261 — A1CR6 — TRANSFER CONVEYOR M-27-1-1 FORWARD REQUIRED
NO 3A3-134
NC SP- 1

O:19/06 OUT 6 — A22301 — A1CR7 — TRANSFER CONVEYOR M-27-1-1 REVERSE REQUIRED
NO 3A3-137
NC SP- 1

O:19/07 OUT 7 — A22341 — A1CR8 — TRANSFER CONVEYOR ROL. GATE 1 FV-27-2-1 OPEN COMMAND
NO A33-02
NC A33-05

A
to A22-37

from A21-73
B
to A22-37

from A22-36
A

PLCA221

VAC/VDC 2

A2131

O:19/08 OUT 8 — A22431 — A1CR9 — TRANSFER CONVEYOR ROL. GATE 2 FV-27-2-2 OPEN COMMAND
NO A33-08
NC A33-11

O:19/09 OUT 9 — A22471 — A1CR10 — TRANSFER CONVEYOR WEST D.C. VALVE FV-29-2-1 OPEN COM.
NO A36-19
NC SP- 1

O:19/10 OUT 10 — A22511 — A1CR11 — WEST DUST PICKUP D.C. VALVE FV-29-2-2 OPEN COMMAND — A2132
NO A36-22
NC SP- 1

O:19/11 OUT 11 — A22551 — A1CR12 — EAST DUST PICKUP D.C. VALVE FV-29-2-3 OPEN COMMAND
NO A36-25
NC SP- 1

O:19/12 OUT 12 — A22591 — A1CR13 — TRANSFER CONVEYOR EAST D.C. VALVE FV-29-2-4 OPEN COM.
NO A36-28
NC SP- 1

O:19/13 OUT 13 — A22631 — A1CR14 — BULK BAG LOADING CONVEYOR D.C. VALVE FV-29-2-5 OPEN COM.
NO A36-31
NC SP- 1

O:19/14 OUT 14 — A22671 — A1CR15 — SPARE
NO SP- 1
NC SP- 1

O:19/15 OUT 15 — A22711 — A1CR16 — TRUCK LOADING CONVEYOR M-27-3-1 FORWARD REQUIRED
NO 4H3-134
NC SP- 1

A
to A23-00

from A22-36
B
to A23-00

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A22 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

AB
1769-OW16
MODULE 20
COMPACTLOGIX
16-PT RELAY OUTPUT
PLCA231

from A22-73
A

VAC/VDC 1

0:20/00 OUT 0 — A23061 — A1CR17 — TRUCK LOADING CONVEYOR M-27-3-1 REVERSE REQUIRED
NO 4H3-137
NC SP- 1

0:20/01 OUT 1 — A23101 — A1CR18 — CAKE BIN SCRUBBER INLET AIR BLOWER M-30-1-1 REQUIRED
NO 5C2-85
NC SP- 1

0:20/02 OUT 2 — A23141 — A1CR19 — CAKE SCREW CONVEYOR BIN NO.1 M-18-3-1 REQUIRED (FORWARD)
NO 5H3-136
NC SP- 1

A2132

0:20/03 OUT 3 — A23181 — A1CR20 — CAKE SCREW CONVEYOR BIN NO.2 M-18-3-1 REQUIRED (REVERSE)
NO 5H3-140
NC SP- 1

A2131

0:20/04 OUT 4 — A23221 — A1CR21 — THERMAL HEATER ROOM EXHAUST FAN F-1 REQUIRED
NO 6C2-79
NC SP- 1

0:20/05 OUT 5 — A23261 — A1CR22 — THERMAL HEATER ROOM EX. AIR DAMPERS REQ. OPEN DL-1, DL-3A & DL-3B
NO A32-20
NC SP- 1

0:20/06 OUT 6 — A23301 — A1CR23 — DRYER ROOM LOW TEMP LOCKOUT
NO SP- 3
NC 9A1-42,9C1-42,A34-07

0:20/07 OUT 7 — A23341 — LCP-H A23341 — SPARE

A
to A23-37

from A22-73
B

B
to A23-37

from A23-36
A

PLCA231

VAC/VDC 2

0:20/08 OUT 8 — A23431 — A1CR24 — DRYER ROOM EXHAUST FAN NO.1 F-2 REQUIRED
NO 6H2-79
NC SP- 1

0:20/09 OUT 9 — A23471 — A1CR25 — DRYER ROOM EXHAUST FAN NO.2 F-3 REQUIRED
NO 7C2-79
NC SP- 1

0:20/10 OUT 10 — A23511 — A1CR26 — TRUCK LOADING EXHAUST FAN F-4 REQUIRED
NO 7H2-79,SP- 2
NC SP- 3

A2132

A2131

0:20/11 OUT 11 — A23551 — A1CR27 — S.S. BLDG NORTHEAST EXHAUST FAN F-5 REQUIRED
NO 8C2-79,SP- 2
NC SP- 3

0:20/12 OUT 12 — A23591 — A1CR28 — S.S. BLDG SOUTHEAST EXHAUST FAN F-6 REQUIRED
NO 8H2-79,SP- 2
NC SP- 3

0:20/13 OUT 13 — A23631 — A1CR29 — SPARE
NO SP- 1
NC SP- 1

0:20/14 OUT 14 — A23671 — A1CR30 — SPARE
NO SP- 1
NC SP- 1

0:20/15 OUT 15 — A23711 — A1LR1 — THERMAL HEATER ROOM COMB. AIR DAMPER NO.1 DL-2A
NO A34-48,SP- 2
NC

A
to A24-00

from A23-36
B

B
to A24-00

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A23 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

AB
1769-OW16
MODULE 21
COMPACTLOGIX
16-PT RELAY OUTPUT
PLCA241

from A23-73
A

from A23-73
B

VAC/VDC 1

0:21/00	OUT 0	A24061	A1LR2	THERMAL HEATER ROOM COMB. AIR DAMPER NO.2 DL-2B	NO A34-51,SP- 2 NC
0:21/01	OUT 1	A24101	A1CR31	DUST COLLECTOR EXHAUST FAN M-29-1-1 REQUIRED	NO 9H2-86 NC SP- 1
0:21/02	OUT 2	A24141	A1CR32	DUST COLLECTOR ROTARY AIR LOCK M-29-4-1 REQUIRED	NO 10L1-45 NC SP- 1
0:21/03	OUT 3	A24181	A1CR33	DUST COLLECTOR HIGH PRESSURE ALARM RESET	NO A34-01 NC SP- 1
0:21/04	OUT 4	A24221	A1CR34	PURGE AIR SYSTEM SOL. VALVE FV-23-10-1 OPEN COMMAND	NO A34-04 NC SP- 1
0:21/05	OUT 5	A24261	A1CR35	BULK BAG INFLATING BLOWER M-28-2-1 REQUIRED	NO 11A1-45 NC SP- 1
0:21/06	OUT 6	A24301	A1CR36	CONDENSATE WASTE PUMP NO.1 P-31-1-1 REQUIRED	NO 11C2-85 NC SP- 1
0:21/07	OUT 7	A24341	A1CR37	CONDENSATE WASTE PUMP NO.2 P-31-1-2 REQUIRED	NO 11H2-85 NC SP- 1

A2131

A2132

A
to A24-37

B
to A24-37

from A24-36
A

from A24-36
B

PLCA241

VAC/VDC 2

0:21/08	OUT 8	A24431	A1CR38	BACKUP COOLING WATER PUMP P-19-5-1 REQUIRED	NO 12H2-82 NC SP- 1
0:21/09	OUT 9	A24471	LCP-H A24471	SPARE	
0:21/10	OUT 10	A24511	LCP-H A24511	SPARE	
0:21/11	OUT 11	A24551	LCP-H A24551	SPARE	
0:21/12	OUT 12	A24591	LCP-H A24591	SPARE	
0:21/13	OUT 13	A24631	LCP-H A24631	SPARE	
0:21/14	OUT 14	A24671	LCP-H A24671	SPARE	
0:21/15	OUT 15	A24711	LCP-H A24711	SPARE	

A2131

A2132

A
to A25-00

B
to A25-00

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

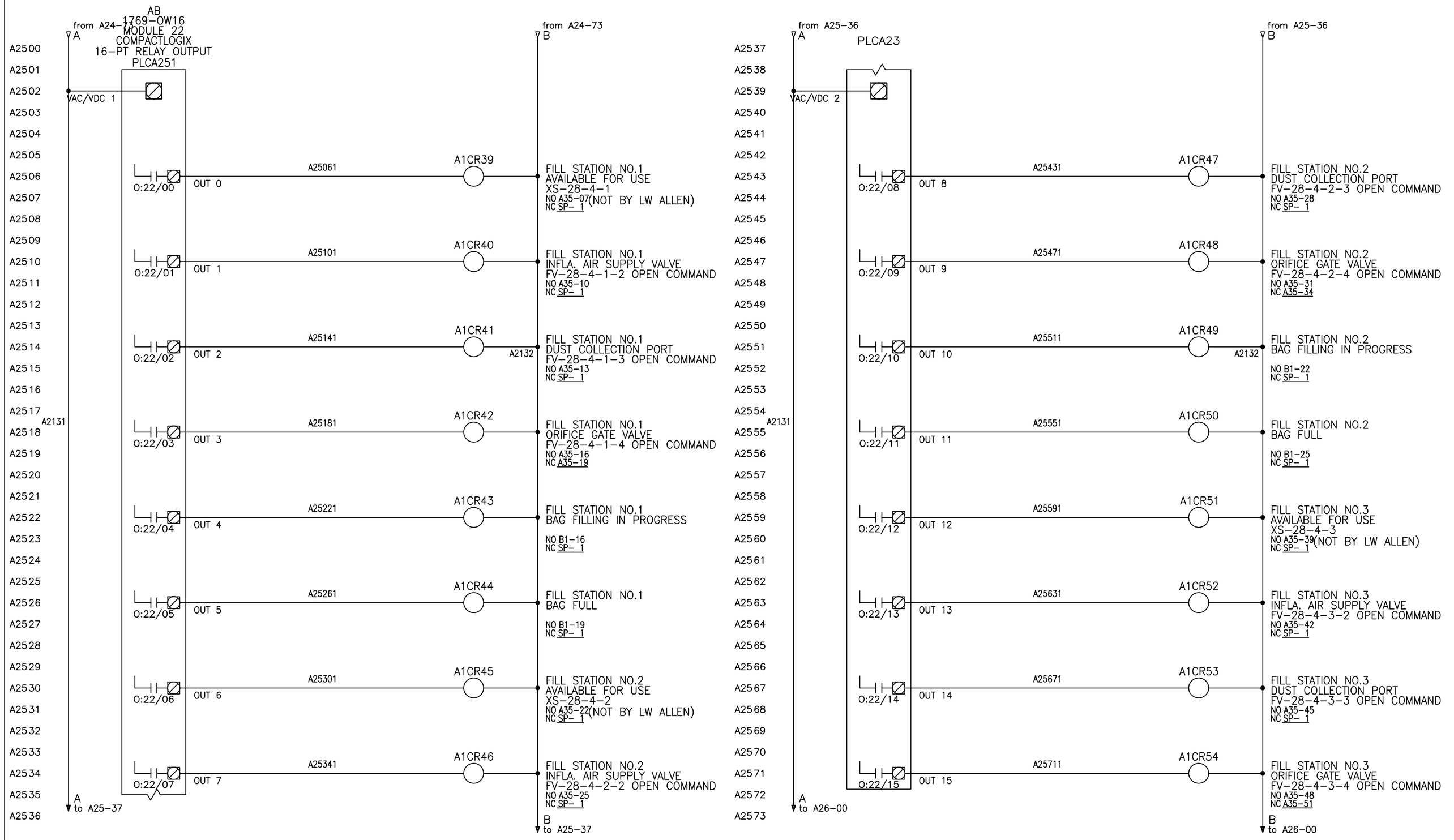
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C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
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J			
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SECTION A1
LOCATION LCP-BEACON
TYPE 101
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ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
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G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A25 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

AB
1769-OW16
MODULE 23
COMPACTLOGIX
16-PT RELAY OUTPUT
PLCA261

from A25-73
A
VAC/VDC 1

from A25-73
B

A2131

0:23/00	OUT 0	A26061	A1CR55	FILL STATION NO.3 BAG FILLING IN PROGRESS NO B1-28 NC SP- 1
0:23/01	OUT 1	A26101	A1CR56	FILL STATION NO.3 BAG FULL NO B1-31 NC SP- 1
0:23/02	OUT 2	A26141	A1CR57	FILL STATION NO.4 AVAILABLE FOR USE XS-28-4-4 NO A35-54(NOT BY LW ALLEN) NC SP- 1
0:23/03	OUT 3	A26181	A1CR58	FILL STATION NO.4 INFLA. AIR SUPPLY VALVE FV-28-4-4-2 OPEN COMMAND NO A35-57 NC SP- 1
0:23/04	OUT 4	A26221	A1CR59	FILL STATION NO.4 DUST COLLECTION PORT FV-28-4-4-3 OPEN COMMAND NO A35-60 NC SP- 1
0:23/05	OUT 5	A26261	A1CR60	FILL STATION NO.4 ORIFICE GATE VALVE FV-28-4-4-4 OPEN COMMAND NO A35-63 NC A35-66
0:23/06	OUT 6	A26301	A1CR61	FILL STATION NO.4 BAG FILLING IN PROGRESS NO B1-39 NC SP- 1
0:23/07	OUT 7	A26341	A1CR62	FILL STATION NO.4 BAG FULL NO B1-42 NC SP- 1

A
to A26-37

B
to A26-37

PLCA24

from A26-36
A
VAC/VDC 2

from A26-36
B

A2131

0:23/08	OUT 8	A26431	A1CR63	FILL STATION NO.5 AVAILABLE FOR USE XS-28-4-5 NO A36-02(NOT BY LW ALLEN) NC SP- 1
0:23/09	OUT 9	A26471	A1CR64	FILL STATION NO.5 INFLA. AIR SUPPLY VALVE FV-28-4-5-2 OPEN COMMAND NO A36-05 NC SP- 1
0:23/10	OUT 10	A26511	A1CR65	FILL STATION NO.5 DUST COLLECTION PORT FV-28-4-5-3 OPEN COMMAND NO A36-08 NC SP- 1
0:23/11	OUT 11	A26551	A1CR66	FILL STATION NO.5 ORIFICE GATE VALVE FV-28-4-5-4 OPEN COMMAND NO A36-11 NC A36-14
0:23/12	OUT 12	A26591	A1CR67	FILL STATION NO.5 BAG FILLING IN PROGRESS NO B1-45 NC SP- 1
0:23/13	OUT 13	A26631	A1CR68	FILL STATION NO.5 BAG FULL NO B1-48 NC SP- 1
0:23/14	OUT 14	A26671	A1CR69	ADDITIONAL FILL STATION REQUIRED ALARM NO B1-54 NC SP- 1
0:23/15	OUT 15	A26711 LCP-H A26711		SPARE

A
to A27-00

B
to A27-00

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

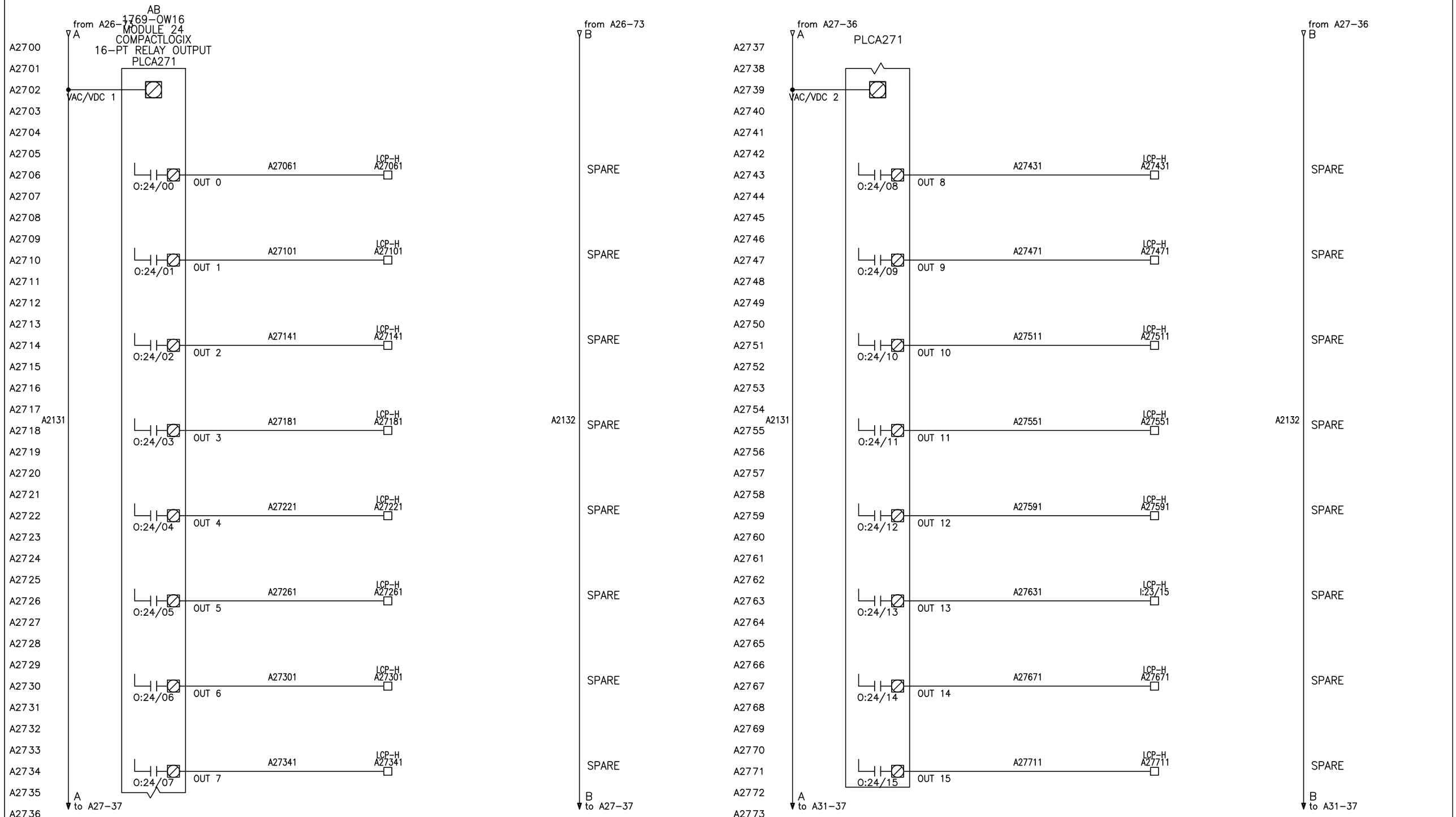
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D			
C	AS INSTALLED	10/18	AO
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A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
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G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
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ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

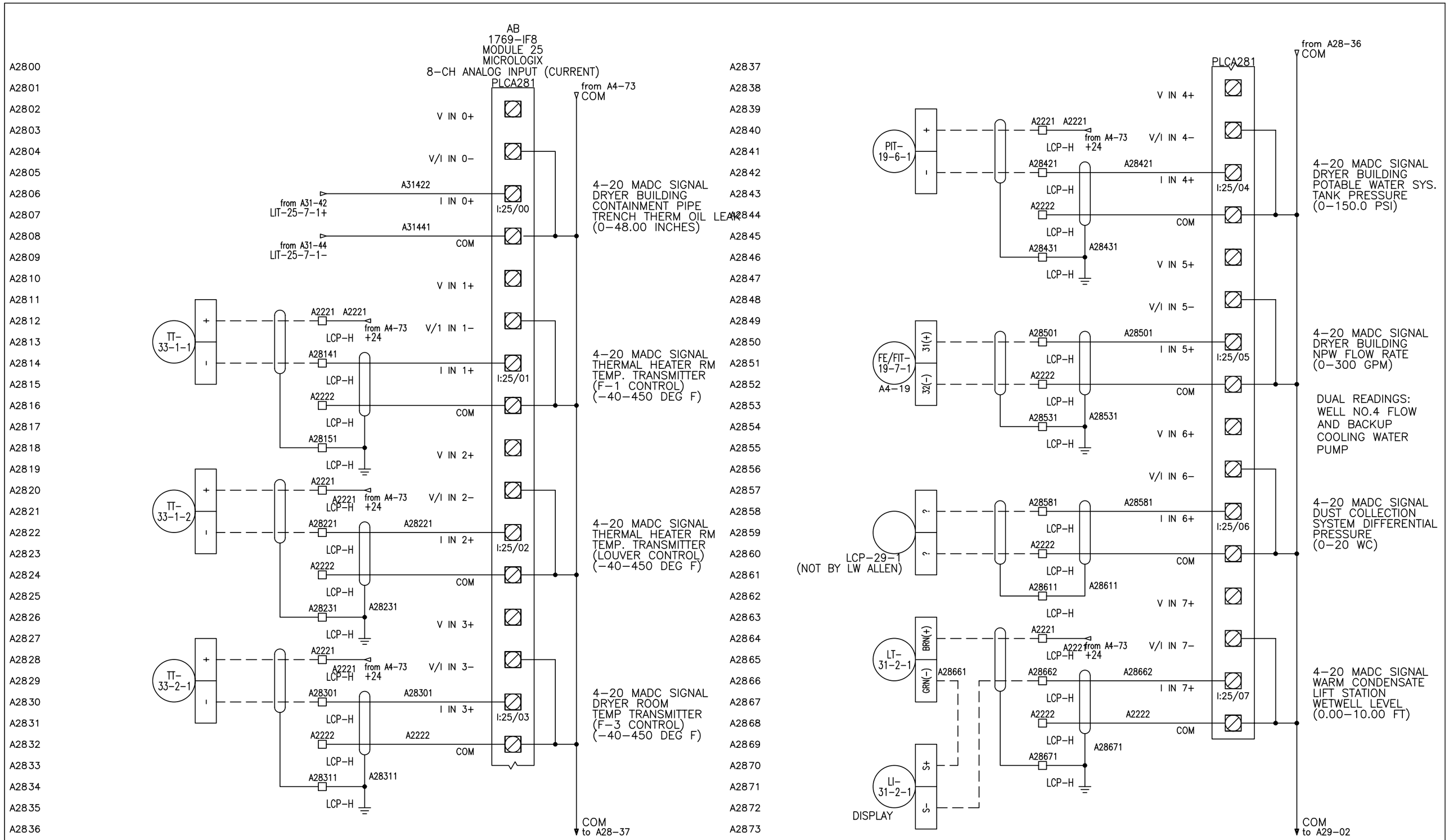
REV	DESCRIPTION	DATE	INIT
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D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
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REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A27 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

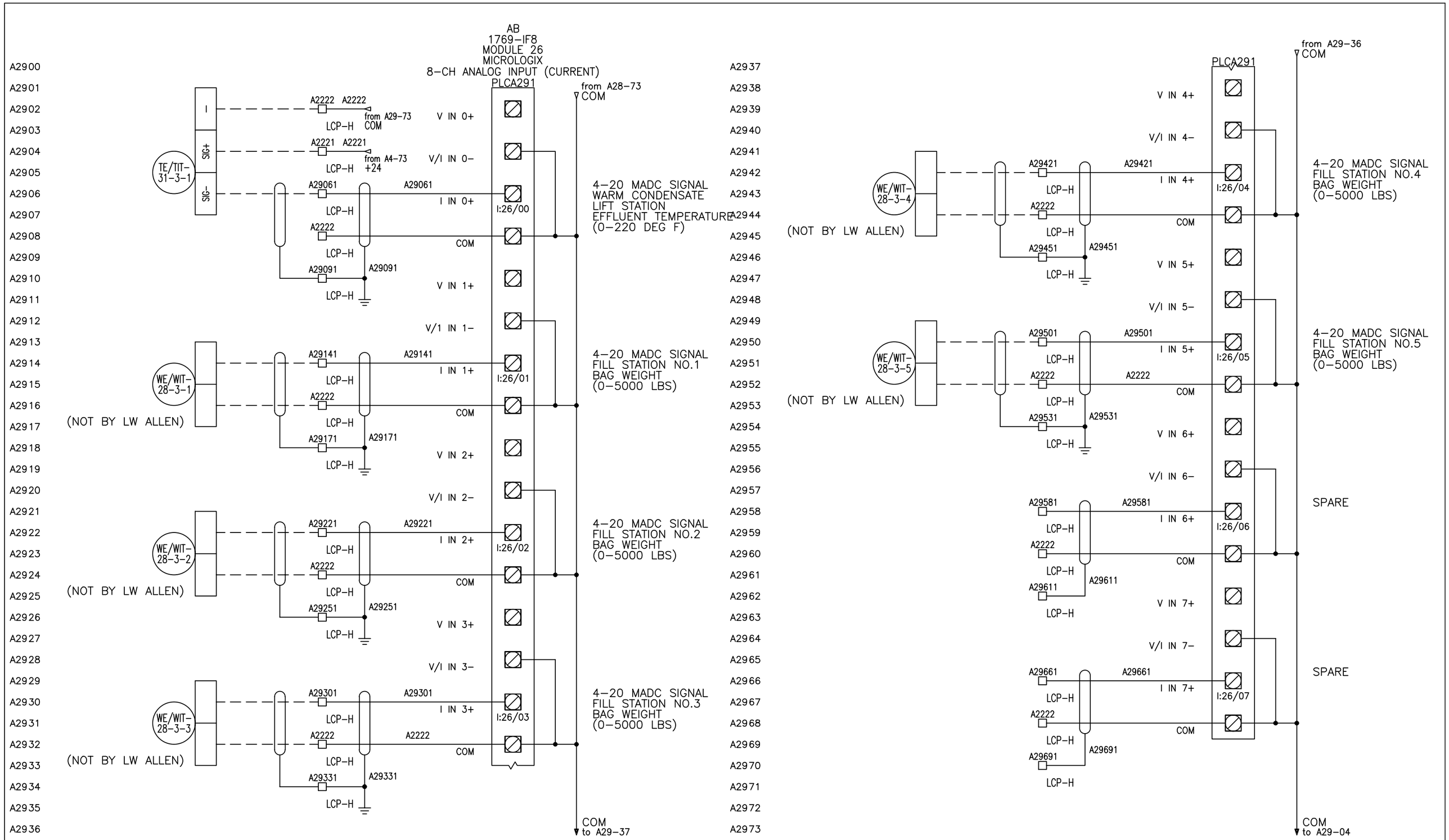
REV	DESCRIPTION	DATE	INIT
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E			
D			
C	AS INSTALLED	10/18	AO
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A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
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H			
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SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A28 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI



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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
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APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
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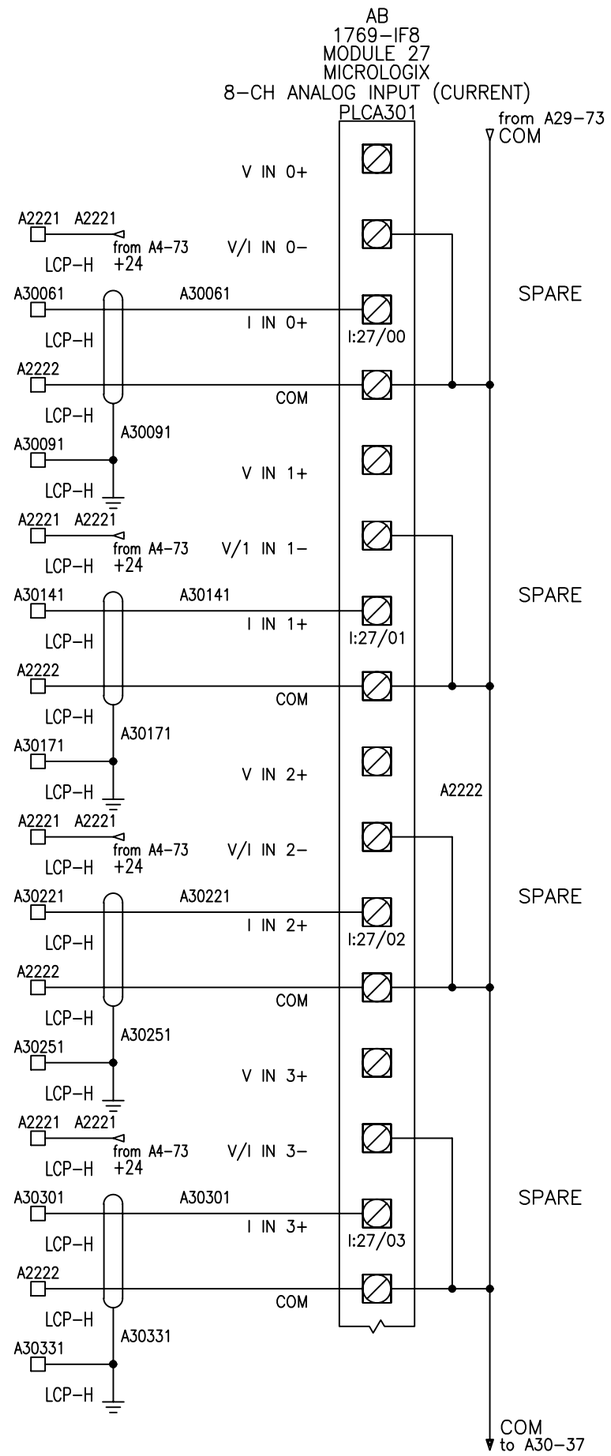
SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A29 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

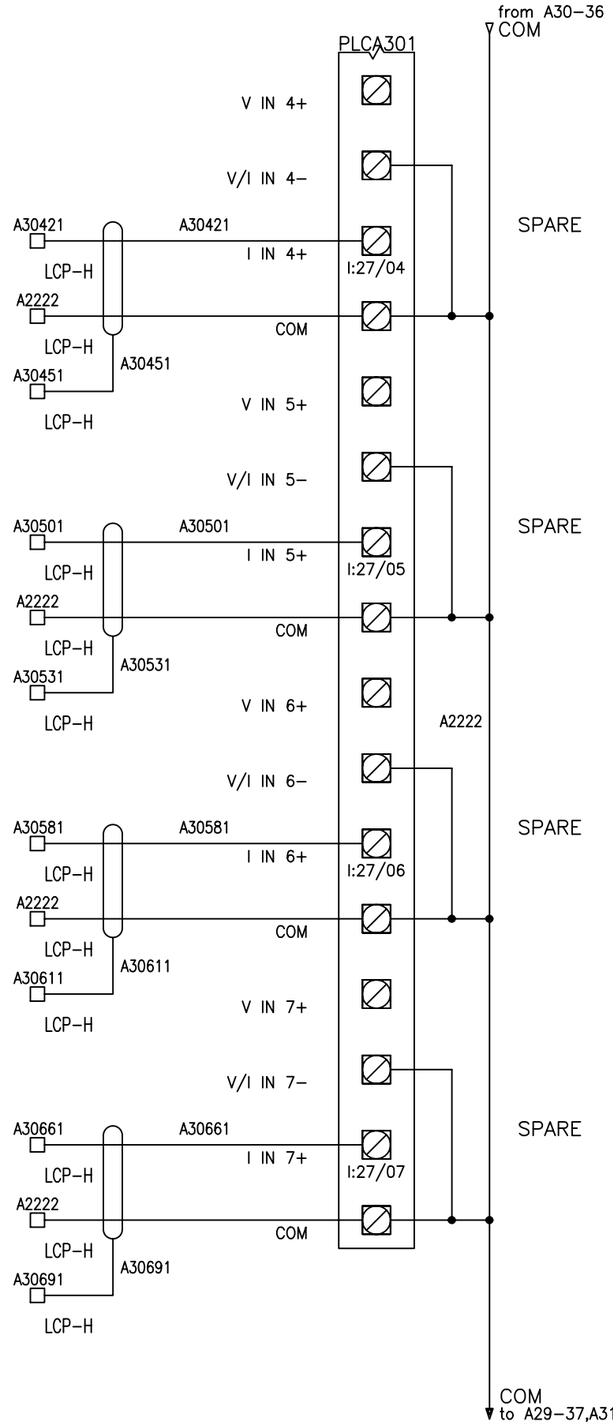
DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

A3000
A3001
A3002
A3003
A3004
A3005
A3006
A3007
A3008
A3009
A3010
A3011
A3012
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A3031
A3032
A3033
A3034
A3035
A3036

AB
1769-IF8
MODULE 27
MICROLOGIX
8-CH ANALOG INPUT (CURRENT)



A3037
A3038
A3039
A3040
A3041
A3042
A3043
A3044
A3045
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A3071
A3072
A3073



L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

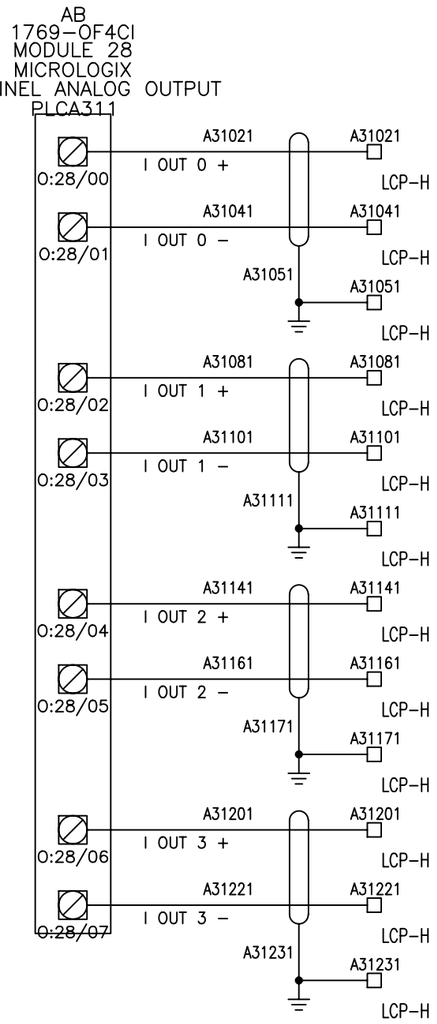
REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A30 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

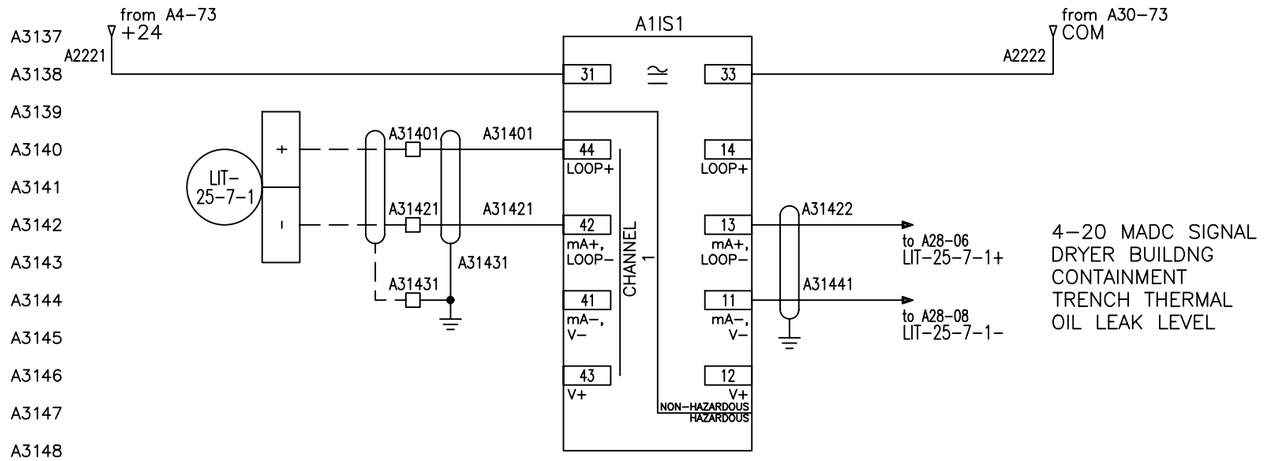


SPARE

SPARE

SPARE

SPARE



4-20 MADC SIGNAL
DRYER BUILDNG
CONTAINMENT
TRENCH THERMAL
OIL LEAK LEVEL

MAXIMUM TOTAL WIRE LENGTH BETWEEN EQUIPMENT & BARRIER IS 100 FT
INTRINSICALLY SAFE WIRING MUST BE POSITIVELY SEPARATED FROM NON-INTRINSICALLY SAFE WIRING BY SEPARATE CONDUITS, HOUSINGS, OR BY USE OF GROUNDING METAL BARRIERS. FOR ADDITIONAL GUIDANCE, SEE ANSI/ISA RP 12.6. THE NATIONAL ELECTRIC CODE AND NFPA 70, ARTICLES 500-516.
INSTALL IN ACCORDANCE WITH ARTICLE 504 OF NEC CLASS 1 GROUP A,B,C,D

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
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D			
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A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A31 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A27-73
A

A1CR2
A22-06
PLC SCAN FAIL

A32021

A1TD1
ON DELAY
(0-10 MIN)

PLC SCAN FAIL
TIME DELAY
NO A32-08,SP- 3
NC SP- 4

A1CR2
A22-06
PLC SCAN FAIL

A32051

A1TD2
ON DELAY
(0-10 MIN)

PLC SCAN FAIL
TIME DELAY
NO A32-11,SP- 3
NC SP- 4

A1TD1
A32-02
PLC SCAN FAIL
TIME DELAY

A32081

XA-21-5-2
R

PLC SCAN FAIL

A1TD2
A32-05
PLC SCAN FAIL
TIME DELAY

from A10-08
F-1 RUN

A10061

A1CR72

THERMAL HEATER ROOM
EXHAUST FAN F-1
RUNNING
NO A32-23
NC SP- 1

A2131

A2132

A1CR22
A23-26
THERMAL HEATER ROOM
EX. AIR DAMPERS REQ. OPEN

A32201

A1LR3

THERMAL HEATER ROOM
EXH. AIR DAMPERS REQ.
DL-1, DL-3A & DL-3B
NO A34-38,SP- 2
NC

A1CR72
A32-17
THERMAL HEATER ROOM
EXHAUST FAN F-1 RUNNING

from A11-41
F-4 RUN

A11391

A1CR73

TRUCK LOADING
EXHAUST FAN F-4
RUNNING
NO A32-42,A32-51,A32-57
NC SP- 3

from A12-08
F-5 RUN

A12061

A1CR74

S.S. BLDG NORTHEAST
EXHAUST FAN F-5
RUNNING
NO A32-54,A32-60,SP- 1
NC SP- 3

from A12-41
F-6 RUN

A12391

A1CR75

S.S. BLDG SOUTHEAST
EXHAUST FAN F-6
RUNNING
NO A32-45,A32-63,SP- 1
NC SP- 3

A
to A31-37,A32-37

B
to A31-37,A32-37

from A32-36
A

A1CR73
A32-26
TRUCK LOADING
EXHAUST FAN F-4 RUNNING

A32391

A1LR4

S.S. BLDG INTAKE
AIR DAMPER NO.1 DL-6
OPEN COMMAND
NO A34-54,SP- 2
NC

A1CR75
A32-32
S.S. BLDG SOUTHEAST
EXHAUST FAN F-6 RUNNING

A1CR73
A32-26
TRUCK LOADING
EXHAUST FAN F-4 RUNNING

A32481

A1LR5

S.S. BLDG INTAKE
AIR DAMPER NO.2 DL-7
OPEN COMMAND
NO A34-57,SP- 2
NC

A1CR74
A32-29
S.S. BLDG NORTHEAST
EXHAUST FAN F-5 RUNNING

A2131

A2132

A1CR73
A32-26
TRUCK LOADING
EXHAUST FAN F-4 RUNNING

A32571

A1LR6

S.S.BLDG FAN F-4
DAMPER DF-4
NO A34-60,SP- 2
NC

A1CR74
A32-29
S.S. BLDG NORTHEAST
EXHAUST FAN F-5 RUNNING

A32601

A1LR7

S.S.BLDG FAN F-5
DAMPER DF-5
NO A34-63,SP- 2
NC

A1CR75
A32-32
S.S. BLDG SOUTHEAST
EXHAUST FAN F-6 RUNNING

A32631

A1LR8

S.S.BLDG FAN F-6
DAMPER DF-6
NO A34-66,SP- 2
NC

A
to A33-00

B
to A33-00

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
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A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
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I			
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SECTION
A1
LOCATION
LCP-BEACON
TYPE
101
PAGE
A32 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D16007-C
PROJECT
WISCONSIN DELLS, WI

from A32-73
A

from A32-73
B

A3300
A3301
A3302
A3303
A3304
A3305
A3306
A3307
A3308
A3309
A3310
A3311
A3312
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A3328
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A3330
A3331
A3332
A3333
A3334
A3335
A3336

A2131

A2132

A1CR8 — A22-34 TRANSFER CONVEYOR ROL. GATE 1 FV-27-2-1 OPEN COMMAND — A33021 — LCP-H A33021 — TRANSFER CONVEYOR ROLLER GATE NO.1 FV-27-2-1 OPEN — LCP-H A2132

A1CR8 — A22-34 TRANSFER CONVEYOR ROL. GATE 1 FV-27-2-1 OPEN COMMAND — A33051 — LCP-H A33051 — TRANSFER CONVEYOR ROLLER GATE NO.1 FV-27-2-1 CLOSE

A1CR9 — A22-43 TRANSFER CONVEYOR ROL. GATE 2 FV-27-2-2 OPEN COMMAND — A33081 — LCP-H A33081 — TRANSFER CONVEYOR ROLLER GATE NO.2 FV-27-2-2 OPEN — LCP-H A2132

A1CR9 — A22-43 TRANSFER CONVEYOR ROL. GATE 2 FV-27-2-2 OPEN COMMAND — A33111 — LCP-H A33111 — TRANSFER CONVEYOR ROLLER GATE NO.2 FV-27-2-2 CLOSE

A to A33-37

B to A33-37

from A33-36
A

from A33-36
B

A3337
A3338
A3339
A3340
A3341
A3342
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A3371
A3372
A3373

A2131

A2132

A to A32-37

B to A32-37

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

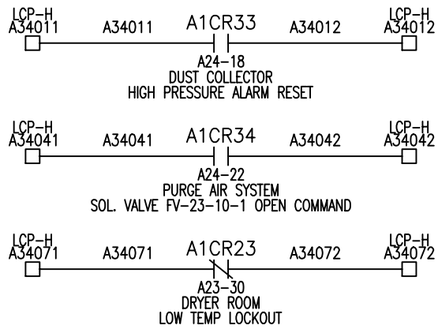
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B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A33 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

A3400
A3401
A3402
A3403
A3404
A3405
A3406
A3407
A3408
A3409
A3410
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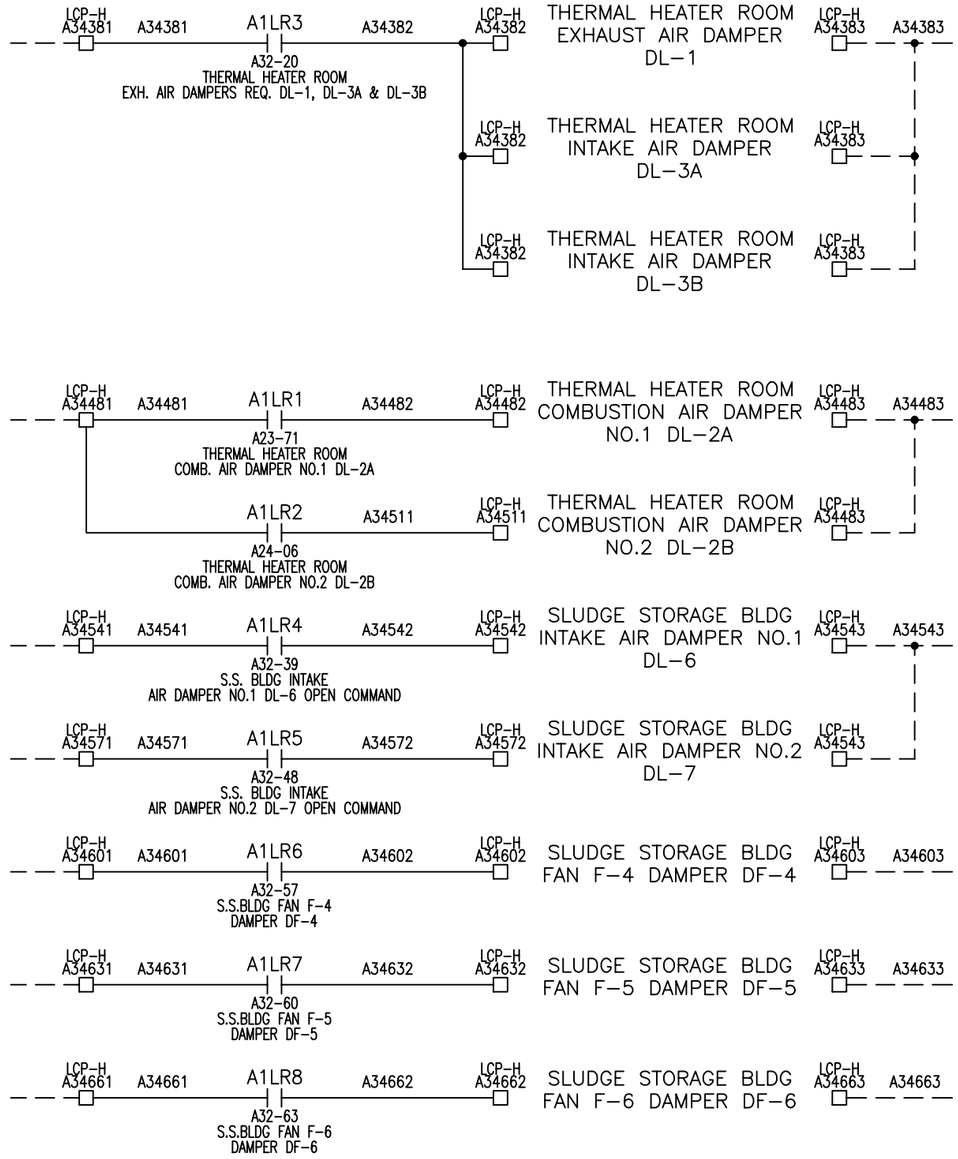
A3437
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A3473

LIGHTING PANEL LH-2 CKT 58

LIGHTING PANEL LH-2 CKT 62

LIGHTING PANEL LH-2 CKT 17

LIGHTING PANEL LH-2 CKT 16



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WWTF SLUDGE DRYER BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16	F					L				
DRN	K.ATWOOD	DATE	01/18/16	E					K				
APP	K.ATWOOD	DATE	01/18/16	D					J				
				C	AS INSTALLED	10/18	AO		I				
				B	AS BUILT	10/17	AO		H				
				A	RELEASED	04/17	AO		G				
				REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT		

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A34 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

TO 120 VAC, 1 PHASE, 60 HZ SUPPLY
MAIN DISCONNECT EXTERNAL TO PANEL
PROVIDED BY OTHERS

WARNING:
DANGEROUS VOLTAGE WITHIN.
DE-ENERGIZE ALL POWER
SOURCES PRIOR TO
ENTERING

L2
L2
L2
A1CB2
10A

N2
N2
N2

G
GROUND PER
NEC

A1CR39 — A35071 — LCP-H A35071 — FILL STATION NO.1 AVAILABLE FOR USE STATUS TO XS-28-4-1 — LCP-H N2
A25-06
FILL STATION NO.1
AVAILABLE FOR USE XS-28-4-1

A1CR40 — A35101 — LCP-H A35101 — FILL STATION NO.1 INFLATION AIR SUPPLY VALVE FV-28-4-1-2 — LCP-H N2
A25-10
FILL STATION NO.1
INFLA. AIR SUPPLY VALVE FV-28-4-1-2 OPEN COMMAND

A1CR41 — A35131 — LCP-H A35131 — AIR MANAGEMENT VALVE FV-28-4-1-3 DUST COLL. PORT OPEN — LCP-H N2
A25-14
FILL STATION NO.1
DUST COLLECTION PORT

A1CR42 — A35161 — LCP-H A35161 — FILL STATION NO.1 ORIFICE GATE VALVE FV-28-4-1-4 — A35-16 OPEN — LCP-H N2
A25-18
FILL STATION NO.1
ORIFICE GATE VALVE FV-28-4-1-4 OPEN COMMAND

A1CR42 — A35191 — LCP-H A35191 — FILL STATION NO.1 ORIFICE GATE VALVE FV-28-4-1-4 — A35-16 CLOSE
A25-18
FILL STATION NO.1
ORIFICE GATE VALVE FV-28-4-1-4 OPEN COMMAND

A1CR45 — A35221 — LCP-H A35221 — FILL STATION NO.2 AVAILABLE FOR USE STATUS TO XS-28-4-2 — LCP-H N2
A25-30
FILL STATION NO.2
A35061 AVAILABLE FOR USE XS-28-4-2

A1CR46 — A35251 — LCP-H A35251 — FILL STATION NO.2 INFLATION AIR SUPPLY VALVE FV-28-4-2-2 — LCP-H N2
A25-34
FILL STATION NO.2
INFLA. AIR SUPPLY VALVE FV-28-4-2-2 OPEN COMMAND

A1CR47 — A35281 — LCP-H A35281 — AIR MANAGEMENT VALVE FV-28-4-2-3 DUST COLL. PORT OPEN — LCP-H N2
A25-43
FILL STATION NO.2
DUST COLLECTION PORT

A1CR48 — A35311 — LCP-H A35311 — FILL STATION NO.2 ORIFICE GATE VALVE FV-28-4-2-4 — A35-34 OPEN — LCP-H N2
A25-47
FILL STATION NO.2
ORIFICE GATE VALVE FV-28-4-2-4 OPEN COMMAND

A1CR48 — A35341 — LCP-H A35341 — FILL STATION NO.2 ORIFICE GATE VALVE FV-28-4-2-4 — CLOSE
A25-47
FILL STATION NO.2
ORIFICE GATE VALVE FV-28-4-2-4 OPEN COMMAND

C
to A35-37

D
to A35-37

from A35-36
C

from A35-36
D

A1CR51 — A35391 — LCP-H A35391 — FILL STATION NO.3 AVAILABLE FOR USE STATUS TO XS-28-4-3 — LCP-H N2
A25-59
FILL STATION NO.3
AVAILABLE FOR USE XS-28-4-3

A1CR52 — A35421 — LCP-H A35421 — FILL STATION NO.3 INFLATION AIR SUPPLY VALVE FV-28-4-3-2 — LCP-H N2
A25-63
FILL STATION NO.3
INFLA. AIR SUPPLY VALVE FV-28-4-3-2 OPEN COMMAND

A1CR53 — A35451 — LCP-H A35451 — AIR MANAGEMENT VALVE FV-28-4-3-3 DUST COLL. PORT OPEN — LCP-H N2
A25-67
FILL STATION NO.3
DUST COLLECTION PORT

A35061
A1CR54 — A35481 — LCP-H A35481 — FILL STATION NO.3 ORIFICE GATE VALVE FV-28-4-3-4 — A35-51 OPEN — LCP-H N2
A25-71
FILL STATION NO.3
ORIFICE GATE VALVE FV-28-4-3-4 OPEN COMMAND

A1CR54 — A35511 — LCP-H A35511 — FILL STATION NO.3 ORIFICE GATE VALVE FV-28-4-3-4 — CLOSE
A25-71
FILL STATION NO.3
ORIFICE GATE VALVE FV-28-4-3-4 OPEN COMMAND

A1CR57 — A35541 — LCP-H A35541 — FILL STATION NO.4 AVAILABLE FOR USE STATUS TO XS-28-4-4 — LCP-H N2
A26-14
FILL STATION NO.4
AVAILABLE FOR USE XS-28-4-4

N2

A1CR58 — A35571 — LCP-H A35571 — FILL STATION NO.4 INFLATION AIR SUPPLY VALVE FV-28-4-4-2 — LCP-H N2
A26-18
FILL STATION NO.4
INFLA. AIR SUPPLY VALVE FV-28-4-4-2 OPEN COMMAND

A1CR59 — A35601 — LCP-H A35601 — AIR MANAGEMENT VALVE FV-28-4-4-3 DUST COLL. PORT OPEN — LCP-H N2
A26-22
FILL STATION NO.4
DUST COLLECTION PORT

A1CR60 — A35631 — LCP-H A35631 — FILL STATION NO.4 ORIFICE GATE VALVE FV-28-4-4-4 — OPEN — LCP-H N2
A26-26
FILL STATION NO.4
ORIFICE GATE VALVE FV-28-4-4-4 OPEN COMMAND

A1CR60 — A35661 — LCP-H A35661 — FILL STATION NO.4 ORIFICE GATE VALVE FV-28-4-4-4 — A35-63 CLOSE
A26-26
FILL STATION NO.4
ORIFICE GATE VALVE FV-28-4-4-4 OPEN COMMAND

C
to A36-00

D
to A36-00

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
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B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A35 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

from A35-73 C

from A35-73 D

A3600
A3601
A3602 — A35061 — A1CR63 — A26-43 FILL STATION NO.5 AVAILABLE FOR USE XS-28-4-5 — A36021 — LCP-H A36021 — FILL STATION NO.5 AVAILABLE FOR USE STATUS TO XS-28-4-5 — LCP-H N2
A3603
A3604
A3605 — A1CR64 — A26-47 FILL STATION NO.5 INFLA. AIR SUPPLY VALVE FV-28-4-5-2 OPEN COMMAND — A36051 — LCP-H A36051 — FILL STATION NO.5 INFLATION AIR SUPPLY VALVE FV-28-4-5-2 — LCP-H N2
A3606 — N2
A3607
A3608 — A1CR65 — A26-51 FILL STATION NO.5 DUST COLLECTION PORT — A36081 — LCP-H A36081 — AIR MANAGEMENT VALVE FV-28-4-5-3 DUST COLL. PORT OPEN — LCP-H N2
A3609
A3610
A3611 — A1CR66 — A26-55 FILL STATION NO.5 ORIFICE GATE VALVE FV-28-4-5-4 OPEN COMMAND — A36111 — LCP-H A36111 — FILL STATION NO.5 ORIFICE GATE VALVE FV-28-4-5-4 — A36-14 OPEN — LCP-H N2
A3612
A3613
A3614 — A1CR66 — A26-55 FILL STATION NO.5 ORIFICE GATE VALVE FV-28-4-5-4 OPEN COMMAND — A36141 — LCP-H A36141 — FILL STATION NO.5 ORIFICE GATE VALVE FV-28-4-5-4 — CLOSE
A3615
A3616
A3617
A3618
A3619 — A1CR10 — A22-47 TRANSFER CONVEYOR WEST D.C. VALVE FV-29-2-1 OPEN COM. — A36191 — LCP-H A36191 — TRANSFER CONVEYOR WEST D.C. VALVE FV-29-2-1 — LCP-H N2
A3620
A3621
A3622 — A1CR11 — A22-51 WEST DUST PICKUP D.C. VALVE FV-29-2-2 OPEN COMMAND — A36221 — LCP-H A36221 — WEST DUST PICKUP D.C. VALVE FV-29-2-2 — LCP-H N2
A3623
A35061
A3624
A3625 — A1CR12 — A22-55 EAST DUST PICKUP D.C. VALVE FV-29-2-3 OPEN COMMAND — A36251 — LCP-H A36251 — EAST DUST PICKUP D.C. VALVE OPEN COMMAND FV-29-2-3 — LCP-H N2
A3626
A3627
A3628 — A1CR13 — A22-59 TRANSFER CONVEYOR EAST D.C. VALVE FV-29-2-4 OPEN COM. — A36281 — LCP-H A36281 — TRANSFER CONVEYOR EAST D.C. VALVE FV-29-2-4 — LCP-H N2
A3629
A3630
A3631 — A1CR14 — A22-63 BULK BAG LOADING CONVEYOR D.C. VALVE FV-29-2-5 OPEN COM. — A36311 — LCP-H A36311 — BULK BAG LOADING CONVEYOR D.C. VALVE FV-29-2-5 — LCP-H N2
A3632
A3633
A3634
A3635
A3636

C to A36-37

D to A36-37

from A36-36 C

from A36-36 D

A3637
A3638
A3639
A3640
A3641
A3642
A3643
A3644
A3645
A3646
A3647
A3648
A3649
A3650
A3651 — A35061
A3652
A3653
A3654
A3655 — N2
A3656
A3657
A3658
A3659
A3660
A3661
A3662
A3663
A3664
A3665
A3666
A3667
A3668
A3669
A3670
A3671
A3672
A3673

C to A35-37

D to A35-37

L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTF SLUDGE DRYER BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

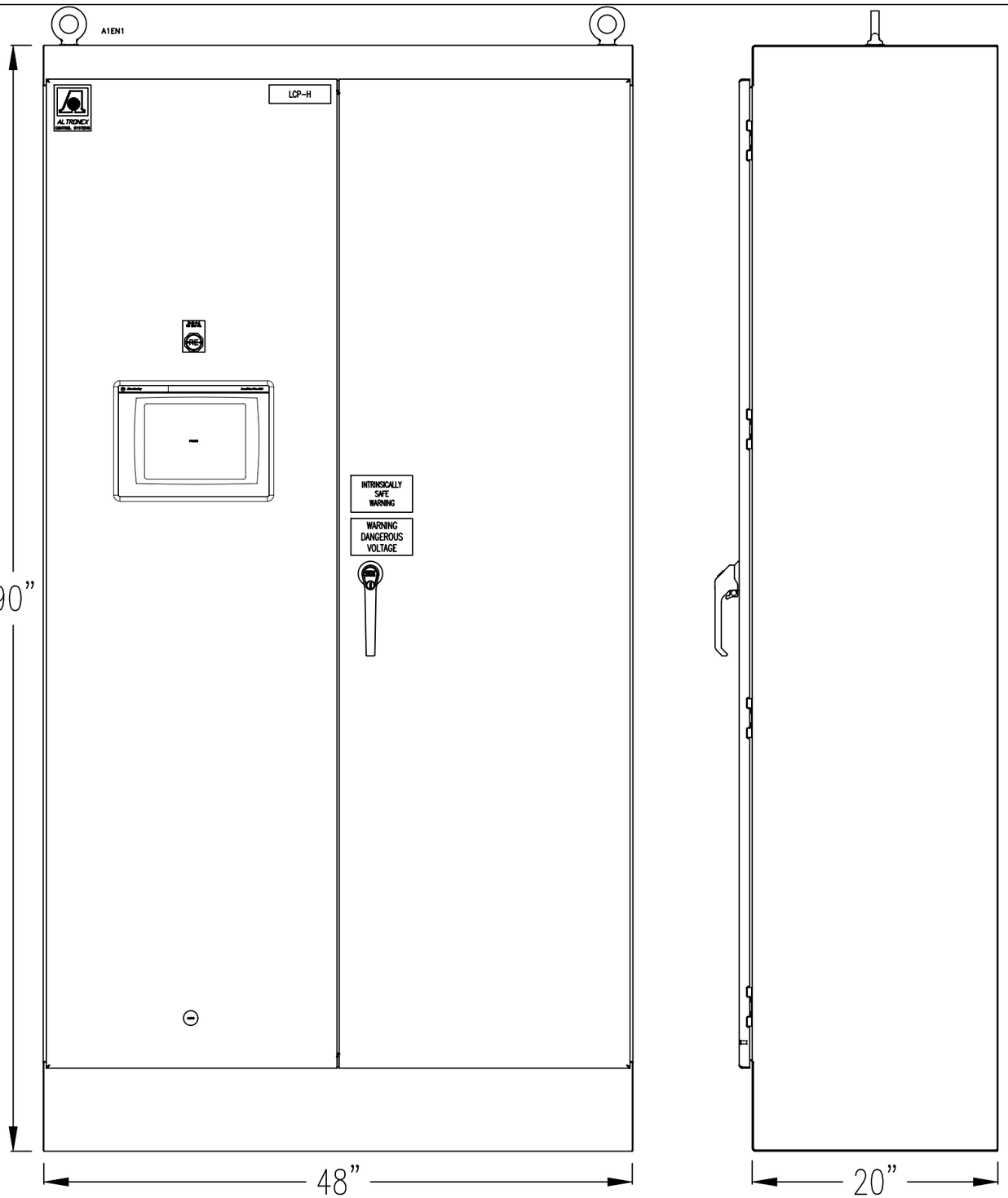
REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A36 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

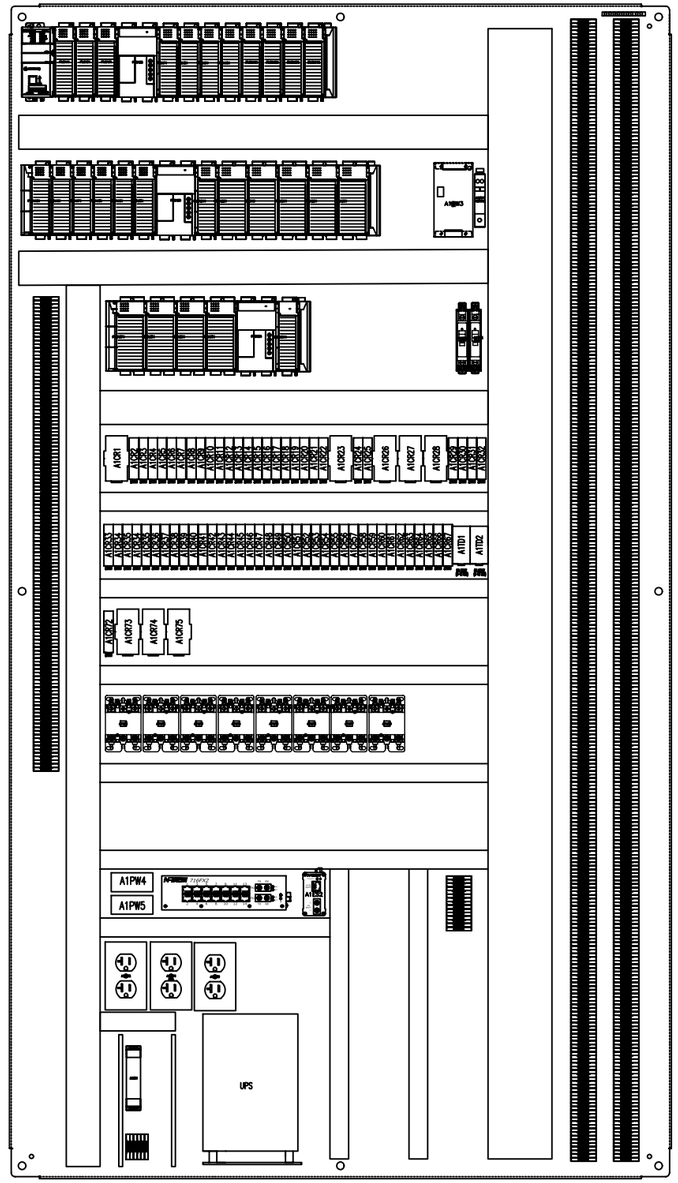


NEMA 12 STEEL ENCLOSURE TYPE 1 – GRAY

ENLARGED VIEW

XA-21-5-2
PLC SCAN FAIL

RE



PANEL BUILT & LABELED TO UL 508A STANDARDS

TIGHTEN ALL TERMINAL BLOCKS TO 6 LB-INS

POWER CIRCUIT FIELD WIRING TERMINALS USE COPPER WIRE AND INSULATING TEMP ABOVE 60 DEGREES C

ALL INCOMING CONTACTS TO BE PROTECTED BY $\frac{1}{2}$ AMP FUSING

UL LABEL NO. A43285098

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
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B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
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SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A37 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

INSTALLATION: A1 LOCATION: LCP-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
XA-21-5-2	1		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
PLCA101 PLCA111 PLCA121 PLCA131 PLCA141 PLCA151 PLCA161 PLCA171 PLCA181 PLCA191 PLCA201 PLCA211 PLCA51 PLCA61 PLCA71 PLCA81 PLCA91	17		1769-IA16	AB	1769 SERIES, 16 CH, AC, DIGITAL INPUT MODULE
PLCA281 PLCA291 PLCA301	3		1769-IF8	AB	1769 SERIES, 8 CH, ANALOG CURRENT/VOLTAGE INPUT MODULE
PLCA41	1		1769-IQ16	AB	1769 SERIES, 16 CH, DC, DIGITAL INPUT MODULE
PLCA21	1		1769-L36ERM	AB	1769 SERIES, COMPACTLOGIX CONTROLLER, 3 MB, DUAL ETHERNET
PLCA311	1		1769-OF4CI	AB	1769 SERIES, 4 CH, ANALOG ISOLATED CURRENT OUTPUT MODULE
PLCA221 PLCA231 PLCA241 PLCA251 PLCA261 PLCA271	6		1769-OW16	AB	1769 SERIES, 16 CH, DIGITAL OUTPUT MODULE
PLCA22 PLCA23	2	*1	1769-PA2	AB	1769 SERIES POWER SUPPLY, 120/240VAC INPUT, 2A AT 5 VDC OUTPUT
		*1	1769-CRL3	AB	1769 SERIES, COMM. BUS EXPANSION CABLE, RIGHT TO LEFT, 3.28 FT
PLCA24	1	*1	1769-PA2	AB	1769 SERIES POWER SUPPLY, 120/240VAC INPUT, 2A AT 5 VDC OUTPUT
		*1	1769-ECR	AB	1769 SERIES, RIGHT END CAP
PLCA25	1		2711P-T10C4D8	AB	PANELVIEW PLUS 6, 10" OPERATOR INTERFACE, TOUCHSCREEN
A1PW4 A1PW5	2		T8133	AXIS	30W MIDSPAN, POWER OVER ETHERNET, 120-240VAC I/P, POE+ O/P
A1SU1	1		DS240S-120	CITEL	SURGE SUPPRESSOR, 120 VAC, 3W, 40 kA SCCR, REPLACEABLE MODULE
A1TD1 A1TD2	2	*1	GT5Y-4SN1A100	IDEC	TIME DELAY RELAY, RANGE: 0.1 SEC - 10 MIN, 4 FORM C CONTACTS, 120VAC COIL
		*1	SY4S-05	IDEC	14 BLADE SCREW TERMINAL BASE SOCKET

INSTALLATION: A1 LOCATION: LCP-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
A1CR10,A1CR11 A1CR12,A1CR13 A1CR14,A1CR15 A1CR16,A1CR17 A1CR18,A1CR19 A1CR2,A1CR20 A1CR21,A1CR22 A1CR24,A1CR25 A1CR29,A1CR3 A1CR30,A1CR31 A1CR32,A1CR33 A1CR34,A1CR35 A1CR36,A1CR37 A1CR38,A1CR39 A1CR4,A1CR40 A1CR41,A1CR42 A1CR43,A1CR44 A1CR45,A1CR46 A1CR47,A1CR48 A1CR49,A1CR5 A1CR50,A1CR51 A1CR52,A1CR53 A1CR54,A1CR55 A1CR56,A1CR57 A1CR58,A1CR59 A1CR6,A1CR60 A1CR61,A1CR62 A1CR63,A1CR64 A1CR65,A1CR66 A1CR67,A1CR68 A1CR69,A1CR7 A1CR72,A1CR8 A1CR9	65	*1	RJ1S-CL-A120	IDEC	SLIM POWER RELAY, 1PDT, 120VAC, 12 AMP CONTACT

CONTINUE TO NEXT PAGE

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
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D			
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A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A38 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

INSTALLATION: A1 LOCATION: LCP-H

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
A1CR1 A1CR23 A1CR26 A1CR27 A1CR28 A1CR73 A1CR74 A1CR75	8	*1	RR3B-ULAC120V	IDEC	SQUARE BASE RELAY, 3PDT, 120VAC, 10 AMP CONTACT
		*1	SR3B-05	IDEC	SCREW TERMINAL BASE SOCKET
A1PW1 A1PW2 A1PW6	3		CR20-I	LEVITON	20 AMP DUPLEX RECEPTACLE, IVORY
A1PW3	1		DR-120-24	MEANWELL	120W, 24VDC POWER SUPPLY
A1ES2	1		102MC-SC	N-TRON	1 PORT 10/100BASE TX RJ-45 PORT, 1 SC FIBER PORT
A1ES1	1		716FX2-SC	N-TRON	14 PORT 10/100BASE TX RJ-45 PORTS, 2 SC FIBER PORTS, MANAGED SWITCH
L2 N2	602		3001035	PHOENIX CONTACT	STANDARD IEC TERMINAL BLOCK - UK 2,5 B
A1UPS1	1		PW9130L700T	POWERWARE	UPS, 700 VA, 120/240 VAC INPUT, 120/240 VAC OUTPUT, RELAY OUTPUT
A1IS1	1		5104BB2A	PR ELECTRONICS	ANALOG IS BARRIER, 1 CHANNEL, 4-20 MADC
A1EN1	1	*1	SCE-904820FSD	SCE	FREE-STANDING TYPE 12 TWO-DOOR ENCLOSURES
		*1	SCE-90P48F1	SCE	SUBPANEL, WHITE
	2		PK9GTA	SQD	9 HOLE GROUND BAR KIT
A1CB1 A1CB2	2		QOU110	SQD	CIRCUIT BREAKER, QOU, 10 A, 10 KAIC
A1LR1 A1LR2 A1LR3 A1LR4 A1LR5 A1LR6 A1LR7 A1LR8	8		8910DPA13V02	SQD	LOAD RELAY, 3 POLE, 20 A CONTACTS, 3NO
A1AH1	1		12PN31100	WOLF AUTOMATION	HORN, 80dB, 110VAC/10mA, UL, NEMA 1

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WWTF SLUDGE DRYER
BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C	AS INSTALLED	10/18	AO
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A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION A1
LOCATION LCP-BEACON
TYPE 101
PAGE A39 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-C
PROJECT WISCONSIN DELLS, WI

TO 120 VAC, 1 PHASE, 60 HZ SUPPLY
MAIN DISCONNECT EXTERNAL TO PANEL
PROVIDED BY OTHERS

WARNING:
DANGEROUS VOLTAGE WITHIN.
DE-ENERGIZE ALL POWER
SOURCES PRIOR TO
ENTERING

L1 → L1 B1CB1 10A

N

G → GROUND PER NEC

B1111 → B1SU1 120VAC → SURGE PROTECTION DEVICE

CONTROL POWER
HS-28-4-1-1
OFF ON
X0

B1112

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR43 | LCP-H B1161 | LCP-28-1 B1161 → B1161 → YL-28-4-1-38 (G)
TB1
A25-22
FILL STATION NO.1
BAG FILLING IN PROGRESS
→ FILL STATION NO.1 BAG FILLING IN PROGRESS

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR44 | LCP-H B1191 | LCP-28-1 B1191 → B1191 → YA-28-4-1-7 (R)
A25-26
FILL STATION NO.1
BAG FULL
→ FILL STATION NO.1 BAG FULL

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR49 | LCP-H B1221 | LCP-28-1 B1221 → B1221 → YL-28-4-2-38 (G)
A25-51
FILL STATION NO.2
BAG FILLING IN PROGRESS
→ FILL STATION NO.2 BAG FILLING IN PROGRESS

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR50 | LCP-H B1251 | LCP-28-1 B1251 → B1251 → YA-28-4-2-7 (R)
A25-55
FILL STATION NO.2
BAG FULL
→ FILL STATION NO.2 BAG FULL

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR55 | LCP-H B1281 | LCP-28-1 B1281 → B1281 → YL-28-4-3-38 (G)
A26-06
FILL STATION NO.3
BAG FILLING IN PROGRESS
→ FILL STATION NO.3 BAG FILLING IN PROGRESS

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR56 | LCP-H B1311 | LCP-28-1 B1311 → B1311 → YA-28-4-3-7 (R)
A26-10
FILL STATION NO.3
BAG FULL
→ FILL STATION NO.3 BAG FULL

E → to B1-37

N → to 37

from B1-36
E

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR61 | LCP-H B1391 | LCP-28-1 B1391 → B1391 → YL-28-4-4-38 (G)
A26-30
FILL STATION NO.4
BAG FILLING IN PROGRESS
→ FILL STATION NO.4 BAG FILLING IN PROGRESS

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR62 | LCP-H B1421 | LCP-28-1 B1421 → B1421 → YA-28-4-4-7 (R)
A26-34
FILL STATION NO.4
BAG FULL
→ FILL STATION NO.4 BAG FULL

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR67 | LCP-H B1451 | LCP-28-1 B1451 → B1451 → YL-28-4-5-38 (G)
A26-59
FILL STATION NO.5
BAG FILLING IN PROGRESS
→ FILL STATION NO.5 BAG FILLING IN PROGRESS

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR68 | LCP-H B1481 | LCP-28-1 B1481 → B1481 → YA-28-4-5-7 (R)
A26-63
FILL STATION NO.5
BAG FULL
→ FILL STATION NO.5 BAG FULL

LCP-28-1 B1112 | LCP-H B1112 | LCP-H A1CR69 | LCP-H B1541 | LCP-28-1 B1541 → B1541 → YA-28-4-1-12 (R)
B1112
A26-67
ADDITIONAL FILL STATION
REQUIRED ALARM
→ ADDITIONAL FILL STATION REQUIRED ALARM

from 36
N

N

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WWTF SLUDGE DRYER
BUILDING H
LCP-28-1

DES	K.ATWOOD	DATE	01/18/16	B	AS BUILT	10/17	AO	H							
DRN	K.ATWOOD	DATE	01/18/16	A	RELEASED	04/17	AO	G							
APP	K.ATWOOD	DATE	01/18/16	REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT				

SECTION B1
LOCATION MCC
TYPE 101
PAGE B1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

FILL STATION NO.1

INFLATION AIR SUPPLY VALVE FV-28-4-1-2
HS-28-4-1-4
CLOSE / OPEN AUTO
XOO
A18-10,A18-14

DUST COLLECTION PORT FV-28-4-1-3
HS-28-4-1-9
CLOSE / OPEN AUTO
XOO
A18-18,A18-22

ORIFICE GATE VALVE FV-28-4-1-4
HS-28-4-1-14
CLOSE / OPEN AUTO
XOO
A18-26,A18-30

FILL STATION NO.2

INFLATION AIR SUPPLY VALVE FV-28-4-2-2
HS-28-4-2-4
CLOSE / OPEN AUTO
XOO
A18-39,A18-43

DUST COLLECTION PORT FV-28-4-2-3
HS-28-4-2-9
CLOSE / OPEN AUTO
XOO
A18-47,A18-51

ORIFICE GATE VALVE FV-28-4-2-4
HS-28-4-2-14
CLOSE / OPEN AUTO
XOO
A18-55,A18-59

FILL STATION NO.3

INFLATION AIR SUPPLY VALVE FV-28-4-3-2
HS-28-4-3-4
CLOSE / OPEN AUTO
XOO
A19-02,A19-06

DUST COLLECTION PORT FV-28-4-3-3
HS-28-4-3-9
CLOSE / OPEN AUTO
XOO
A19-10,A19-14

ORIFICE GATE VALVE FV-28-4-3-4
HS-28-4-3-14
CLOSE / OPEN AUTO
XOO
A19-18,A19-22

START BAG AUTO FILLING SEQUENCE
HS-28-4-1-2
A18-02

FILLING FAULT ALARM RESET
HS-28-4-1-3
A18-06

FILL STATION NO.4

INFLATION AIR SUPPLY VALVE FV-28-4-4-2
HS-28-4-4-4
CLOSE / OPEN AUTO
XOO
A19-30,A19-34

DUST COLLECTION PORT FV-28-4-4-3
HS-28-4-4-9
CLOSE / OPEN AUTO
XOO
A19-39,A19-43

ORIFICE GATE VALVE FV-28-4-4-4
HS-28-4-4-14
CLOSE / OPEN AUTO
XOO
A19-47,A19-51

FILL STATION NO.5

INFLATION AIR SUPPLY VALVE FV-28-4-5-2
HS-28-4-5-4
CLOSE / OPEN AUTO
XOO
A19-59,A19-63

DUST COLLECTION PORT FV-28-4-5-3
HS-28-4-5-9
CLOSE / OPEN AUTO
XOO
A20-02,A20-06

ORIFICE GATE VALVE FV-28-4-5-4
HS-28-4-5-14
CLOSE / OPEN AUTO
XOO
A20-10,A20-14

TRANSFER CONVEYOR DUST COLLECTION VALVES

XFR CONVEYOR WEST D.C. VALVE FV-29-2-1
HS-29-2-1-1
CLOSE / OPEN AUTO
XOO
A14-26,A14-30

WEST DUST PICKUP D.C. VALVE FV-29-2-2
HS-29-2-2-1
CLOSE / OPEN AUTO
XOO
A14-34,A14-39

EAST DUST PICKUP D.C. VALVE FV-29-2-3
HS-29-2-3-1
CLOSE / OPEN AUTO
XOO
A14-43,A14-47

XFR CONVEYOR EAST D.C. VALVE FV-29-2-4
HS-29-2-4-1
CLOSE / OPEN AUTO
XOO
A14-51,A14-55

BULK BAG LOADING CONVEYOR DUST COLLECTOR

BULK BAG LOADING CONV. D.C. VALVE FV-29-2-5
HS-29-2-5-1
CLOSE / OPEN AUTO
XOO
A14-59,A14-63

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WWTF SLUDGE DRYER
BUILDING H
LCP-28-1

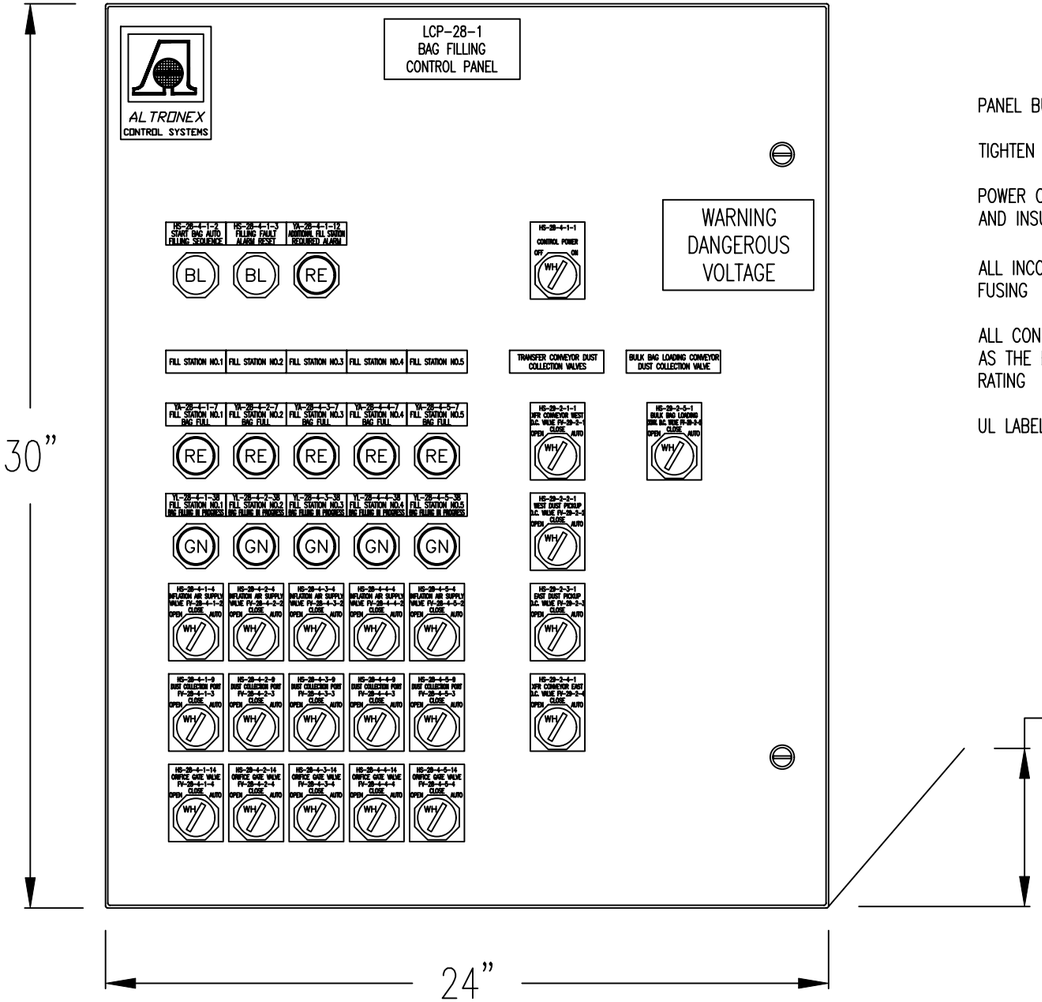
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DRN	K.ATWOOD	DATE	01/18/16	A	RELEASED	04/17	AO	G					
APP	K.ATWOOD	DATE	01/18/16	REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT		

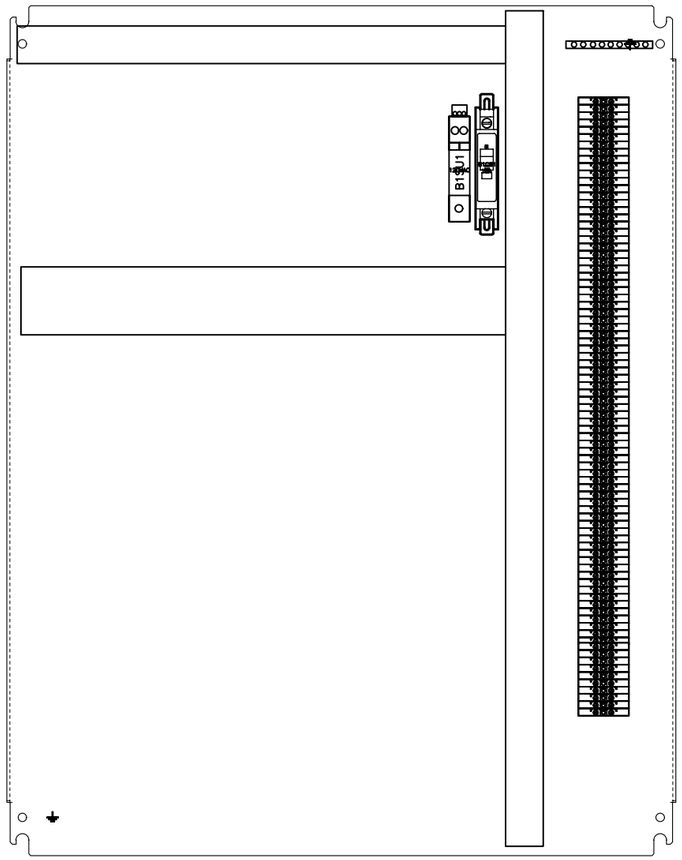
SECTION B1
LOCATION MCC
TYPE 101
PAGE B2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

ENCLOSURE





PANEL BUILT AND LABELED TO UL 508A STANDARDS

TIGHTEN ALL TERMINAL BLOCKS TO 6 IN-LBS

POWER CIRCUIT FIELD WIRING TERMINALS USE COPPER WIRE AND INSULATING TEMP ABOVE 60 DEGREES C.

ALL INCOMING CONTACTS TO BE PROTECTED BY $\frac{1}{2}$ AMP FUSING

ALL CONDUIT CONNECTIONS NEED TO BE THE SAME RATING AS THE ENCLOSURE TO MAINTAIN THE ENCLOSURE TYPE RATING

UL LABEL NO. A43285100

NEMA 12 GRAY PAINTED STEEL ENCLOSURE

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WWTF SLUDGE DRYER
BUILDING H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION B1
LOCATION MCC
TYPE 101
PAGE B3 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: Location: LCP-28-1

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
HS-28-4-1-2 HS-28-4-1-3	2		800T-A2D1	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NO, BLACK
HS-28-4-1-1	1		800T-H2A	AB	SELECTOR SW - 2 POS MAINT, NEMA 4/13
HS-28-4-1-14 HS-28-4-1-4 HS-28-4-1-9 HS-28-4-2-14 HS-28-4-2-4 HS-28-4-2-9 HS-28-4-3-14 HS-28-4-3-4 HS-28-4-3-9 HS-28-4-4-14 HS-28-4-4-4 HS-28-4-4-9 HS-28-4-5-14 HS-28-4-5-4 HS-28-4-5-9 HS-29-2-1-1 HS-29-2-2-1 HS-29-2-3-1 HS-29-2-4-1 HS-29-2-5-1	20		800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
YL-28-4-1-38 YL-28-4-2-38 YL-28-4-3-38 YL-28-4-4-38 YL-28-4-5-38	5		800T-QTH2G	AB	GREEN PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
YA-28-4-1-12 YA-28-4-1-7 YA-28-4-2-7 YA-28-4-3-7 YA-28-4-4-7 YA-28-4-5-7	6		800T-QTH2R	AB	RED PILOT LIGHT - PRESS TO TEST, NEMA 4/13, LED, 12-130V AC/DC
B1SU1	1		DS240S-120	CITEL	SURGE SUPPRESSOR, 120 VAC, 3W, 40 kA SCCR, REPLACEABLE MODULE
ENCLOSURE	1	*1	CSD302412	HOFFMAN	CONCEPT WALL-MOUNT ENCLOSURE
		*1	CP3024	HOFFMAN	BACKPAN
TB1	22		3001035	PHOENIX	TERMINAL BLOCKS
	1		PK9GTA	SQD	9 HOLE GROUND BAR KIT
B1CB1	1		QOU110	SQD	CIRCUIT BREAKER, QOU, 10 A, 10 KAIC

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WWTF SLUDGE DRYER
BUILDING H
LCP-28-1 BOM

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION B1
LOCATION MCC
TYPE 101
PAGE B4 OF 116

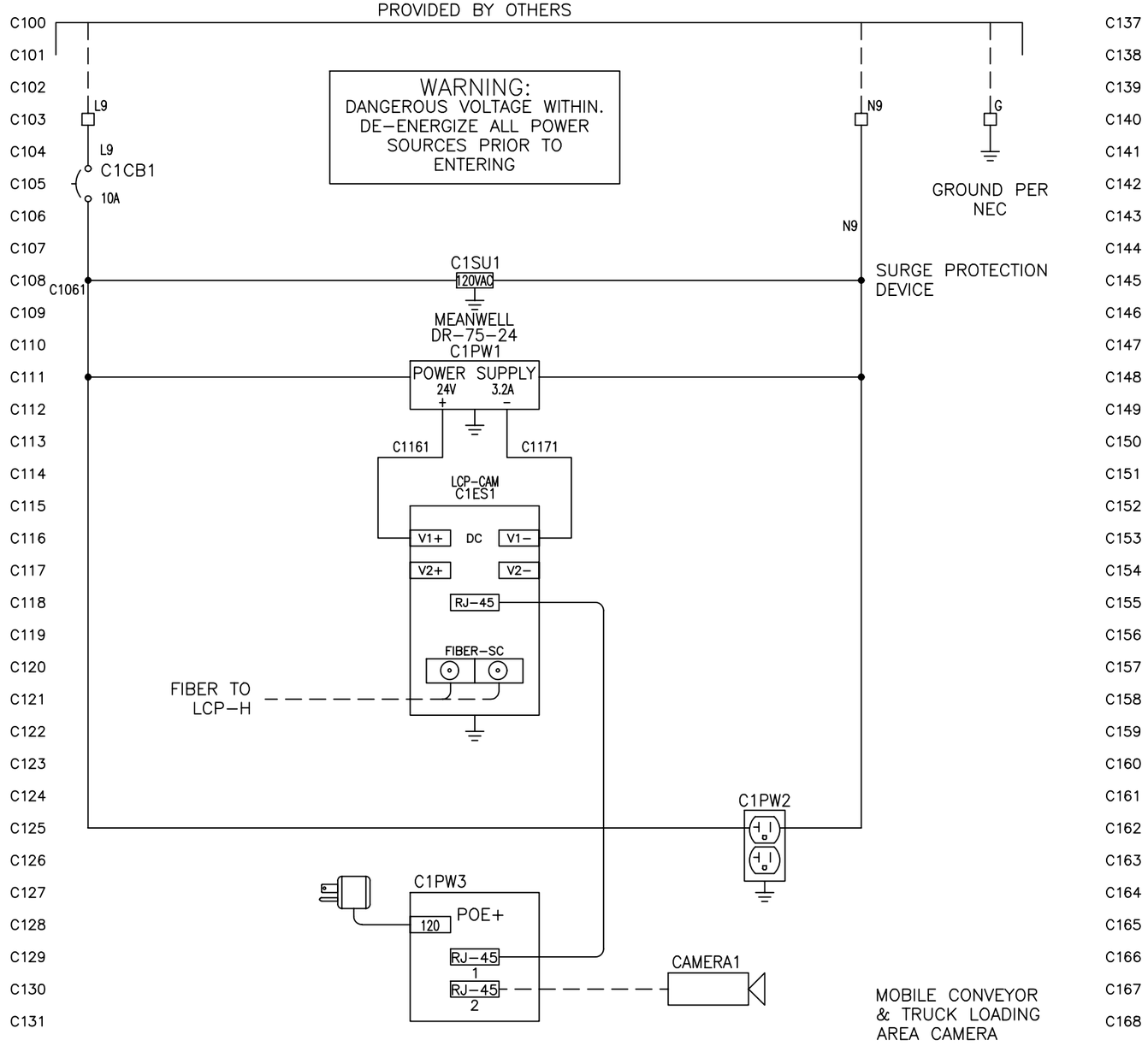
ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

TO 120 VAC, 1 PHASE, 60 HZ SUPPLY
MAIN DISCONNECT EXTERNAL TO PANEL
PROVIDED BY OTHERS

C100 C101 C102 C103 C104 C105 C106 C107 C108 C109 C110 C111 C112 C113 C114 C115 C116 C117 C118 C119 C120 C121 C122 C123 C124 C125 C126 C127 C128 C129 C130 C131 C132 C133 C134 C135 C136

C137 C138 C139 C140 C141 C142 C143 C144 C145 C146 C147 C148 C149 C150 C151 C152 C153 C154 C155 C156 C157 C158 C159 C160 C161 C162 C163 C164 C165 C166 C167 C168 C169 C170 C171 C172 C173



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WWTF SLUDGE DRYER
BUILDING H
CAMERA EQUIPMENT

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C			
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

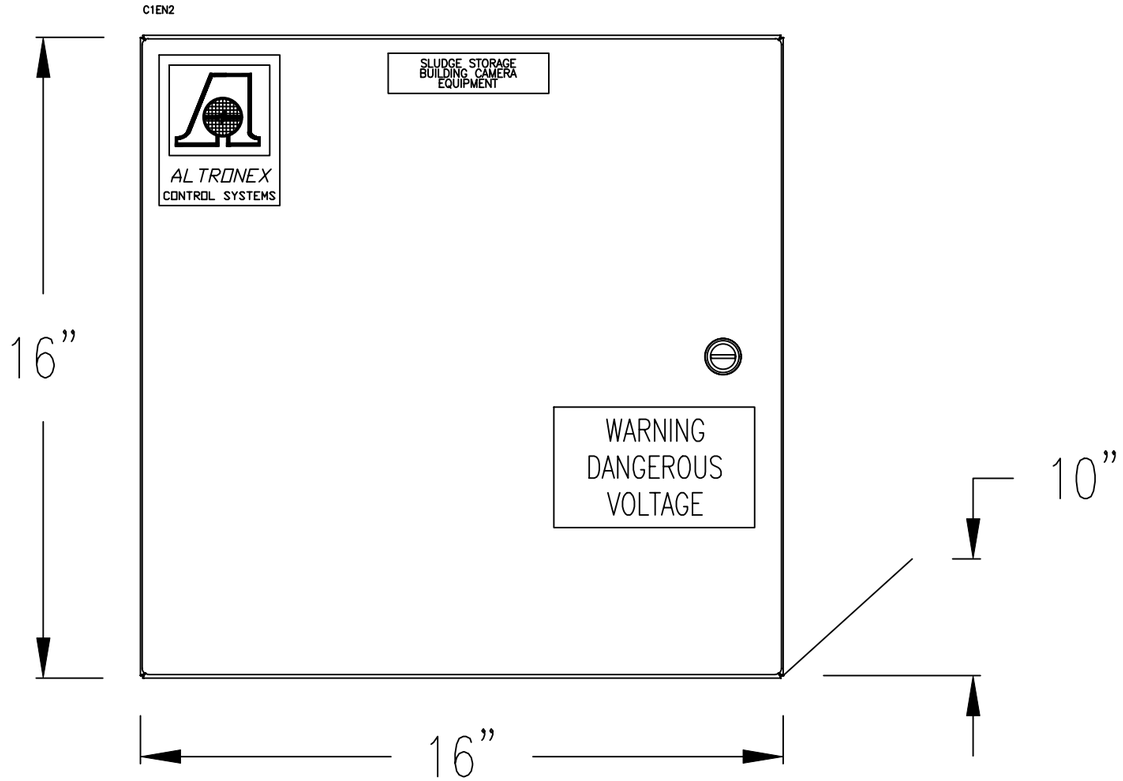
REV	DESCRIPTION	DATE	INIT
L			
K			
J			
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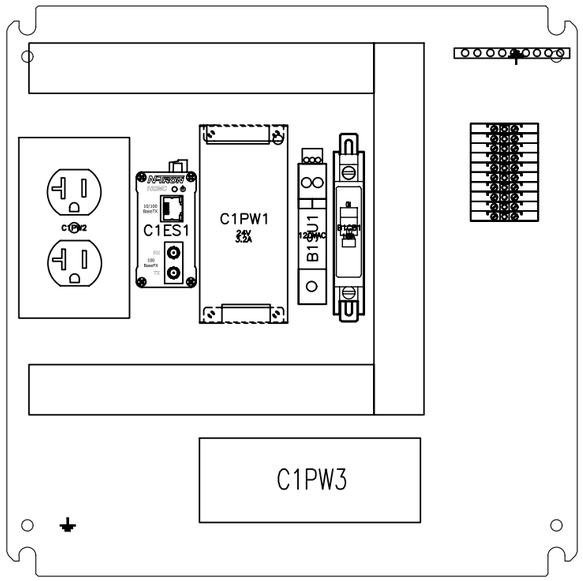
SECTION C1
LOCATION MCC
TYPE 101
PAGE C1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

C1EN2





NEMA 12 GRAY PAINTED STEEL ENCLOSURE

PANEL BUILT AND LABELED TO UL 508A STANDARDS

TIGHTEN ALL TERMINAL BLOCKS TO 6 IN-LBS

POWER CIRCUIT FIELD WIRING TERMINALS USE COPPER WIRE AND INSULATING TEMP ABOVE 60 DEGREES C.

ALL INCOMING CONTACTS TO BE PROTECTED BY $\frac{1}{2}$ AMP FUSING

ALL CONDUIT CONNECTIONS NEED TO BE THE SAME RATING AS THE ENCLOSURE TO MAINTAIN THE ENCLOSURE TYPE RATING

UL LABEL NO. A43285099

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WWTF SLUDGE DRYER
BUILDING H
CAMERA EQUIPMENT

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION C1
LOCATION MCC
TYPE 101
PAGE C2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS Installation:			Location: LCP-CAM		
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
C1PW3	1		T8133	AXIS	30W MIDSPAN, POWER OVER ETHERNET, 120-240VAC I/P, POE+ O/P
C1SU1	1		DS240S-120	CITEL	SURGE SUPPRESSOR, 120 VAC, 3W, 40 kA SCCR, REPLACEABLE MODULE
C1EN2	1	*1	CSD161610	HOFFMAN	CONCEPT WALL-MOUNT ENCLOSURE
		*1	CP1616	HOFFMAN	BACKPAN
C1PW2	1		CR20-I	LEVITON	20 AMP DUPLEX RECEPTACLE, IVORY
C1PW1	1		DR-75-24	MEANWELL	75W, 24VDC POWER SUPPLY
C1ES1	1		102MC-SC	N-TRON	1 PORT 10/100BASE TX RJ-45 PORT, 1 SC FIBER PORT
	2		3001035	PHOENIX CONTACT	STANDARD IEC TERMINAL BLOCK - UK 2,5 B
	1		PK9GTA	SQD	9 HOLE GROUND BAR KIT
C1CB1	1		QOU110	SQD	CIRCUIT BREAKER, QOU, 10 A, 10 KAIC

BILL OF MATERIALS Installation: REMOTE			Location: LCP-CAM		
TAGS	QTY	SUB	CATALOG	MFG	DESCRIPTION
CAMERA1	1	*1	P5624-E	AXIS	DOME NETWORK CAMERA, HDTV 720P, PTZ, INDOOR/OUTDOOR
		*1	T91D61	AXIS	WALL MOUNT BRACKET

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WWTF SLUDGE DRYER
BUILDING H
CAMERA EQUIPMENT

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

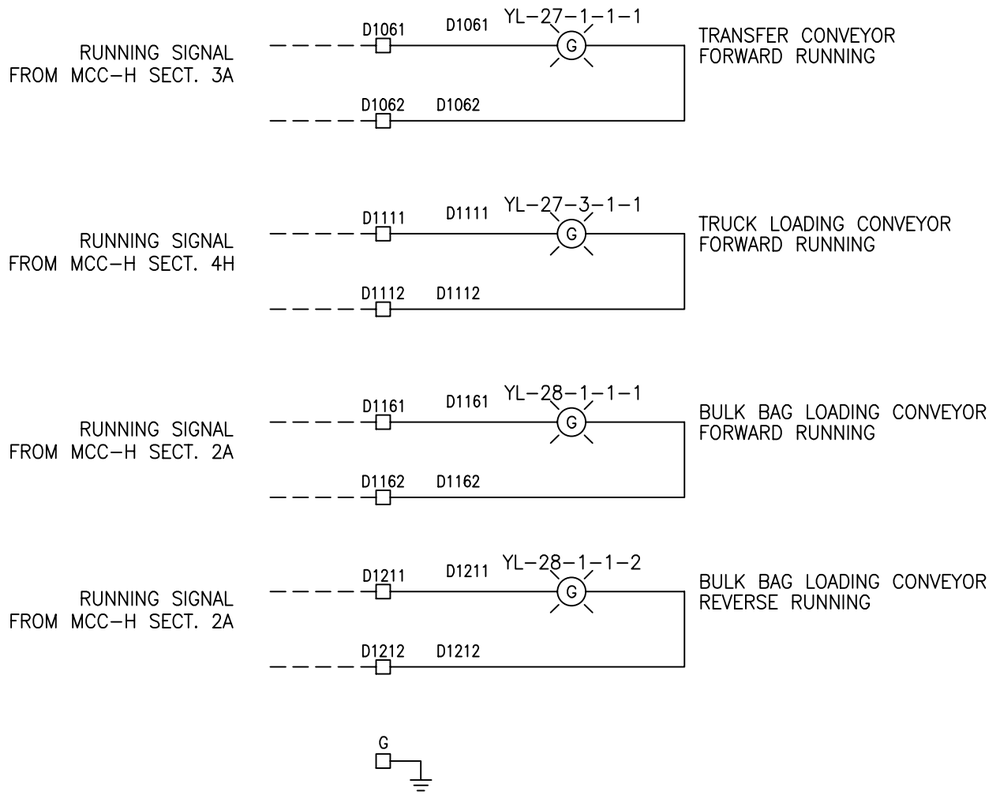
REV	DESCRIPTION	DATE	INIT
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION C1
LOCATION MCC
TYPE 101
PAGE C3 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

D100
D101
D102
D103
D104
D105
D106
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D136



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WWTF SLUDGE DRYER
BUILDING H
CONVEYOR BEACONS

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION D1
LOCATION LCP–BEACON
TYPE 101
PAGE D1 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222–8622 www.altronex.com

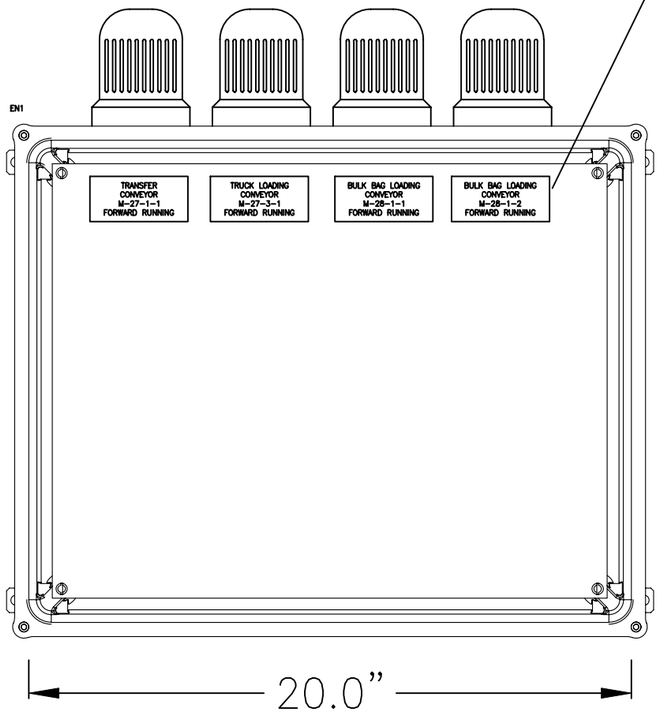
DRAWING D16007–B
PROJECT WISCONSIN DELLS, WI

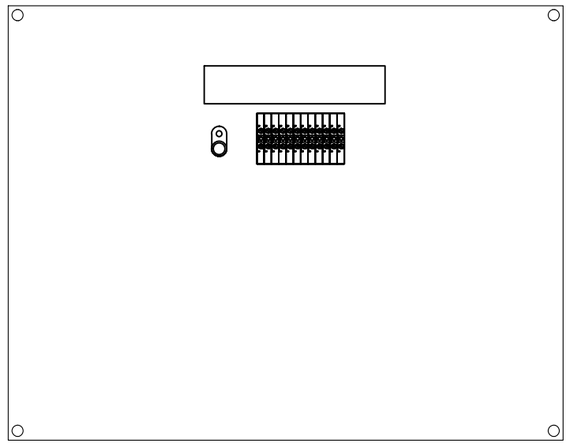
TRANSFER CONVEYOR M-27-1-1 FORWARD RUNNING

TRUCK LOADING CONVEYOR M-27-3-1 FORWARD RUNNING

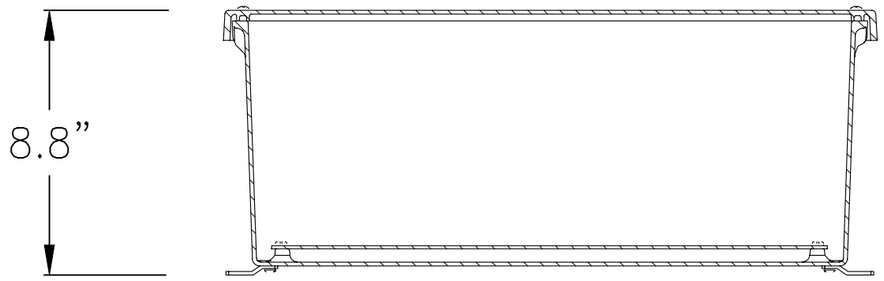
BULK BAG LOADING CONVEYOR M-28-1-1 FORWARD RUNNING

BULK BAG LOADING CONVEYOR M-28-1-2 FORWARD RUNNING





NEMA 4X POLYESTER JUNCTION BOX



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WWTF SLUDGE DRYER BUILDING H
CONVEYOR BEACONS

DES	K.ATWOOD	DATE	01/18/16
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REV	DESCRIPTION	DATE	INIT
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SECTION D1
LOCATION LCP-BEACON
TYPE 101
PAGE D2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS
Installation: Location: LCP-BEACON

TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
YL-27-1-1-1 YL-27-3-1-1 YL-28-1-1-1 YL-28-1-1-2	4		125LEDFG120AB	EDWARDS	125 SERIES, GREEN, FLASHING BEACON, LED, NEMA 4X, BLACK BASE, 120 VAC
EN1	1	*1	PJ20168H	HAMMOND MFG	20"X16"X8", NEMA 4X, POLYESTER, JUNCTION BOX, HINGED COVER
		*1	P2068	HAMMOND MFG	BACKPAN
G	1		CP-4	ILSCO	CP POST CONNECTOR, 4-14 AWG
	8		3001035	PHOENIX CONTACT	STANDARD IEC TERMINAL BLOCK - UK 2,5 B

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WWTF SLUDGE DRYER
BUILDING H
LCP-BEACON BOM

DES	K.ATWOOD	DATE	01/18/16
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APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	10/17	AO
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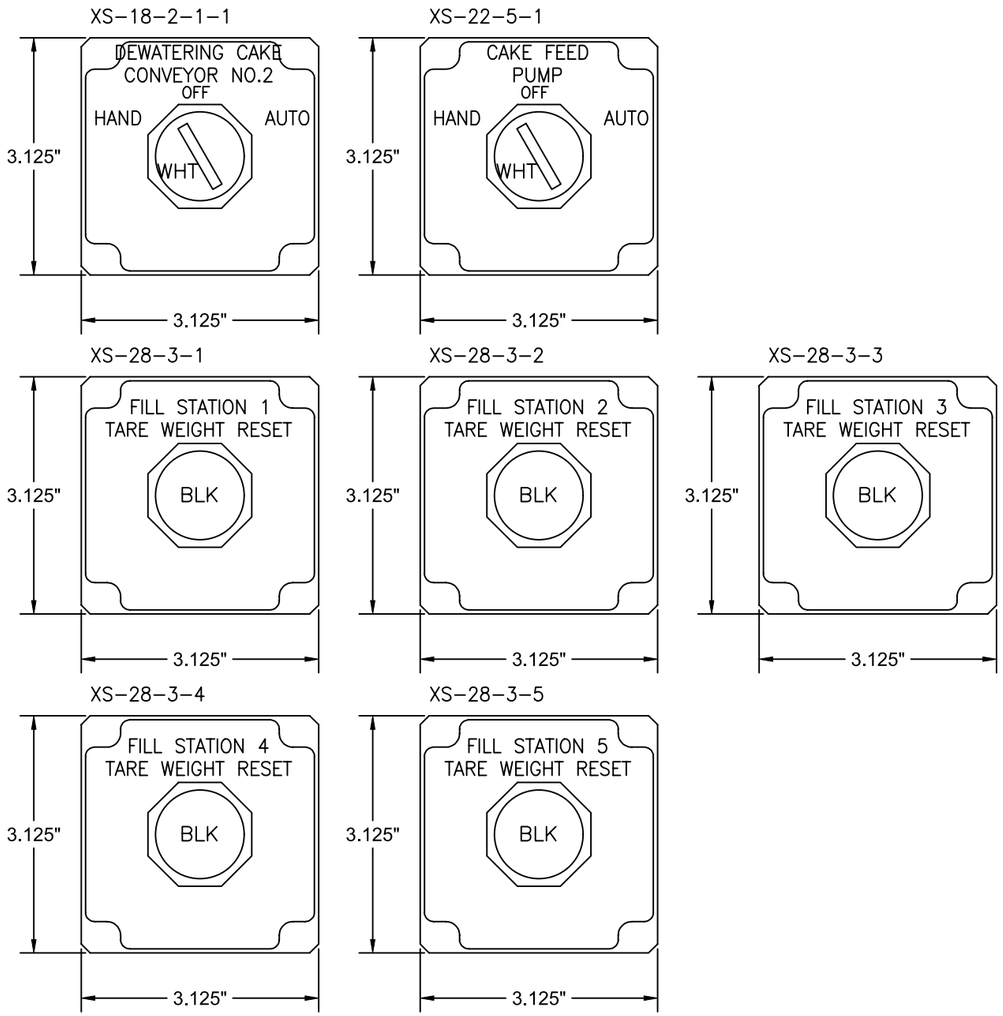
SECTION D3
LOCATION LCP-BEACON
TYPE 101
PAGE D3 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

Installation: REMOTE			Location: MCC-H		
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
XS-18-3-2 XS-18-3-3 XS-27-1-2 XS-27-1-3 XS-27-3-2	5	*1	Q1PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 1 HOLE
		*1	800T-FX6D4	AB	MUSHROOM HEAD PUSH-PULL, RED, 1 NC, NEMA 4/13
XS-18-3-1	1	*1	Q1PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 1 HOLE
		*1	800T-N2KF4B	AB	SELECTOR SW - 4 POS MAINT, NEMA 4/13
XS-19-5-1 XS-28-2-1 XS-31-1-1 XS-31-1-2 XS-33-2-3 XS-33-2-4	6	*1	Q1PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 1 HOLE
		*1	800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
XS-28-1-2	1	*1	Q2PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 2 HOLE
		*1	800T-FX6A1	AB	MUSHROOM HEAD PUSH-PULL, RED, 1 NO 1 NC, NEMA 4/13
		*1	800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
XS-27-1-1 XS-27-3-1	2	*1	Q2PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 2 HOLE
		*1	800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
		*1	800T-H2A	AB	SELECTOR SW - 2 POS MAINT, NEMA 4/13
XS-18-4-1 XS-18-4-2	2	*1	Q2PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 2 HOLE
		*1	800T-FX6D4	AB	MUSHROOM HEAD PUSH-PULL, RED, 1 NC, NEMA 4/13
		*1	800T-H2A	AB	SELECTOR SW - 2 POS MAINT, NEMA 4/13
XS-30-1-1 XS-33-1-1 XS-33-2-1 XS-33-2-2 XS-33-3-1 XS-33-4-1 XS-33-4-2	7	*1	Q3PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 3 HOLE
		*1	800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
		*2	800T-A2D1	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NO, BLACK
XS-28-1-1	1	*1	Q4PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 4 HOLE
		*1	800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
		*1	800T-H2A	AB	SELECTOR SW - 2 POS MAINT, NEMA 4/13
		*1	800T-FXT6A1	AB	MUSHROOM HEAD PUSH-PULL BUTTON, NEMA 4/13, NO, NC, RED
		*1	800T-A2D2	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NC, BLACK
XS-27-4-1	1	*1	Q4PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 4 HOLE
		*1	800T-H2A	AB	SELECTOR SW - 2 POS MAINT, NEMA 4/13
		*1	800T-FX6D4	AB	MUSHROOM HEAD PUSH-PULL, RED, 1 NC, NEMA 4/13
		*2	800T-A2D1	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NO, BLACK

Installation: LOOSE			Location: REMOTE		
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
XS-18-2-1-1 XS-22-5-1	2	*1	Q1PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 1 HOLE
		*1	800T-J2B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
XS-28-3-1 XS-28-3-2 XS-28-3-3 XS-28-3-4 XS-28-3-5	5	*1	Q1PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 1 HOLE
		*1	800T-A2D1	AB	PUSH BUTTON - MOMENTARY, NEMA 4/13, NO, BLACK



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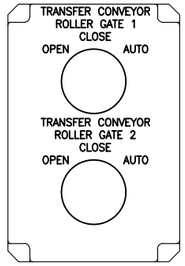
WWTF SLUDGE DRYER
BUILDING H
REMOTE INSTRUMENTATION

DES	K.ATWOOD	DATE	01/18/16	F					L				SECTION		
DRN	K.ATWOOD	DATE	01/18/16	E					K				R1		
APP	K.ATWOOD	DATE	01/18/16	D					J				LOCATION		
				C					I				MCC		
				B	AS BUILT	10/17	AO		H				TYPE	PAGE	
				A	RELEASED	04/17	AO		G				101	R1 OF 116	
				REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT				

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

XS-27-2-1



BILL OF MATERIALS
Installation: REMOTE Location: LCP-H

TAGS	QTY	SUB	CATALOG	MFG	DESCRIPTION
XS-27-2-1	1	*2	800T-J2KC1B	AB	SELECTOR SW - 3 POS MAINT, NEMA 4/13, 3 NO
		*1	Q2PBPCD	HOFFMAN	FIBERGLASS PUSHBUTTON ENCLOSURE, 2 HOLE
CAMERA2 CAMERA3	2	*1	P5624-EMK2	AXIS	DOME NETWORK CAMERA, HDTV 720P, PTZ, INDOOR/OUTDOOR
		*1	T91D61	AXIS	WALL MOUNT BRACKET
PIT-19-6-1	1		IGP10-A22D1F	FOXBORO	PRESSURE TRANSDUCER, DIRECT MOUNT, 10-300 PSI, 4-20 MADC LOOP POWERED, 1/2" MALE NPT, 1/4" FEMALE NPT
LI-31-2-1	1		PD6770-0K0	PRECISION DIGITAL	VANTAGEVIEW DISPLAY, 3 1/2" DIGITAL LCD, 4-20 MA LOOP POWERED W/ BACKLIGHT
LSHH-31-2-1	1		W2T294202C	SIEMENS	NO, 9G NON-MERCURY SUSPENDED FLOAT SWITCH
FE/FIT-19-7-1	1	*1	7ME6920-1AA10-1AA0-Z+Y17	SIEMENS	SITRANS FM MAG 6000 TRANSMITTER, 115-230 VAC
		*1	7ME6580-3TJ14-2AA2-Z+Y17	SIEMENS	SITRANS FM MAG 5100W, 4" MAGNETIC FLOW METER
		*2	FDK083N8025	SIEMENS	4" STAINLESS STEEL GROUNDING RING
		*1	FDK085U1053	SIEMENS	MAGFLO TRANSMITTER WALL MOUNT BRACKET
		*1	FDK001SPCAB	SIEMENS	MAG METER CABLE, 30FT
		*1	FDK001STCAB	SIEMENS	MAG METER CABLE, STANDARD, 30FT
LT-31-2-1	1	*1	7MF1572-2DA10	SIEMENS	LH100 SUBMERSIBLE PRESSURE TRANSDUCER, 0-12 FT, 33 FT OF CABLE
		*1	7MF1572-8AA	SIEMENS	LH100 J BOX, IP54 PLASTIC, VENT TUBE BOX
		*1	7MF1572-8AB	SIEMENS	LH100 CABLE HANGER
LIT-25-7-1	1	*1	7ML5431-0AD20-0DB1-Z+Y15	SIEMENS	LR250 RADAR LEVEL TRANSMITTER, 4" HORN, INTRINSICALLY SAFE, 2" NPT
		*1	7ML1930-1BK	SIEMENS	HANDHELD PROGRAMMER FOR PROBE LR200
TE/TIT-31-3-1	1	*1	7NG3136-0AC11-Z+U02+Y01 +Y23	SIEMENS	SITRANS TF TEMPERATURE TRANSMITTER, DISPLAY, SETUP FOR PT100 3 WIRE RTD
		*1	R1T185L483-S4C0408-SL-8H N31	PYROMATION	3 WIRE RTD WITH 4" THERMOWELL, 1/2" NPT PROCESS CONNECTION
TSH-34-1-1 TSH-34-1-2	2		5602	SYSTEM SENSOR	HEAT DETECTOR, FIXED TEMPERATURE/RATE-OF-RISE, 194 DEG F, 6-28 VDC, 6-128 VAC
PSL-19-5-1 PSL-19-6-1	2	*1	J400-156/M201/M446/1520	UNITED ELECTRIC	GAUGE PRESSURE SWITCH, 0-100 PSI, 1/4" NPT FEMALE, 1 SPDT CONTACT, FACTORY SETPOINT, SS TAG, ADJUSTABLE DEADBAND
		*4	UPBA475B	MILWAUKEE VALVE	BRASS BALL VALVE, 1/4" NPT FEMALE
		*1	212.34	WIKA	4.5" PRESSURE GAUGE, 1/2" NPT, LOWER MOUNT, 0-100 PSI
TT-33-1-1 TT-33-1-2 TT-33-2-1	3		1XTXSWTL1/M446	UNITED ELECTRIC	ONE SERIES TEMPERATURE TRANSMITTER, 4-20 MADC OUT, LOOP POWERED, 4"RIGID PROBE, -40-450 DEG F

BILL OF MATERIALS
Installation: REMOTE Location: LCP-CAM

TAGS	QTY	SUB	CATALOG	MFG	DESCRIPTION
CAMERA1	1	*1	P5624-E	AXIS	DOME NETWORK CAMERA, HDTV 720P, PTZ, INDOOR/OUTDOOR
		*1	T91D61	AXIS	WALL MOUNT BRACKET

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WWTF SLUDGE DRYER
BUILDING H
REMOTE INSTRUMENTATION

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
F			
E			
D			
C			
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

REV	DESCRIPTION	DATE	INIT
L			
K			
J			
I			
H			
G			

SECTION R1
LOCATION MCC
TYPE 101
PAGE R2 OF 116

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

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bcr ENV | Hollow-Screw Heat Exchangers

INSTRUMENT SCHEDULE

Project: 5914 WISCONSIN DELLS
Document: 5914-04502 Rev I
Date: 8/21/2017

REV	TYPE	LOOP	SUB-LOOP	TAG	SERVICE DESCRIPTION	MFR	PART NO.	BOM	ELEC. DWG.	INPUT RANGE	OUTPUT RANGE	HAZARD CLASS	I.S.	EXP	CERT	SUPPLIER	REMARKS
F	SIC	1101		SIC-1101	DRYER LH M-1101 VFD POWERFLEX 525 5 HP, 10.5A, Frame-B. In VFD CP-107	ALLEN BRADLEY	25B-D010N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					BCR	Motor size 5HP
F	SIC	1102		SIC-1102	DRYER RH M-1102 VFD POWERFLEX 525 5 HP, 10.5A, Frame-B. In VFD CP-107	ALLEN BRADLEY	25B-D010N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					BCR	Motor size 5HP
F	SIC	1201		SIC-1201	COOLING SCREW MOTOR M-1201 VFD POWERFLEX 525 5 HP, 10.5A, Frame-B. In VFD CP-107	ALLEN BRADLEY	25B-D010N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					BCR	Motor size 5HP
F	SIC	1211		SIC-1211	ROTARY VALVE MOTOR M-1211 VFD POWERFLEX 525, 3 HP, 6A, Frame-A. In VFD CP-107	ALLEN BRADLEY	25B-D6P0N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					BCR	Motor size 1HP
F	SIC	1301		SIC-1301	FEED HOPPER LIVE BOTTOM SCREWS M-1301, M-1302 VFD POWERFLEX 525 10HP, 17A, Frame-C. In VFD CP-107	ALLEN BRADLEY	25B-D017N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0-60 Hz					CP Shop	2 Motors size 5HP each
F	SIC	1303		SIC-1303	HOPPER LEVELING SCREWS VFD POWERFLEX 525, 3 HP, 6A, Frame-A. In VFD CP-107	ALLEN BRADLEY	25B-D6P0N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					BCR	2 Motors size 1HP each
F	SIC	1311		SIC-1311	FEED HOPPER LIVE BOTTOM SCREWS M-1311, M-1312 VFD POWERFLEX 525 10HP, 17A, Frame-C. In VFD CP-107	ALLEN BRADLEY	25B-D017N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0-60 Hz					CP Shop	2 Motors size 5HP each
F	SIC	1313		SIC-1313	HOPPER LEVELING SCREWS VFD POWERFLEX 525, 3 HP, 6A, Frame-A. In VFD CP-107	ALLEN BRADLEY	25B-D6P0N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					BCR	2 Motors size 1HP each
F	SIC	1401		SIC-1401	FEED PUMP M-1401 VFD POWERFLEX 525 15HP, 30 A, Frame-D. In VFD CP-107	ALLEN BRADLEY	25B-D030N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0-60 Hz					CP Shop	Motor size 15HP
F	SIC	1531		SIC-1531	CONDENSER BLOWER M-1531 VFD POWERFLEX 525, 3 HP, 6A, Frame-A. In VFD CP-107	ALLEN BRADLEY	25B-D6P0N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					BCR	Motor size 1HP
F	SIC	1551		SIC-1551	ODOR CONTROL BLOWER M-1551 VFD POWERFLEX 525, 3 HP, 6A, Frame-A. IN ODOR CONTROL PANEL	ALLEN BRADLEY	25B-D6P0N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					PURE AIR	Motor size 3HP
F	SIC	1611		SIC-1611	DISCHARGE CONVEYOR M-1611 VFD POWERFLEX 525 5HP, 10.5A, Frame-B. In VFD CP-107	ALLEN BRADLEY	25B-D010N114	N/A	TFL5914-05017	480VAC/3Ø/60Hz	0 - 60 Hz					CP Shop	Motor size 5HP
E	SC	1621		SC-1621	CONDENSER BLOWER M-1531 VFD POWERFLEX 525, 3 HP, 6A, Frame-A. In VFD CP-107	AUMA ACTUATORS	SAEX07.2/AMEXC01.1	N/A	TFL5914-05017	480VAC/3Ø/60Hz	480VAC/3Ø/60Hz	CLASS2 DIV2 GROUP-G		Y	FM	Vortex	Do not order separately, part of actuator
E	SC	1711		SC-1711	CONTACTOR: UL/CSA 480VAC FLA 10A/10HP SIZE S0 (NEMA 1), IP20, MAX 690VAC, MAX 40A @ 400VAC, COIL 120VAC @ 1.1A, 3 POLE, 1NO 1NC 3A @ 400VA, SERIUS, TEMPERATURE -13 TO +140 °F. COMBUSTION AIR BLOWER MOTOR M-1711 CONTACTOR.	SIEMENS	3RT2025-1AK60	N/A	(FULTON)							Fulton	Motor size 10HP
E	SC	1711		SC-1711	OVERLOAD RELAY: SIZE S0 6 TO 25A, CLASS 20, 1NO 1NC, OVERLOAD/PHASE FAILURE/PHASE UNBALANCE DETECTION, SELF-MONITORING, MANUAL/AUTOMATIC RESET, DIRECT MOUNTING TO CONTACTOR, IP20, MOTOR EXPLOSION PROTECTION, TEMPERATURE -13 TO +140, SERIUS, COMBUSTION AIR BLOWER MOTOR M-1711 CONTACTOR OVERLOAD RELAY.	SIEMENS	3RB3026-2QB0	N/A	(FULTON)							Fulton	
E	SIC	1721		SIC-1721	SOFT STARTER ALTISTART 22, 460VAC, 40 HP, 52A, 60 HZ, 3 PHASE, CONTROLS 110VAC, IP20, INTERNAL BYPASS, MODBUS RS485/RS485, 1 DI, 2 DO RELAY (DRY CONTACTS, TEMPERATURE 14 TO 104 °F, UL, CSA. THERMAL FLUID CIRCULATION PUMP MOTOR M-1721.	SCHNEIDER ELECTRIC	ATS22D62S6U	N/A	(FULTON)							Fulton	Motor size 10HP
I	PCV	9001		PCV-9001	NITROGEN PERSSURE REGULATOR	VICTOR	450 HEAVY	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Airgas	
I	PI	9001		PI-9001	NITROGEN PRESSURE GAUGE	VICTOR	INCLUDED WITH 450 HEAVY REGULATOR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Airgas	
E	TE	11001		TE-11001	DRYER INLET PROCESS VAPOR TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, 24" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-024-00-8HN-93	IC03600-11005	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	24" PROBE LENGTH (NO PROCESS SEAL AVAILABLE W/ 0185 SERIES - STEM NOT WELDED)
E	TE	11002		TE-11002	DRYER INLET PROCESS MATERIAL TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, 18" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-018-00-8HN-93	IC03600-11003	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	18" PROBE LENGTH (NO PROCESS SEAL AVAILABLE W/ 0185 SERIES - STEM NOT WELDED)
E	TE	11003		TE-11003	DRYER MIDDLE PROCESS VAPOR TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, 12" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-012-00-8HN-93	IC03600-11001	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	12" PROBE LENGTH (NO PROCESS SEAL AVAILABLE W/ 0185 SERIES - STEM NOT WELDED)

bcr ENV | Hollow-Screw Heat Exchangers

INSTRUMENT SCHEDULE

Project: 5914 WISCONSIN DELLS
Document: 5914-04502 Rev I
Date: 8/21/2017

REV	TYPE	LOOP	SUB-LOOP	TAG	SERVICE DESCRIPTION	MFR	PART NO.	BOM	ELEC. DWG.	INPUT RANGE	OUTPUT RANGE	HAZARD CLASS	I.S.	EXP	CERT	SUPPLIER	REMARKS
E	TE	11004		TE-11004	DRYER MIDDLE PROCESS MATERIAL TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, 18" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-018-00-8HN-93	IC03600-11003	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	18" PROBE LENGTH (NO PROCESS SEAL AVAILABLE W/ 0185 SERIES - STEM NOT WELDED)
E	TE	11007		TE-11007	DRYER DISCHARGE PROCESS VAPOR TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, 12" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-012-00-8HN-93	IC03600-11001	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	12" PROBE LENGTH (NO PROCESS SEAL AVAILABLE W/ 0185 SERIES - STEM NOT WELDED)
E	TE	11008		TE-11008	DRYER DISCHARGE PROCESS MATERIAL TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, 18" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-018-00-8HN-93	IC03600-11003	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	18" PROBE LENGTH (NO PROCESS SEAL AVAILABLE W/ 0185 SERIES - STEM NOT WELDED)
E	TE	11009		TE-11009	DRYER DISCHARGE BIN PROCESS MATERIAL TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, 6" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-006-00-8HN-93	IC03600-11004	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	6" PROBE LENGTH (NO PROCESS SEAL AVAILABLE W/ 0185 SERIES - STEM NOT WELDED)
E	PDT	11010		PDT-11010	DRYER CHAMBER DIFFERENTIAL PRESSURE TRAMSMITTER, RANGE –25" to 25" inH2O, 4-20MA HART, 316-SS DIAPHRAM, FM CSA EXPLOSION/DUST/IGNITION PROOF INTRINSICALLY SAFE DIV2	ROSEMOUNT	3051CD1A02A1AH2M5B3K5Q4	IC03600-11002	TFL5914-05001	-25 to 25 in H20	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	
E	TSH	11010		TSH-11010	DRYER LH MOTOR M-1101 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	BALDOR	XP MOTOR STANDARD N/C	N/A	TFL5914-05017	NC	Open/Close					BCR	Order Motor with internal Windings Thermal Switches
E	ZE	11011		ZE-11011	ENCODER 12BIT GRAY CODE, 4096 COUNT/TURN, SSI, CLOCKWISE, UL CLASS I,II EXPLOSION PROOF, DRYER LH ROTOR POSITION	BEI INDUSTRIES	H38D-12-GC-S3-CW-SC-UL	IC03600-10900	TFL5914-05001	24VDC		CLASS2 DIV2 GROUP-G		Y	UL, CEN	BCR	
E	ZE	11012		ZE-11012	ENCODER 12BIT GRAY CODE, 4096 COUNT/TURN, SSI, CLOCKWISE, UL CLASS I,II EXPLOSION PROOF, DRYER RH ROTOR POSITION	BEI INDUSTRIES	H38D-12-GC-S3-CW-SC-UL	IC03600-10900	TFL5914-05001	24V DC		CLASS2 DIV2 GROUP-G		Y	UL, CEN	BCR	
E	LSH	11013		LSH-11013	DRYER DISCHARGE MATERIAL HIGH LEVEL SWITCH, 115VAC, HAZARDOUS LOCATION CSA USA-CANADA, HIGH TEMPERATURE SS MAXIMUM 750 °F, NO EXTERNAL LED LIGHTS.	MONITOR	1-8511-22	IC03600-11010	TFL5914-05001		NORMALLY OPEN	CLASS2 DIV1 GROUP-G		Y	CSA USA-CANADA	BCR	115VAC, High Temperature 750ºF, Explosion Proof.
E	LSL	11014		LSL-11014	DRYER DISCHARGE MATERIAL LOW LEVEL SWITCH, 115VAC, HAZARDOUS LOCATION CSA USA-CANADA, HIGH TEMPERATURE SS MAXIMUM 750 °F, NO EXTERNAL LED LIGHTS.	MONITOR	1-8511-22	IC03600-11010	TFL5914-05001		NORMALLY OPEN	CLASS2 DIV1 GROUP-G		Y	CSA USA-CANADA	BCR	115VAC, High Temperature 750ºF, Explosion Proof.
G	FIV	11015		FIV-11015	NITROGEN PURGE ROTOMETER - FLOW INDICATOR WITH NEEDLE VALVE	DWYER	RMC-108-BV	TFL5914-11701	TFL5914-05001		0-1800 SCFH					BCR	
E	FV	11015		FV-11015	SOLENOID VALVE NC CRYOGENIC & CO2,DRYER NITROGEN SPRAY, COIL 120VAC, EXPLOSION PROOF, RED HAT II NEMA 3, 3S, 4, 4X, 6, 6P, 7, 9	ASCO	EF8222G002LT 120VAC	TFL5914-11701	TFL5914-05001	NORMALLY CLOSED		CLASS2 DIV2 GROUP-G		Y	CSA	BCR	120VAC Hermetically seal molded coil
E	PSL	11016		PSL-11016	PRESSURE SWITCH, DUAL ACTION-SWITCH, EXPLOSION PROOF, NITROGEN SUPPLY LOW AND LOW-LOW PRESSURE.	DWYER	H2S1	TFL5914-11701	TFL5914-05001			CLASS2 DIV2 GROUP-G		Y	UL	BCR	H2S1 Single unit with dual Pressure Switches
E	PSLL	11016		PSLL-11016	PRESSURE SWITCH, DUAL ACTION-SWITCH, EXPLOSION PROOF, NITROGEN SUPPLY LOW AND LOW-LOW PRESSURE.											BCR	Do not oder seprately; part of PSL-11016
E	FV	11017		FV-11017	SOLENOID VALVE NC GENERAL SERVICE SAFETY SHUT OF VALVE, WATER SPRAY, COIL 120VAC, EXPL PROOF, RED HAT II NEMA 3,3S, 4,4X, 6,6P, 7, 9	ASCO	EF8210G094MO 120VAC	IC03600-11610	TFL5914-05001	0 OR 120 V AC		CLASS2 DIV2 GROUP-G		Y	UL, CSA	BCR	120VAC Hermetically seal molded coil
E	FV	11018		FV-11018	SOLENOID VALVE NC GENERAL SERVICE SAFETY SHUT OF VALVE, WATER SPRAY, COIL 120VAC, EXPL PROOF, RED HAT II NEMA 3,3S, 4,4X, 6,6P, 7, 9	ASCO	EF8210G094MO 120VAC	IC03600-11610	TFL5914-05001	0 OR 120 V AC		CLASS2 DIV2 GROUP-G		Y	UL, CSA	BCR	120VAC Hermetically seal molded coil
E	FV	11019		FV-11019	SOLENOID VALVE NC GENERAL SERVICE SAFETY SHUT OF VALVE, WATER SPRAY, COIL 120VAC, EXPL PROOF, RED HAT II NEMA 3,3S, 4,4X, 6,6P, 7, 9	ASCO	EF8210G094MO 120VAC	IC03600-11610	TFL5914-05001	0 OR 120 V AC		CLASS2 DIV2 GROUP-G		Y	UL, CSA	BCR	120VAC Hermetically seal molded coil
E	TE	11020		TE-11020	THERMAL FLUID OIL SUPPLY HEADER TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIA. 316 SS, 6" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-006-FP-8HN-93	IC03600-11831	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	
E	TSH	11020		TSH-11020	DRYER RH MOTOR M-1102 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	BALDOR	XP MOTOR STANDARD N/C	N/A	TFL5914-05017	NC	Open/Close					BCR	Order Motor with internal Windings Thermal Switches
A	TW	11020		TW-11020	THERMAL FLUID OIL SUPPLY HEADER TEMPERATURE THERMOWELL	PYROMATION	S4D0608S	IC03600-11831	TFL5914-05001		NA					BCR	THERMOWELL IMMERSION LENGTH/115MM/4.53 IN
A	PI	11021		PI-11021	THERMAL FLUID OIL SUPPLY PRESSURE INDICATOR GAUGE	WEKSLER	BA43YPF4LW	IC03600-11814	TFL5914-05001							BCR	

bcr ENV Hollow-Screw Heat Exchangers

INSTRUMENT SCHEDULE

Project: 5914 WISCONSIN DELLS
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REV	TYPE	LOOP	SUB-LOOP	TAG	SERVICE DESCRIPTION	MFR	PART NO.	BOM	ELEC. DWG.	INPUT RANGE	OUTPUT RANGE	HAZARD CLASS	I.S.	EXP	CERT	SUPPLIER	REMARKS
A	PI	11022		PI-11022	THERMAL FLUID OIL RETURN PRESSURE INDICATOR GAUGE FROM DRYER LH ROTOR	WEKSLER	BA43YPF4LW	IC03600-11814	TFL5914-05001							BCR	
A	TI	11022		TI-11022	THERMAL FLUID OIL RETURN TEMPERATURE FROM DRYER LH ROTOR	OMEGA ENG.	NB12-CPSS-14U-6	TFL5914-11802	TFL5914-05001							BCR	
A	TW	11022		TW-11022	THERMAL FLUID OIL RETURN TEMPERATURE THERMOWELL FROM DRYER LH ROTOR	MCMASTER-CARR	3957K21	TFL5914-11802	TFL5914-05001							BCR	
A	PI	11023		PI-11023	THERMAL FLUID OIL RETURN PRESSURE INDICATOR GAUGE FROM DRYER RH ROTOR	WEKSLER	BA43YPF4LW	IC03600-11814	TFL5914-05001							BCR	
A	TI	11023		TI-11023	THERMAL FLUID OIL RETURN TEMPERATURE FROM DRYER RH ROTOR	OMEGA ENG.	NB12-CPSS-14U-6	TFL5914-11802	TFL5914-05001							BCR	
A	TW	11023		TW-11023	THERMAL FLUID OIL RETURN TEMPERATURE THERMOWELL FROM DRYER RH ROTOR	MCMASTER-CARR	3957K21	TFL5914-11802	TFL5914-05001							BCR	
A	PI	11024		PI-11024	THERMAL FLUID OIL RETURN PRESSURE INDICATOR GAUGE FROM DRYER HOUSING	WEKSLER	BA43YPF4LW	IC03600-11814	TFL5914-05001							BCR	
A	TI	11024		TI-11024	THERMAL FLUID OIL RETURN TEMPERATURE FROM DRYER HOUSING	OMEGA ENG.	NB12-CPSS-14U-6	TFL5914-11802	TFL5914-05001							BCR	
A	TW	11024		TW-11024	THERMAL FLUID OIL RETURN TEMPERATURE THERMOWELL FROM DRYER HOUSING	MCMASTER-CARR	3957K21	TFL5914-11802	TFL5914-05001							BCR	
A	PI	11025		PI-11025	THERMAL FLUID OIL RETURN PRESSURE INDICATOR GAUGE FROM DRYER	WEKSLER	BA43YPF4LW	IC03600-11814	TFL5914-05001							BCR	
E	TE	11026		TE-11026	THERMAL FLUID OIL RETURN HEADER TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIA. 316 SS, 6" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-006-FP-8HN-93	IC03600-11831	TFL5914-05001	-328 to 662 F	4-20mA	CLASS2 DIV1 GROUP-G		Y	FM, CSA	BCR	
A	TW	11026		TW-11026	THERMAL FLUID OIL RETURN TEMPERATURE THERMOWELL	PYROMATION	S4D0608S	IC03600-11831	TFL5914-05001							BCR	THERMO WELL IMMERSION LENGTH = 115MM = 4.53 IN
E	TE	12001		TE-12001	COOLING SCREW DISCHARGED MATERIAL TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, 6" LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-006-00-8HN-93	TFL5914-20800	TFL5914-05001	-328 to 662 F	4 to 20 mA (0 - 100%)					CCV VENDOR	EXP PROOF THERMOCOUPLE IS PROVIDED AS A STANDARD, BUT MOUNTED IN NON-CLASSIFIED ZONE.
H	FV	12002		FV-12002	COOLING WATER SUPPLY FLOW TRIM VALVE	APOLLO	121T	TFL5914-21500	TFL5914-05001							CCV VENDOR	
H	FI	12002		FI-12002	COOLING WATER SUPPLY FLOW INDICATOR	HEDLAND	H895B-050	TFL5914-21500	TFL5914-05001	5-50 GPM						CCV VENDOR	
E	XV	12003		XV-12003	FLOW VALVE-ACTUATOR MOV, 120VAC, NEMA-7 EXP PROOF CLASS1 DIV1 GROUP A,B,C,D, 2 AUX CONTACTS FULLY-OPENED/CLOSED POSITION SWITCHES, COOLING SCREW COOLING WATER SUPPLY.	INSTRUPAK (BI-TORQUE)	IS-2P-12-1000-E-A-7-2S-IND	TFL5914-21500	TFL5914-05001			CLASS2 DIV2 GROUP-G		Y		CCV VENDOR	
E	ZSC	12003		ZSC-12003	POSITION SWITCH CLOSED	INSTRUPAK (BI-TORQUE)	IS-2P-12-1000-E-A-7-2S-IND	N/A	TFL5914-05001			CLASS2 DIV2 GROUP-G		Y		CCV VENDOR	Do not order separately; integral to actuator
E	ZSO	12003		ZSO-12003	POSITION SWITCH OPEN	INSTRUPAK (BI-TORQUE)	IS-2P-12-1000-E-A-7-2S-IND	N/A	TFL5914-05001			CLASS2 DIV2 GROUP-G		Y		CCV VENDOR	Do not order separately; integral to actuator
A	PI	12004		PI-12004	COOLING SCREW COOLING WATER SUPPLY PRESSURE INDICATOR GAUGE	REOTEMP	PM25C1A4P17	TFL5914-21500	TFL5914-05001							CCV VENDOR	
E	SSL	12005		SSL-12005	ZERO SPEED SWITCH SPDT NC, EXP PROOF UL CLASS1 DIV1 AND CLASS 2 DIVISION 1, GROUP E,F,G ELECTRO SENSORS M100T, 115VAC, COOLING SCREW	ELECTRO SENSORS	800-001700	TFL5914-20000	TFL5914-05001	5 TO 100 RPM	Open/Close	CLASS2 DIV2 GROUP-G		Y		CCV VENDOR	
E	SSL	12005		SSL-12005	16 MAGNETS PULSER DISC, 4" DIAMETER, STANDARD 255 NYLON, FOR COOLING SCREW ZERO SPEED SWITCH.	ELECTRO SENSORS	700-000200	TFL5914-20000	TFL5914-05001	16 PULSE/ REVOLUTION	16 PULSE/ REVOLUTION					CCV VENDOR	

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REV	TYPE	LOOP	SUB-LOOP	TAG	SERVICE DESCRIPTION	MFR	PART NO.	BOM	ELEC. DWG.	INPUT RANGE	OUTPUT RANGE	HAZARD CLASS	I.S.	EXP	CERT	SUPPLIER	REMARKS
A	TSH	12010		TSH-12010	COOLING SCREW MOTOR M-1201 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	NORD	TW OPTION	N/A	TFL5914-05017	NC	Open/Close					NORD	Order Motor with internal Windings Thermal Switches
E	TSH	12110		TSH-12110	ROTARY VALVE MOTOR M-1211 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	MARATHON	STANDARD N/C	N/A	SEE MOTOR DTS	NC	Open/Close	CLASS2 DIV1 GROUP-G		Y		Motor Vendor	Order Motor with internal Windings/Thermal Switches
E	LIT	13001		LIT-13001	HOPPER H-130 LEVEL SENSOR, FM XP CLASS 1,2,3 Div 1 GROUP A-G ZONE 1,2, 2WIRE 4-20MA HART, NO DISPLAY, NEMA-6P/IP68, RANGE 16 FEET, BLANKING DISTANCE 9.6 INCH,	ENDRESS-HAUSER	FMU40-TNB1C4	N/A	TFL5914-05010	STANDARD DISTANCE	NC	CLASS1 DIV2 GRP D INSIDE HOPPER		Y	FM	KWS	Due to potential abnormal methane presence in biosolids feed, the inside of Feed Hopper is Class1 Div2 Group D
~~B~~	~~LT~~	~~13001~~		~~LT-13001~~	~~HOPPER ULTRA SONIC LEVEL TRANSMITTER~~	~~ENDRESS-HAUSER~~	~~FMU40-AA-H-G-AB-RHF~~										
E	WE	13002	A	WE-13002A	STRAIN-GAUGE LOAD CELL RL75016, DOUBLE-ENDED SHEAR BEAM, 50000 LBS, ALLOY STEEL, IP67/NEMA6/NEMA6P, INSIDE 4 RL1600 WEIGHT COMPRESSION MODULES, PAINTED MILD STEEL, 50000 LBS, WITH CABLE 4-WIRE (RED, BLK, GRN, WHT) 25FEET, RLWS # 17320 (PART OF A KIT)	RICE LAKE	17816 / 17319	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
E	WE	13002	B	WE-13002B	STRAIN-GAUGE LOAD CELL RL75016, DOUBLE-ENDED SHEAR BEAM, 50000 LBS, ALLOY STEEL, IP67/NEMA6/NEMA6P, INSIDE 4 RL1600 WEIGHT COMPRESSION MODULES, PAINTED MILD STEEL, 50000 LBS, WITH CABLE 4-WIRE (RED, BLK, GRN, WHT) 25FEET, RLWS # 17320 (PART OF A KIT)	RICE LAKE	17816 / 17319	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
E	WE	13002	C	WE-13002C	STRAIN-GAUGE LOAD CELL RL75016, DOUBLE-ENDED SHEAR BEAM, 50000 LBS, ALLOY STEEL, IP67/NEMA6/NEMA6P, INSIDE 4 RL1600 WEIGHT COMPRESSION MODULES, PAINTED MILD STEEL, 50000 LBS, WITH CABLE 4-WIRE (RED, BLK, GRN, WHT) 25FEET, RLWS # 17320 (PART OF A KIT)	RICE LAKE	17816 / 17319	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
E	WE	13002	D	WE-13002D	STRAIN-GAUGE LOAD CELL RL75016, DOUBLE-ENDED SHEAR BEAM, 50000 LBS, ALLOY STEEL, IP67/NEMA6/NEMA6P, INSIDE 4 RL1600 WEIGHT COMPRESSION MODULES, PAINTED MILD STEEL, 50000 LBS, WITH CABLE 4-WIRE (RED, BLK, GRN, WHT) 25FEET, RLWS # 17320 (PART OF A KIT)	RICE LAKE	17816 / 17319	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
E	WIT	13002		WIT-13002	WEIGHT LED DISPLAY INDICATOR, 480 LEGEND, NEMA 4X SS, 115-230VAC, WITH ANALOG OUTPUT BOARD (0-10VDC, 4-20mA)	RICE LAKE	130338	N/A	TFL5914-05009	0-10VDC	4-20mA					KWS	
E	WJB	13002		WJB-13002	TUFFSEAL SINGLE TRIM JUNCTION BOX, NEMA4X/IP66 SS, RLWS #88956, WITH PG7 CORD GRIPS, WITH SHIELDED CABLE 6-WIRE (RED, BLK, GRN, WHT, BLU, BRW) 25FEET, RLWS # EL147HE SURVIVOR. (PART OF A KIT)	RICE LAKE	88956	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
A	TSH	13010		TSH-13010	FEED HOPPER LIVE BOTTOM MOTOR M-1301 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC. INSIDE MOTOR.	NORD	TW OPTION	N/A	TFL5914-05017	NC	NC					KWS	Order Motor with internal Windings Thermal Switches
A	TSH	13020		TSH-13020	FEED HOPPER LIVE BOTTOM MOTOR M-1302 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC. INSIDE MOTOR.	NORD	TW OPTION	N/A	TFL5914-05017	NC	NC					KWS	Order Motor with internal Windings Thermal Switches
A	TSH	13030		TSH-13030	FEED HOPPER LEVELING SCREW MOTOR M-1303 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC, INSIDE MOTOR.	NORD	TW OPTION	N/A	TFL5914-05017	NC	NC					KWS	Order Motor with internal Windings Thermal Switches
A	TSH	13040		TSH-13040	FEED HOPPER LEVELING SCREW MOTOR M-1304 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC. INSIDE MOTOR.	NORD	TW OPTION	N/A	TFL5914-05017	NC	NC					KWS	Order Motor with internal Windings Thermal Switches
E	LIT	13101		LIT-13101	HOPPER H-130 LEVEL SENSOR, FM XP CLASS 1,2,3 Div 1 GROUP A-G ZONE 1,2, 2WIRE 4-20MA HART, NO DISPLAY, NEMA-6P/IP68, RANGE 16 FEET, BLANKING DISTANCE 9.6 INCH,	ENDRESS-HAUSER	FMU40-TNB1C4	N/A	TFL5914-05010	STANDARD DISTANCE	4-20mA	CLASS1 DIV2 GRP D INSIDE HOPPER		Y	FM	KWS	Due to potential abnormal methane presence in biosolids feed, inside the Feed Hopper is Class1 Div2 Group D
E	WE	13102	A	WE-13102A	STRAIN-GAUGE LOAD CELL RL75016, DOUBLE-ENDED SHEAR BEAM, 50000 LBS, ALLOY STEEL, IP67/NEMA6/NEMA6P, INSIDE 4 RL1600 WEIGHT COMPRESSION MODULES, PAINTED MILD STEEL, 50000 LBS, WITH CABLE 4-WIRE (RED, BLK, GRN, WHT) 25FEET, RLWS # 17320 (PART OF A KIT)	RICE LAKE	17816 / 17319	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
E	WE	13102	B	WE-13102B	STRAIN-GAUGE LOAD CELL RL75016, DOUBLE-ENDED SHEAR BEAM, 50000 LBS, ALLOY STEEL, IP67/NEMA6/NEMA6P, INSIDE 4 RL1600 WEIGHT COMPRESSION MODULES, PAINTED MILD STEEL, 50000 LBS, WITH CABLE 4-WIRE (RED, BLK, GRN, WHT) 25FEET, RLWS # 17320 (PART OF A KIT)	RICE LAKE	17816 / 17319	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
E	WE	13102	C	WE-13102C	STRAIN-GAUGE LOAD CELL RL75016, DOUBLE-ENDED SHEAR BEAM, 50000 LBS, ALLOY STEEL, IP67/NEMA6/NEMA6P, INSIDE 4 RL1600 WEIGHT COMPRESSION MODULES, PAINTED MILD STEEL, 50000 LBS, WITH CABLE 4-WIRE (RED, BLK, GRN, WHT) 25FEET, RLWS # 17320 (PART OF A KIT)	RICE LAKE	17816 / 17319	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
E	WE	13102	D	WE-13102D	STRAIN-GAUGE LOAD CELL RL75016, DOUBLE-ENDED SHEAR BEAM, 50000 LBS, ALLOY STEEL, IP67/NEMA6/NEMA6P, INSIDE 4 RL1600 WEIGHT COMPRESSION MODULES, PAINTED MILD STEEL, 50000 LBS, WITH CABLE 4-WIRE (RED, BLK, GRN, WHT) 25FEET, RLWS # 17320 (PART OF A KIT)	RICE LAKE	17816 / 17319	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139
E	WIT	13102		WIT-13102	WEIGHT LED DISPLAY INDICATOR, 480 LEGEND, NEMA 4X SS, 115-230VAC, WITH ANALOG OUTPUT BOARD (0-10VDC, 4-20mA)	RICE LAKE	130338	N/A	TFL5914-05009	0-10VDC	4-20mA					KWS	
E	WJB	13102		WJB-13102	TUFFSEAL SINGLE TRIM JUNCTION BOX, NEMA4X/IP66 SS, RLWS #88956, WITH PG7 CORD GRIPS, WITH SHIELDED CABLE 6-WIRE (RED, BLK, GRN, WHT, BLU, BRW) 25FEET, RLWS # EL147HE SURVIVOR. (PART OF A KIT)	RICE LAKE	88956	N/A	TFL5914-05009	NC	4-20mA					KWS	KIT# 18139

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REV	TYPE	LOOP	SUB-LOOP	TAG	SERVICE DESCRIPTION	MFR	PART NO.	BOM	ELEC. DWG.	INPUT RANGE	OUTPUT RANGE	HAZARD CLASS	I.S.	EXP	CERT	SUPPLIER	REMARKS
A	TSH	13110		TSH-13110	FEED HOPPER LIVE BOTTOM MOTOR M-1311 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC. In motor.	NORD	TW OPTION	N/A	TFL5914-05017	NC	NC					KWS	Order Motor with internal Windings Thermal Switches
A	TSH	13120		TSH-13120	FEED HOPPER LIVE BOTTOM MOTOR M-1312 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC. In motor	NORD	TW OPTION	N/A	TFL5914-05017	NC	NC					KWS	Order Motor with internal Windings Thermal Switches
A	TSH	13130		TSH-13130	FEED HOPPER LEVELING SCREW MOTOR M-1313 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	NORD	TW OPTION	N/A	TFL5914-05017	NC	NC					KWS	Order Motor with internal Windings Thermal Switches
A	TSH	13140		TSH-13140	FEED HOPPER LEVELING SCREW MOTOR M-1314 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	NORD	TW OPTION	N/A	TFL5914-05017	NC	NC					KWS	Order Motor with internal Windings Thermal Switches
E	TE	14001		TE-14001	FEED PUMP STATOR TEMPERATURE RTD ELEMENT,PLATINUM 100Ω,	SEEPEX	TSE	N/A	TFL5914-05010							Seepex	
E	TT	14001		TT-14001	FEED PUMP STATOR ELEMENT TEMPERATURE, CONVERTER RTD TO 4-20MA TRANSMITTER	PROSENSE	XTH-0300F-PT1	N/A	TFL5914-05010							Seepex	
E	PE	14002		PE-14002	FEED PUMP DISCHARGE PRESSURE CAPILLARY RING	ONYX	PSW-4"	N/A	TFL5914-05010							Seepex	Assembled by ONYX
A	PI	14002		PI-14002	FEED PUMP DISCHARGE PRESSURE INDICATOR GAUGE	WIKA	233.53 (p/n 983307)	N/A								Seepex	Assembled by ONYX
E	PT	14002		PT-14002	FEED PUMP DISCHARGE PRESSURE TRANSMITTER	WIKA	S-10-A-PBH-NB-ZGDL3AZ-ZZZ	N/A	TFL5914-05010							Seepex	Assembled by ONYX
E	TSH	14010		TSH-14010	FEED PUMP MOTOR M-1401 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	NORD	TW-OPTION	N/A	TFL5914-05017	NC	NC					Seepex	Order Motor with internal Windings Thermal Switches
E	TE	15001		TE-15001	CONDENSER SCRUBBER INLET VAPOR TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, " LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-006-FP-8HN-93	TFL5914-50021	TFL5914-05001	-328 to 662 F	4 to 20 mA (0 - 100%)	Class2 Div1 Group G		Y	FM, CSA	BCR	
B	TW	15001		TW-15001	CONDENSER-SCRUBBER INLET VAPOR TEMPERATURE ELEMENT THERMOWELL	PYROMATION	S4C0608S	TFL5914-50021-02	TFL5914-50021							BCR	
B	TI	15002		TI-15002	CONDENSER DE-SUPER HEAT STREAM TEMPERATURE INDICATOR GAUGE	REOTEMP	VR-040-1-F63-TG	TFL5914-50022	TFL5914-50022	50-300 °F						BCR	
B	TW	15002		TW-15002	CONDENSER DE-SUPER HEAT STREAM TEMPERATURE INDICATOR GAUGE THERMOWELL	MCMASTER-CARR	3957K65	509-00006.09	TFL5914-50022	1600 °F						BCR	
B	TI	15003		TI-15003	CONDENSER VAPOR TEMPERATURE INDICATOR GAUGE	REOTEMP	BB-040-1-F63-TG	TFL5914-50023	TFL5914-50023	50-300 °F						BCR	
B	TW	15003		TW-15003	CONDENSER VAPOR TEMPERATURE INDICATOR GAUGE THERMOWELL	MCMASTER-CARR	3957K65	509-00006.09	TFL5914-50023	1600 °F						BCR	
B	TI	15004		TI-15004	CONDENSER #2 NON-CONDENSABLE GASES TEMPERATURE INDICATOR GAUGE	REOTEMP	VR-040-1-F63-TG	TFL5914-50000-23	TFL5914-50022	50-300 °F						BCR	
B	TW	15004		TW-15004	CONDENSER #2 NON-CONDENSABLE GASES TEMPERATURE INDICATOR GAUGE THERMOWELL	MCMASTER-CARR	3957K65	509-00006.09	TFL5914-50022	1600 °F						BCR	
E	TE	15005		TE-15005	CONDENSER SCRUBBER CONDENSATE TEMPERATURE ELEMENT, EXPLOSION-PROOF, UNGROUNDED, TYPE-T, 1/4" SHEATH DIAMETER 316-SS, " LONG, FM/CSA XP CLASS 1 DIV1 GROUP A-D, DIP CLASS 2 DIV 1 GR E-G	PYROMATION	XP-T48U-006-FP-8HN-93	TFL5914-50021	TFL5914-05001	-328 to 662 F	4 to 20 mA (0 - 100%)	Class2 Div1 Group G		Y	FM, CSA	BCR	
B	TW	15005		TW-15005	CONDENSER-SCRUBBER CONDENSATE TEMPERATURE ELEMENT THERMOWELL	PYROMATION	S4C0608S	TFL5914-50021-02	TFL5914-50021							BCR	
E	FIT	15006		FIT-15006	CONDENSER COOLING WATER SUPPLY FLOW TRANSMITTER, MAGMETER, 4-20MA, RANGE UP TO 33 FT/SEC, NEMA 4X, IP65, UL/CUL/CE, WITH DISPLAY	SIGNET	3-2551-P0-42	TFL5914-50000-42	TFL5914-50000	(0- 100 %)4 - 20mA						BCR	Field mount at least 10 feet away from Dryer in Non-Hazardous, Non-Classified Area

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REV	TYPE	LOOP	SUB-LOOP	TAG	SERVICE DESCRIPTION	MFR	PART NO.	BOM	ELEC. DWG.	INPUT RANGE	OUTPUT RANGE	HAZARD CLASS	I.S.	EXP	CERT	SUPPLIER	REMARKS
E	FI	15007		FI-15007	CONDENSOR #2 COOLING WATER FLOW INDICATOR	KING	7510-2-1-71-06	TFL5914-50806-08	TFL5914-50806							BCR	
B	PI	15008		PI-15008	CONDENSER #2 NON-CONDENSABLE GASES NOZZLE PRESSURE INDICATOR GAUGE	MCMASTER-CARR	3845K1 0-60	TFL5914-50806-03	TFL5914-50806							BCR	
B	PI	15009		PI-15009	CONDENSER MAIN NOZZLE PRESSURE INDICATOR GAUGE	REOTEMP	PM25C1A4P17	TFL5914-50400-12	TFL5914-50400							BCR	
B	PI	15011		PI-15011	CONDENSER DE-SUPERHEAT NOZZLE PRESSURE INDICATOR GAUGE	REOTEMP	PM25C1A4P17	TFL5914-50400-12	TFL5914-50400							BCR	
E	XV	15012		XV-15012	CONDENSER COOLING WATER SUPPLY FLOW VALVE-ACTUATOR MOV, 120VAC, NEMA-4, 2 AUX CONTACTS FULLY-OPENED/CLOSED POSITION SWITCHES.	INSTRUPAK (BI-TORQUE)	IS-2P-12-1000-E-A-4-2S-IND	TFL5914-21500	TFL5914-05010							BCR	Field mount at least 10 feet away from Dryer in Non-Hazardous, Non-Classified Area
E	ZSC	15012		ZSC-15012	CONDENSER COOLING WATER SUPPLY FLOW VALVE-ACTUATOR MOV, 120VAC, NEMA-4, 2 AUX CONTACTS FULLY-OPENED/CLOSED POSITION SWITCHES.	INSTRUPAK (BI-TORQUE)	IS-2P-12-1000-E-A-4-2S-IND	N/A	TFL5914-05010							BCR	Do not order separately, part of actuator
E	ZSO	15012		ZSO-15012	CONDENSER COOLING WATER SUPPLY FLOW VALVE-ACTUATOR MOV, 120VAC, NEMA-4, 2 AUX CONTACTS FULLY-OPENED/CLOSED POSITION SWITCHES.	INSTRUPAK (BI-TORQUE)	IS-2P-12-1000-E-A-4-2S-IND	N/A	TFL5914-05010							BCR	Do not order separately, part of actuator
G	AT	15014		AT-15014	OXYGEN SENSOR, OPTICAL, 4 WIRE, 4-20mA, INTRINSICALLY SAFE	METTLER-TOLEDO	I6860	N/A	TFL5914-05010	0-21%	4-20Ma		X				Ex-situ at suction of fou;-air fan CF-153
~~G~~	~~AE~~	~~15014~~		~~AE-15014~~	~~CABLE GPRO500 ATEX FM~~	~~UNITRONIC~~	~~UNITRONIC FD CP (TP) plus PART # 0030924~~	~~N/A~~	~~TFL5914-05010~~								
~~G~~	~~AT~~	~~15014~~		~~AT-15014~~	~~M400 MOUNTING KIT~~	~~METTLER-TOLEDO~~	~~PART # 52500213~~	~~N/A~~	~~TFL5914-05010~~								
~~G~~	~~AI~~	~~15014~~		~~AI-15014~~	~~OXYGEN ANALYZER INDICATOR TRANSMITTER, CLASS1 DIV2 FM APPROVAL (ATEX ZONE 2), MODEL # M400~~	~~METTLER-TOLEDO~~	~~PART # 52121350~~	~~N/A~~	~~TFL5914-05010~~							~~BCR~~	~~Field mount on CP-100 door at least 10 feet away from Dryer in Non-Hazardous, Non-Classified Area~~
~~G~~	~~AT~~	~~15014~~		~~AT-15014~~	~~OXYGEN ANALYZER SMART SENSOR-ELEMENT TRANSMITTER, EXPLOSION PROOF ATEX ZONE 1, IECEx AND FM CLASS1 DIV1, MODEL# GPRO 500~~	~~METTLER-TOLEDO~~	~~PART # 30034132~~	~~600-00013~~	~~TFL5914-05010~~	~~32-176° F @ 6 bar~~		~~Class2 Div1 Group G~~		~~Y~~	~~FM, ATEX~~	~~BCR~~	
A	TSH	15310		TSH-15310	CONDENSER BLOWER MOTOR M-1531 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC,	BALDOR	XP MOTOR STANDARD N/C	N/A	TFL5914-05017	NC	Open/Close						Order Motor with internal Windings Thermal Switches
E	PDI	15401		PDI-15401	ODOR CHEMICAL-FILTER TANK DIFFERENTIAL PRESSURE INDICATOR	DWYER	2010	N/A	SEE MANUF. DATASHEET							PURE AIR	
E	MI	15402		MI-15402	ODOR CHEMICAL-FILTER TANK MEDIA BED MONITOR ROD W/ GRAIN SAMPLER	PURE AIR	NOT AVAILABLE	N/A	SEE MANUF. DATASHEET							PURE AIR	
E	TSH	15510		TSH-15510	ODOR CONTROL BLOWER MOTOR M-1551 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC,	BALDOR	XP MOTOR STANDARD N/C	N/A	TFL5914-05017	NC	Open/Close					PURE AIR	Order Motor with internal Windings Thermal Switches
E	SSL	16101		SSL-16101	ZERO SPEED SWITCH SPDT NC, EXP PROOF UL CLASS1 DIV1 AND CLASS 2 DIVISION 1, GROUP E,F,G ELECTRO SENSORS M100T, 115VAC, DISCHARGE SCREW.	ELECTRO SENSORS	800-001700	TFL5914-61000	TFL5914-05001	5 TO 100 RPM	Open/Close	CLASS2 DIV2 GROUP-G		Y	UL	BCR	
E	SSL	16101		SSL-16101	16 MAGNETS PULSER DISC, 4" DIAMETER, STANDARD 255 NYLON, FOR DISCHARGE SCREW ZERO SPEED SWITCH	ELECTRO SENSORS	800-001600	TFL5914-61000	TFL5914-05001	16 PULSE/ REVOLUTION	16 PULSE/ REVOLUTION					BCR	
I	FIV	16102		FIV-16102	NITROGEN PURGE ROTOMETER - FLOW INDICATOR WITH NEEDLE VALVE	DWYER	RMB-52-BV	NA	NA	NA	4-50 SCFH	NA	NA	NA	NA	SOUTH-TEK	Dryer purge into discharge screw for oxygen sensor
B	TSH	16110		TSH-16110	DISCHARGE CONVEYOR MOTOR M-1611 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC,	NORD	TW OPTION	N/A	SEE MOTOR DWG	NC	Open/Close	CLASS2 DIV1 GROUP G		Y		Motor Vendor	Order Motor with internal Windings Thermal Switches
E	ZSC	16201		ZSC-16201	DISCHARGE CONVEYOR MOTOR M-1611 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	AUMA ACTUATORS	SAEX07.2/AMEXC01.1	N/A	TFL5914-05001			CLASS2 DIV2 GROUP-G		Y	FM	Vortex	Do not order separately, part of actuator

bcr ENV | Hollow-Screw Heat Exchangers

INSTRUMENT SCHEDULE

Project: 5914 WISCONSIN DELLS
Document: 5914-04502 Rev I
Date: 8/21/2017

REV	TYPE	LOOP	SUB-LOOP	TAG	SERVICE DESCRIPTION	MFR	PART NO.	BOM	ELEC. DWG.	INPUT RANGE	OUTPUT RANGE	HAZARD CLASS	I.S.	EXP	CERT	SUPPLIER	REMARKS
E	ZSF	16201		ZSF-16201	DISCHARGE CONVEYOR MOTOR M-1611 WINDINGS 3 THERMOSTAT TEMPERATURE SWITCHES NC	AUMA ACTUATORS	SAEX07.2/AMEXC01.1	N/A	TFL5914-05001			CLASS2 DIV2 GROUP-G		Y	FM	Vortex	Do not order separately, part of actuator
E	ZSO	16201		ZSO-16201	VALVE MOTOR ACTUATOR, FULLY-OPENED , FULLY-CLOSED, FAULT, STATUS AUXILIARY SWITCHES, AND INTERNAL REVERSIBLE CONTACTOR, 460VAC, 3PHASE, 60HZ, 1/3HP, 1.0FLA, EXPL PROOF CLASS1 DIV1 GROUP B,C,D, CLASS2 DIV1 GROUP E,F,G FOR KNIFE GATE VALVE.	AUMA ACTUATORS	SAEX07.2/AMEXC01.1	N/A	TFL5914-05001			CLASS2 DIV2 GROUP-G		Y	FM	Vortex	Do not order separately, part of actuator
E	AE	17001		AE-17001	IR FLAME SCANNER SELFCHECK; FRONTAL ILLUMINATION, CABLE 71", IP54, OPERATING TEMPERATURE -4 TO 140 °F, OUTPUT 0 TO +5V, UL RECOGNIZED RU, CSA, FM, THERMAL FLUID HEATER FIRE-EYE.	SIEMENS	QRI2A2.B180B	N/A	(FULTON)								Fulton	
E	BMI	17001		BMI-17001	BURNER MANAGEMENT SYSTEM DISPLAY-KEYPAD, CANBUS, MODBUS.	SIEMENS	AZL52.40B1	N/A	(FULTON)								Fulton	
E	BMS	17001		BMS-17001	BURNER MANAGEMENT SYSTEM COMBUSTION CONTROLLER: DUAL FUEL BURNER CONTROL WITH ELECTRONIC FUEL-AIR RATIO CONTROL OF UP TO 3 ACTUATORS (4 CONNECTED), WITH PID TEMPERATURE AND OR PRESSURE LOAD CONTROL AND A PROGRAMMABLE ANALOG OUTPUT, UL RECOGNIZED RU, CSA, FM, CANBUS.	SIEMENS	LMV51.140C1	N/A	(FULTON)								Fulton	
E	TE	17002		TE-17002	THERMOCOUPLE TYPE-J: CUSTOM ORDER. THERMAL FLUID OUTLET TEMPERATURE.	PYROMATION	J39002G 38Z-C144-1 006-02-20"	N/A	(FULTON)								Fulton	
E	TIC	17002		TIC-17002	TEMPERATURE INDICATING CONTROLLER: STANDARD TYPE, NO FUNCTIONS, NO COMM NETWORK, ENGLISH, BLACK CASE, FRONT PANEL DRIP AND DUST-PROOF IP56. THERMAL FLUID HEATER OUTLET TEMPERATURE TO BMS BURNER ENABLE/ON/OFF.	YOKOGAWA	UT35A-000-11-00	N/A	(FULTON)								Fulton	
E	TV	17002		TV-17002	CONTROL VALVE ACTUATOR: DRIVE SHAFT 5, RUNNING TIME 10 MINUTES, NOMINAL TORQUE 3 NM, HOLDING TORQUE 1.5 Nm, RADIAL FORCE 190 N, ENCLOSURE IP54, OPERATING TEMPERATURE -4 TO 140 °F, CANBUS, UL. COMBUSTION GAS FLOW CONTROL VALVE ACTUATOR.	SIEMENS	SQM45.295A9	N/A	(FULTON)								Fulton	
E	TW	17002		TW-17002	THERMOCOUPLE THERMOWELL: STANDARD-DUTRY THREADED MALE NPT, BORE SIZE 0.260 DIAMETER, PIPE 3/4", LENGTH 4", SS-316. THERMAL FLUID DISCHARGE TEMPERATURE	PYROMATION	SD0408	N/A	(FULTON)								Fulton	
E	TE	17003		TE-17003	THERMOCOUPLE TYPE-J: CUSTOM FULTON PART #.. THERMAL FLUID HIGH OUTLET TEMPERATURE LIMIT.	PYROMATION	J39002G 38Z-C144-1 006-02-20"	N/A	(FULTON)								Fulton	
E	TIC	17003		TIC-17003	TEMPERATURE INDICATING CONTROLLER: LIMIT CONTROL TYPE, NO FUNCTIONS, NO COMM NETWORK, ENGLISH, BLACK CASE, FRONT PANEL DRIP AND DUST-PROOF IP56. THERMAL FLUID OUTLET TEMPERATURE TO TFL DRYER PLC AND THERMAL FLUID HIGH OUTLET TEMPERATURE ALARM TSAH-17003 TO BMS SAFETY LOOP.	YOKOGAWA	UT35A-L00-11-00	N/A	(FULTON)								Fulton	
E	TW	17003		TW-17003	THERMOWELL THREADED THREADE NPT: PIPE 3/4", SS-304, MAX TEMP 1600 °F, MAX PRESSURE 7000 PSI, INSERTION LENGTH 2-1/2". FOR THERMOMETER: STEM LENGTH 4", STEM DIAMETER 1/4", CONNECTION PIPE 1/2", THREADED MALE NPT .	MCMASTER-CARR	3957K21	N/A	(FULTON)								Fulton	
E	TE	17004		TE-17004	THERMOCOUPLE TYPE-J: 4" LONG, CUSTOM ORDER. THERMAL FLUID HEATER EXHAUST-STACK TEMPERATURE.	PYROMATION	SPEC-006-00-004-240	N/A	(FULTON)								Fulton	
E	TIC	17004		TIC-17004	TEMPERATURE INDICATING CONTROLLER: LIMIT CONTROL TYPE, NO FUNCTIONS, NO COMM NETWORK, ENGLISH, BLACK CASE, FRONT PANEL DUST-PROOF AND DRIP-PROOF IP56. THERMAL FLUID EXHAUST STACK TEMPERATURE HIGH TEMPERATURE LIMIT.	YOKOGAWA	UT35A-L00-11-00	N/A	(FULTON)								Fulton	
E	PI	17005		PI-17005	PRESSURE INDICATOR GAUGE DRY: 0-200 PSI, DIAL 2.5", PROCESS CONNECTION 1/4" BACK (CB), 2.5" U-BOLT CLAMP, 2.5" FRONT CLAMP, SS-304 RING, SS-316L SOCKET, IP66 PER UEC 529, UNI 8896, MAX PRESSURE 75% FS, MAX TEMP 150 °F, GASKET BUNA N. THERMAL FLUID HEATER INLET PRESSURE	WINTERS	PFP926-DRY-25UC-25FF 0-200 PSI	N/A	(FULTON)								Fulton	
E	PSH	17005		PSH-17005	PRESSURE SWITCH: RANGE 20-180 PSI, OVERRANGE 1500 PSI, PROOF 2500 PSI, SPDT 15A @ 250VAC MANUAL RESET, ENCLOSURE CARBON STEEL NEMA 4/IP65, TCP DIAPHRAM, BUNA-N O-RING, ELECTRICAL 3/4' FEMALE NPT, PROCESS 1/4" FEMALE NPT, UL, CSA CERTIFIED. THERMAL FLUID HEATER INLET HIGH PRESSURE.	SOR	6RB-D5-N4-F1A-CS	N/A	(FULTON)								Fulton	
E	PSL	17005		PSL-17005	PRESSURE SWITCH: RANGE 20-180 PSI, OVERRANGE 1500 PSI, PROOF 2500 PSI, SPDT 15A @ 250VAC, ENCLOSURE CARBON STEEL NEMA 4/IP66, TCP DIAPHRAM, BUNA-N O-RING, ELECTRICAL 3/4' FEMALE NPT, PROCESS 1/4" FEMALE NPT, UL, CSA CERTIFIED. THERMAL FLUID HEATER INLET LOW PRESSURE.	SOR	6NN-K5-N4-F1A-CS	N/A	(FULTON)								Fulton	
E	PDSH	17006		PDSH-17006	DIFFERENTIAL PRESSURE SWITCH: 10 TO 100 PSI, SPDT 15A @ 480VAC, WORKING PRESSURE 30" Hg VACUUM TO 180 PSI, PROOF PRESSURE 300 PSI, DEADBAND 0.5 TO 3 PSI, SS-316, UL APPROVED, CSA CERTIFIED, CUSTOM FULTON PART#. THERMAL FLUID HEATER DIFF. PRESSURE.	UNITED ELECTRIC	H400K-16100 10-100 PSI	N/A	(FULTON)								Fulton	
E	PI	17007		PI-17007	PRESSURE INDICATOR GAUGE DRY: 0-100 PSI, DIAL 2.5", PROCESS CONNECTION 1/4" BACK (CB), 2.5" U-BOLT CLAMP, 2.5" FRONT CLAMP, SS-304 RING, SS-316L SOCKET, IP66 PER UEC 529, UNI 8896, MAX PRESSURE 75% FS, MAX TEMP 150 °F, GASKET BUNA N. THERMAL FLUID HEATER DISCHARGE PRESSURE	WINTERS	PFP924-DRY-25UC-25FF 0-100 PSI	N/A	(FULTON)								Fulton	

bcr ENV | Hollow-Screw Heat Exchangers

INSTRUMENT SCHEDULE

Project: 5914 WISCONSIN DELLS
Document: 5914-04502 Rev I
Date: 8/21/2017

REV	TYPE	LOOP	SUB-LOOP	TAG	SERVICE DESCRIPTION	MFR	PART NO.	BOM	ELEC. DWG.	INPUT RANGE	OUTPUT RANGE	HAZARD CLASS	I.S.	EXP	CERT	SUPPLIER	REMARKS
E	PSH	17007		PSH-17007	PRESSURE SWITCH: RANGE 20-180 PSI, OVERRANGE 1500 PSI, PROOF 2500 PSI, SPDT 15A @ 250VAC MANUAL RESET, ENCLOSURE CARBON STEEL NEMA 4/IP65, TCP DIAPHRAM, BUNA-N O-RING, ELECTRICAL 3/4' FEMALE NPT, PROCESS 1/4" FEMALE NPT, UL, CSA CERTIFIED, THERMAL FLUID HEATER DISCHARGE HIGH PRESSURE.	SOR	6RB-D5-N4-F1A-CS	N/A	(FULTON)							Fulton	
E	PCV	17011		PCV-17011	NATURAL GAS PRESSURE REGULATING VALVE: INLET PRESSURE 8.0"WC TO 10 PSI, OUTLET PRESSURE 2 TO 28" WC, FLOW 5150 TO 12000 CFH, CSA APPROVED. MAIN GAS LINE PRESSURE REGULATING VALVE.	MAXITROL	210E	N/A	(FULTON)							Fulton	
E	PSL	17011		PSL-17011	PRESSURE SWITCH: ADJUSTABLE 1.00 TO 20.00" WC, SPDT 8A @ 120VAC, MAX PRESSURE 7 PSI, PROCESS 1/4" FEMALE NPT, ELECTRICAL 1/2" NPT, NEMA 4, TEMPERATURE -40 TO +140 °F, UL-795 LISTED, CSA-B149.3 AND CSA-B149.6, CERTIFIED, FM-3510 AND FM-3530 APPROVED, NFPA 85, 86. NATURAL GAS MAIN LINE LOW PRESSURE.	DUNGS	GML A4-4-4 1-20" WC	N/A	(FULTON)							Fulton	
E	PSH	17013		PSH-17013	PRESSURE SWITCH: ADJUSTABLE 1.00 TO 20.00" WC, SPDT 8A @ 120VAC, MAX PRESSURE 7 PSI, PROCESS 1/4" FEMALE NPT, ELECTRICAL 1/2" NPT, NEMA 4, TEMPERATURE -40 TO +140 °F, UL-795 LISTED, CSA-B149.3 AND CSA-B149.6, CERTIFIED, FM-3510 AND FM-3530 APPROVED, NFPA 85, 86. NATURAL GAS MAIN LINE HIGH PRESSURE.	DUNGS	GMH A4-4-4 1-20" WC	N/A	(FULTON)							Fulton	
E	PCV	17014		PCV-17014	NATURAL GAS PRESSURE REGULATING VALVE: INLET PRESSURE 2 PSI OUTLET PRESSURE 5-9" WC, MAX LOAD 100000 BTUH, TEMPERATURE -40 TO +205 °F, VENT PIPE 1/8" NPT, CSA-6.3 APPROVED. PILOT GAS LINE PRESSURE REGULATOR VALVE.	MAXITROL	325-3	N/A	(FULTON)							Fulton	
E	XV	17015		XV-17015	NATURAL GAS SHUTOFF VALVE: 2-WAY NC, 120VAC @ 17.1W, PIPE 1/2", ORIFICE 3/4", CAPACITY 238500 BTUH, MAX DIFF PRESSURE 5 PSI, MAX FLUID TEMP 125 °F, UL-429 LISTED, FM-7400 APPROVED, CSA CERTIFIED, ENCLOSURE REDHAT II NEMA 1/2/3/4/4X. PILOT GAS LINE SAFETY SHUTOFF VALVE.	ASCO	8214G020	N/A	(FULTON)							Fulton	
E	PV	17101		PV-17101	CONTROL VALVE ACTUATOR: DRIVE SHAFT 7, RUNNING TIME 30 MINUTES, NOMINAL TORQUE 20 NM, HOLDING TORQUE 20 Nm, RADIAL FORCE 420 N, ENCLOSURE IP54, OPERATING TEMPERATURE -4 TO 140 °F, CANBUS, UL. COMBUSTION INLET AIR FLOW CONTROL VALVE ACTUATOR	SIEMENS	SQM48.497A9	N/A	(FULTON)							Fulton	
E	PSL	17102		PSL-17102	PRESSURE SWITCH: 4.0 TO 20.0" WC, TEMPERATURE -30 TO +180 °F (32 °F FOR NON-DRY AIR), MAX PRESSURE 45" WC/10 PSIG SURGE, SPDT 15A @120VAC, PROCESS 1/8" NPT, MOUNTING VERTICAL, UL, CE, CSA, FM. COMBUSTION AIR BLOWER LOW PRESSURE.	DWYER	1910-20	N/A	(FULTON)							Fulton	
C	XV	17102	A	XV-17102A	NATURAL GAS VALVE NC DOUBLE-BODY SAFETY SHUTOFF: SIZE 2", MAX OPERATING PRESSURE 15 PSI, CLOSE-OFF PRESSURE 30 PSI, MAX BACK PRESSURE 2.5 PSI, CAPACITY 2300 CFH, TEMPERATURE -40 TO 140 °F, UL-429 LISTED, FM-7400 APPROVED, CSA-Z21.21 CERTIFIED, TWO AGA66 SEAL GASKETS NEMA 3/3R/4. MAIN GAS LINE SAFETY SHUTOFF VALVE.	SIEMENS	VGD20.503U BODY w/(2) AGA66	N/A	(FULTON)							Fulton	
E	XV	17102	B	XV-17102B	NATURAL GAS DOUBLE-BODY SAFETY SHUTOFF VALVE ACTUATOR: ELECTRO-HYDRAULIC, 110-240VAC @ 13.5VA, 1 SPDT 3A @ 120VAC PROOF OF CLOSURE SWITCH, TEMPERATURE 5 TO 140 °F, UL-429 LISTED, FM-7400 APPROVED, CSA-Z21.21 CERTIFIED, NEMA 3/3R/4. WITH TWO AGA66 SEAL GASKETS. MAIN GAS LINE SAFETY SHUTOFF VALVE.	SIEMENS	SKP15.011U1	N/A	(FULTON)							Fulton	
E	PI	17201		PI-17201	PRESSURE INDICATOR GAUGE DRY: 30"-0-60 PSI/kPa, DIAL 4", PROCESS CONNECTION 1/4" BOTTOM, SS-304 RING, SS-316L SOCKET, IP66 PER UEC 529, UNI 8896, MAX PRESSURE 75% FS, MAX TEMP 150 °F, GASKET BUNA N. OIL CIRCULATION PUMP INLET PRESSURE	WINTERS	PFP1038-DRY -30" Hg/0/60 PSI	N/A	(FULTON)							Fulton	
E	LSL	17301		LSL-17301	LEVEL SWITCH GENERAL PURPOSE: SPDT 6A @ 250VAC, PROCESS 2" MALE NPT, PROCESS TEMP RANGE -40 TO +700 °F, ELECTRONICS AMBIENT MAX TEMP +176 °F, ELECTRICAL 1" NPT WITH CONDUIT REDUCER 3/4" NPT, SS-316, CSA, ATEX, IECEx Class I, II, III; Groups B,C,D,E,F,G; Type 4X, Class I, Zone 1, AEx/Ex d IIC T5 Gb, Zone 21, AEx/Ex tb IIIC T90°C Db; IP66. EXPANSION TANK LOW LEVEL.	SOR	1710A-G2A-C-A1-H1-ZZ-CPC3	N/A	(FULTON)							Fulton	

F

NOTES:

1. TAG PREFIX FOLLOWS ISA NAMING CONVENTION; SEE LEGEND ON SHEET 1 OF P&ID.

WISCONSIN DELLS, WI
WWTP POTABLE
WATER SYSTEM
CONTROL PANEL

SH	FILENAME
0	TABEL OF CONTENTS
1	MISC LOGIC
2	LAYOUT
3	BOM1

LINE NUMBERING

610
611
612
613
614

6 = SHEET #
10 = REFERENCE #

WIRE NUMBERING

753
754
755

7541

754 = LINE #
1 = SEQUENCE #

COMPONENT TAGGING

CR0011

RELAY
DESCRIPTION

NO 004,SP-2
NC SP-3

CR = COMPONENT TYPE,
001 = LINE #,
1 = SEQUENCE #

PARENT COMPONENT REFERENCE

CR0011

RELAY
DESCRIPTION

NO 004,SP-2
NC SP-3

NO = NORMALLY OPEN,
NC = NORMALLY CLOSED,
004 = LOCATION OF CHILD COMP.
004 = LINE #
SP-X= SPARE CONTACTS
TEXT = DESCRIPTION OF RELAY

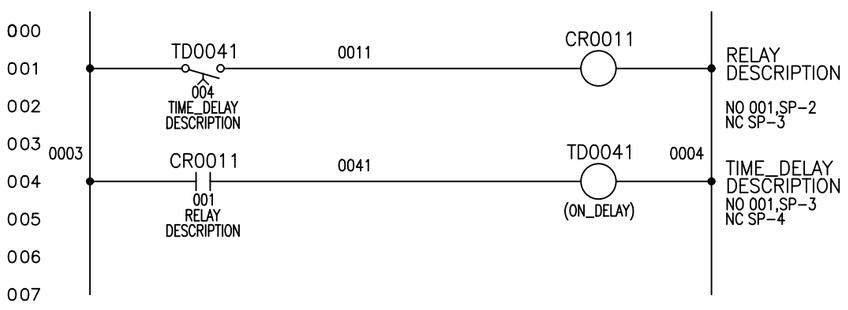
CHILD COMPONENT REFERENCE

000 CR0011 0002

001
RELAY
DESCRIPTION

TAG = SAME AS PARENT
001 = LOCATION OF PARENT,
001 = LINE #
TEXT = DESCRIPTION OF RELAY

LADDER LOGIC



FUNDAMENTAL SYMBOLS

CR — CONTROL RELAY
CR — NORMALLY OPEN CONTACT
CR — NORMALLY CLOSED CONTACT
TD — TIME DELAY RELAY
TD — NORMALLY OPEN TIME DELAY CONTACT
TD — NORMALLY CLOSED TIME DELAY CONTACT
TB — TERMINAL BLOCK WITH BLOCK DESIGNATOR
LT (G) — PUSH TO TEST PILOT LIGHT LETTER IS COLOR
CB — CIRCUIT BREAKER
SW POS1 POS2 — SELECTOR SWITCH 2 POSITION
SW POS1 POS2 POS3 — SELECTOR SWITCH 3 POSITION
SW POS1 POS2 POS3 — SELECTOR SWITCH SPRING RETURN FROM LEFT
PB — PUSH BUTTON NORMALLY OPEN
PB — PUSH BUTTON NORMALLY CLOSED
PB — MUSHROOM HEAD PUSHBUTTON NORMALLY OPEN
PB — MUSHROOM HEAD PUSHBUTTON NORMALLY CLOSED
PS — PRESSURE SWITCH NORMALLY OPEN
PS — PRESSURE SWITCH NORMALLY CLOSED
LS — LIMIT SWITCH NORMALLY OPEN
LS — LIMIT SWITCH NORMALLY CLOSED
FS — FLOW SWITCH NORMALLY OPEN
FS — FLOW SWITCH NORMALLY CLOSED
FT — FLOAT SWITCH NORMALLY OPEN
FT — FLOAT SWITCH NORMALLY CLOSED
TS — TEMPERATURE SWITCH NORMALLY OPEN
TS — TEMPERATURE SWITCH NORMALLY CLOSED

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WWTP POTABLE WATER SYSTEM CONTROL PANEL
TITLE PAGE

DES	A.CLEMENS	DATE	12/13/17
DRN	A.CLEMENS	DATE	12/13/17
APP	A.CLEMENS	DATE	12/13/17

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	02/18	AO
A	RELEASED	01/18	APC

SECTION/INSTALLATION
LOCATION
PANEL
TYPE
PAGE 0 OF 6

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D17296-B
PROJECT WISCONSIN DELLS, WI

TO 120 VAC, 1 PHASE, 60 HZ SUPPLY

WARNING:
DANGEROUS VOLTAGE WITHIN.
DE-ENERGIZE ALL POWER
SOURCES PRIOR TO
ENTERING

L1
TB1
L1
CB1051
10A
1061

N
TB1

G
GROUND PER
NEC

SU1081
120VAC
SURGE PROTECTION
DEVICE

N

R3041
304
ADD AIR
1131
1131
TB1
ADD AIR
SOLENOID
SOL1131
(EXISTING)
N
TB1

UPS1191
L
N
FU1211
1211
5A
1212
+
BATTERY
GND
BAT1231
1231
BAT1232
1232
12V
-
BATTERY
FAIL
1251
to 207
LOW BATTERY
1252
AC
OK
1271
to 204
AC OK
1291
+24
COM
+24
COM

+24
to 137

COM
to 137

from 136
+24

from 136
COM

AB
1766-L32BXBA
PLC
MICROLOGIX 1400
20 DI, 12 DO, 4 AI, 2 AO
PLC1421
+24 VDC
VDC NEUT
GND
8-PIN
COMM 0
RJ45
COMM 1
DB9-M
COMM 2

DRIVER:
BAUD:
PARITY:
NODE:

IP: 192.168.50.132

HIRSCHMANN
SPIDER5TX
ES1461
+
DC
-
GND
1252
from 173
COM
ETHERNET TO
LCP-C
1
2
3
4
5

1291
1252

MOUNTED IN ENCLOSURE
ADJACENT TO
HYDROPNEUMATIC TANK
ABOVE FLOW METER TRANSMITTER

MAPLE SYSTEMS
HMI5070L
0I1611
7 INCH
USB
ETH
USB
IP: 192.168.50.134

1291
TB1
1252
TB1
1691
TB1
1701
1691
1702

+24
to 200

COM
to 146

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WWTP POTABLE WATER
SYSTEM CONTROL PANEL

DES	A.CLEMENS	DATE	12/13/17	B	AS BUILT	02/18	AO	H			F				
DRN	A.CLEMENS	DATE	12/13/17	A	RELEASED	01/18	APC	G			E				
APP	A.CLEMENS	DATE	12/13/17	REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT	D			
												C			
												L			
												K			
												J			
												I			

SECTION/INSTALLATION

LOCATION
PANEL

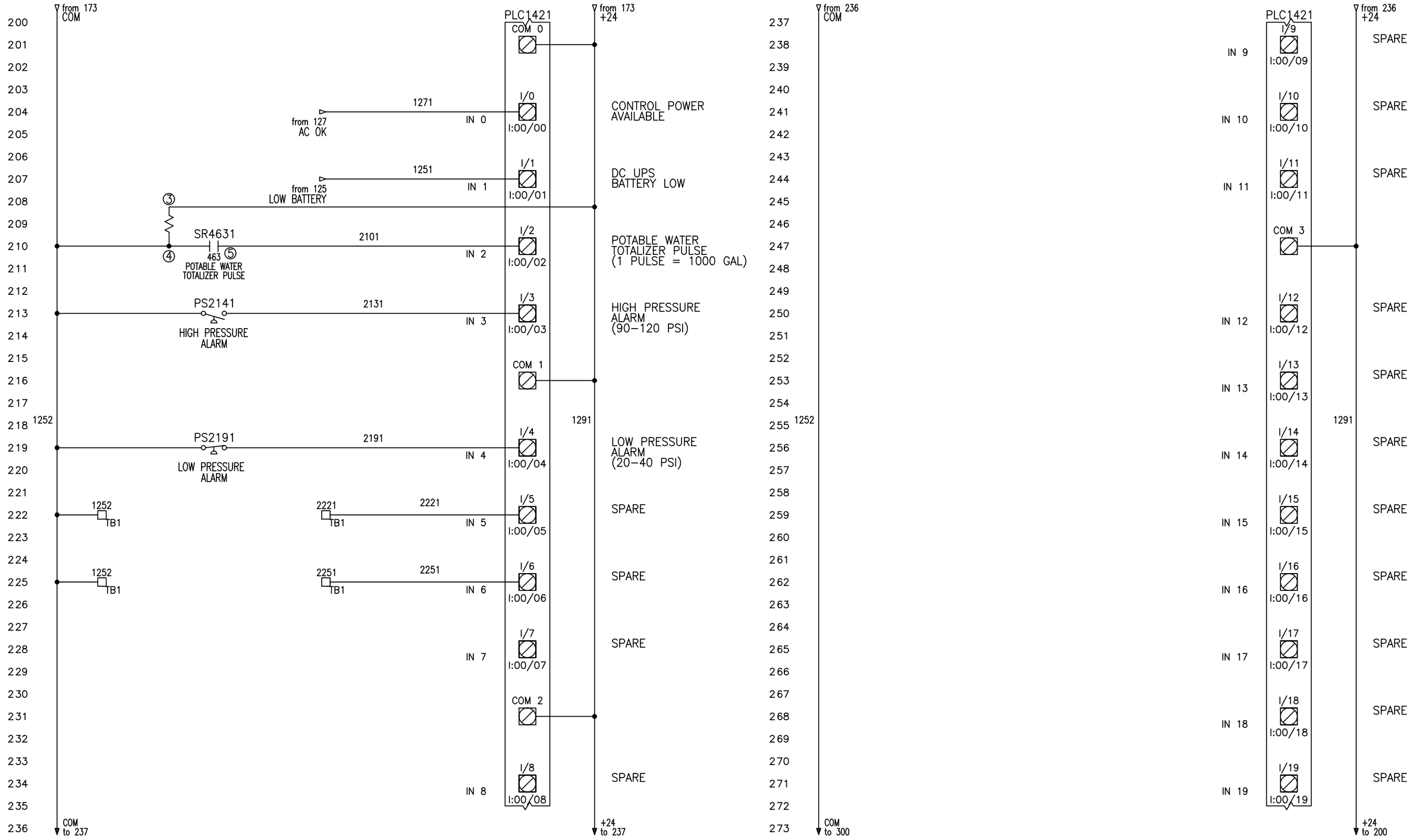
TYPE

PAGE 1 OF 6

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D17296-B

PROJECT
WISCONSIN DELLS, WI



L. W. ALLEN, INC. AND ITS ALTRONEX CONTROL SYSTEMS DIVISION CLAIM PROPRIETARY RIGHTS TO THIS DRAWING AND TECHNICAL DATA THEREIN. THIS MATERIAL IS PROVIDED IN STRICT CONFIDENCE FOR ENGINEERING INFORMATION ONLY AND DOES NOT CONVEY ANY DUPLICATION, DISCLOSURE, OR MANUFACTURING RIGHTS WITHOUT WRITTEN PERMISSION OF L. W. ALLEN, INC.

WWTP POTABLE WATER SYSTEM CONTROL PANEL

DES	A.CLEMENS	DATE	12/13/17	B	AS BUILT	02/18	AO	H							
DRN	A.CLEMENS	DATE	12/13/17	A	RELEASED	01/18	APC	G							
APP	A.CLEMENS	DATE	12/13/17	REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT				
				F				L							
				E				K							
				D				J							
				C				I							

SECTION

LOCATION
PANEL

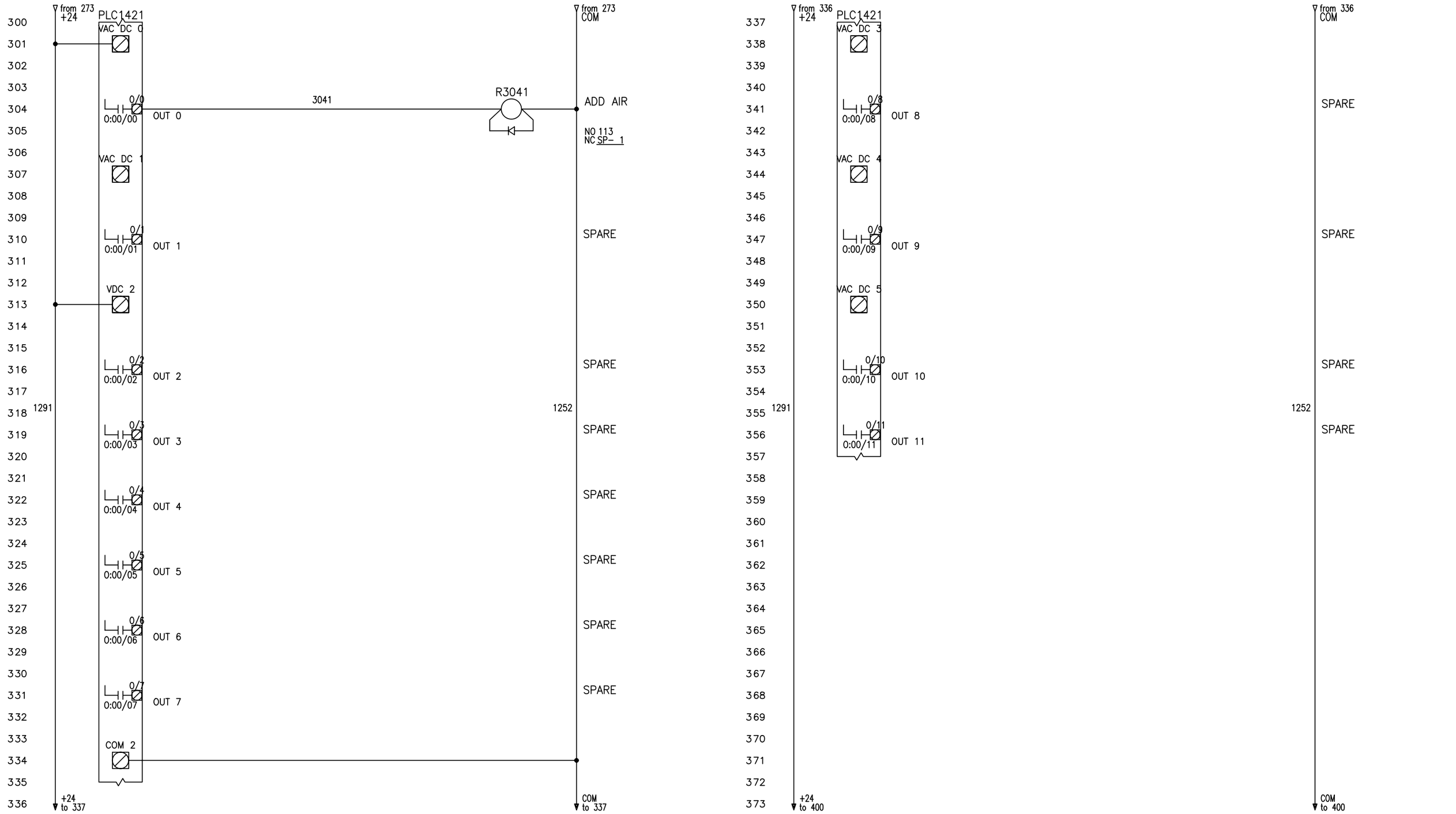
TYPE

PAGE
2 OF 6

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222–8622 www.altronex.com

DRAWING
D17296–B

PROJECT
WISCONSIN DELLS, WI



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WWTP POTABLE WATER SYSTEM CONTROL PANEL

DES	A.CLEMENS	DATE	12/13/17
DRN	A.CLEMENS	DATE	12/13/17
APP	A.CLEMENS	DATE	12/13/17

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	02/18	AO
A	RELEASED	01/18	APC

SECTION

LOCATION
PANEL

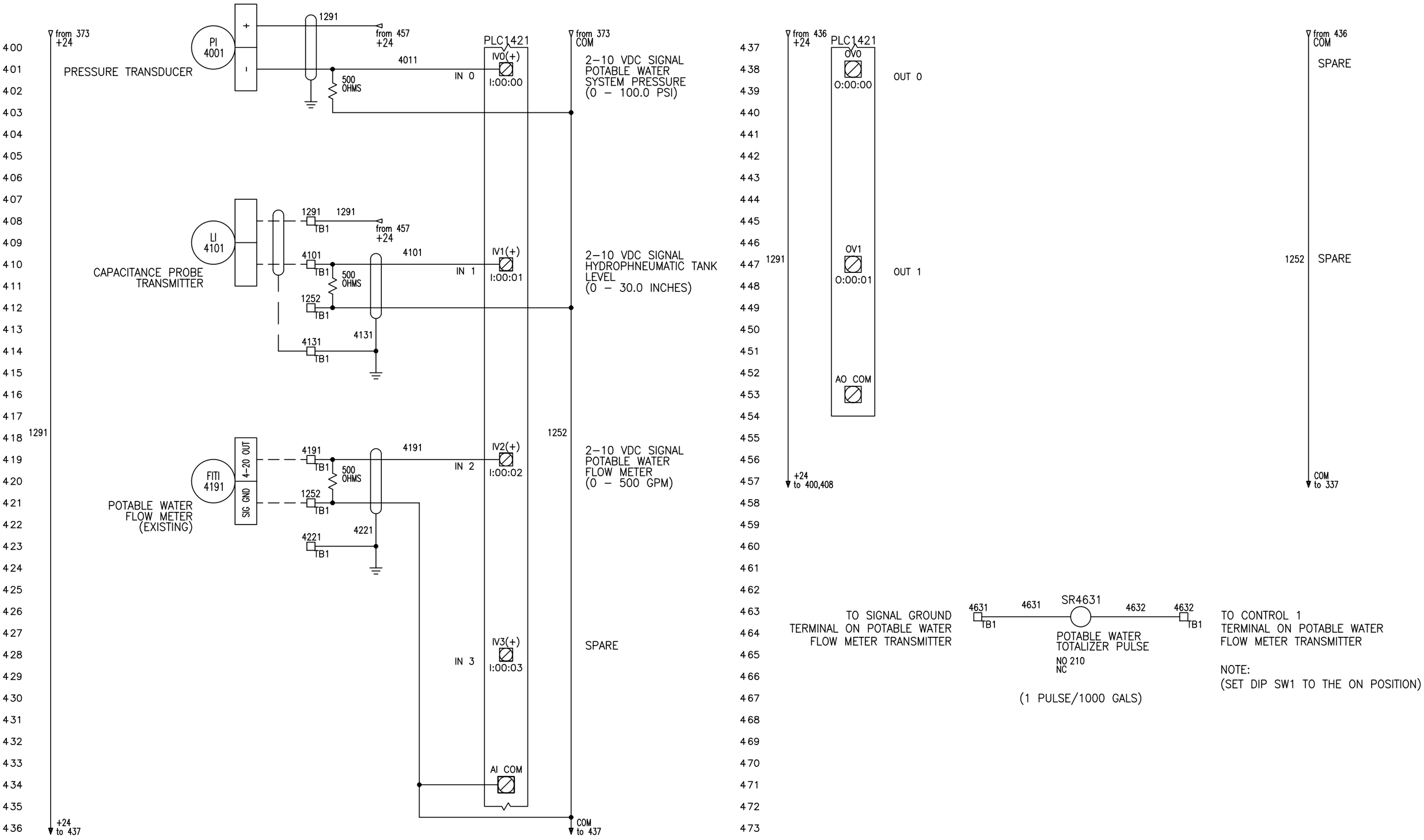
TYPE

PAGE
3 OF 6

ALTRONEX CONTROL SYSTEMS
4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING
D17296-B

PROJECT
WISCONSIN DELLS, WI



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WWTP POTABLE WATER SYSTEM CONTROL PANEL

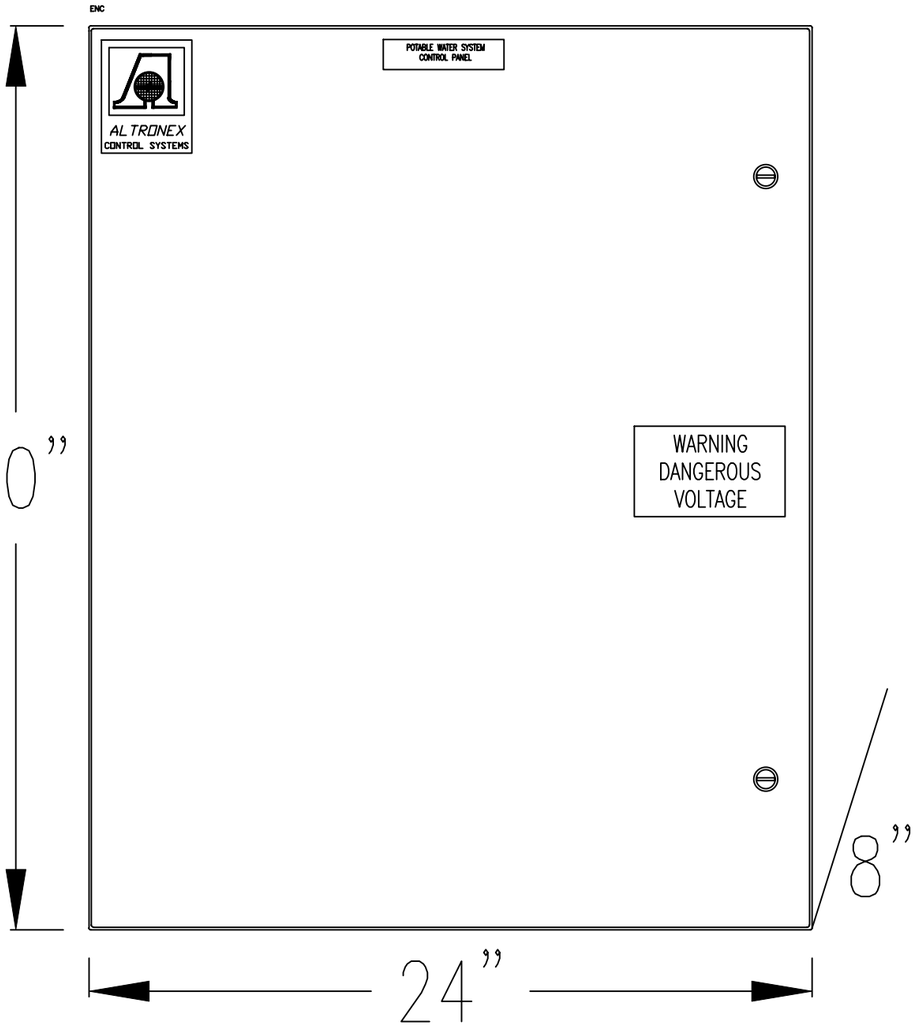
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APP	A.CLEMENS	DATE	12/13/17	D					J				LOCATION		
				C					I				PANEL		
				B	AS BUILT	02/18	AO		H				TYPE	PAGE	
				A	RELEASED	01/18	APC		G					4 OF 6	
				REV	DESCRIPTION	DATE	INIT	REV	DESCRIPTION	DATE	INIT				

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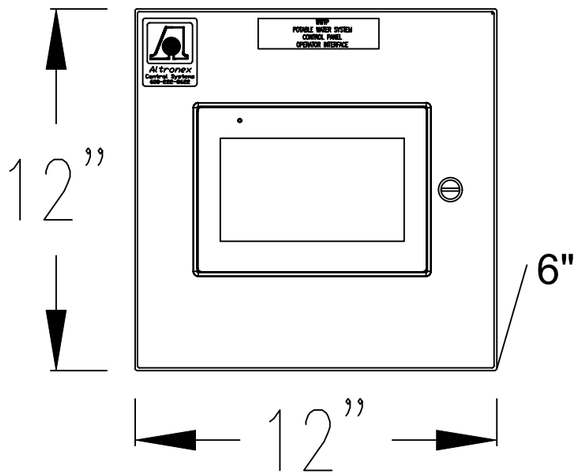
DRAWING D17296–B

PROJECT WISCONSIN DELLS, WI

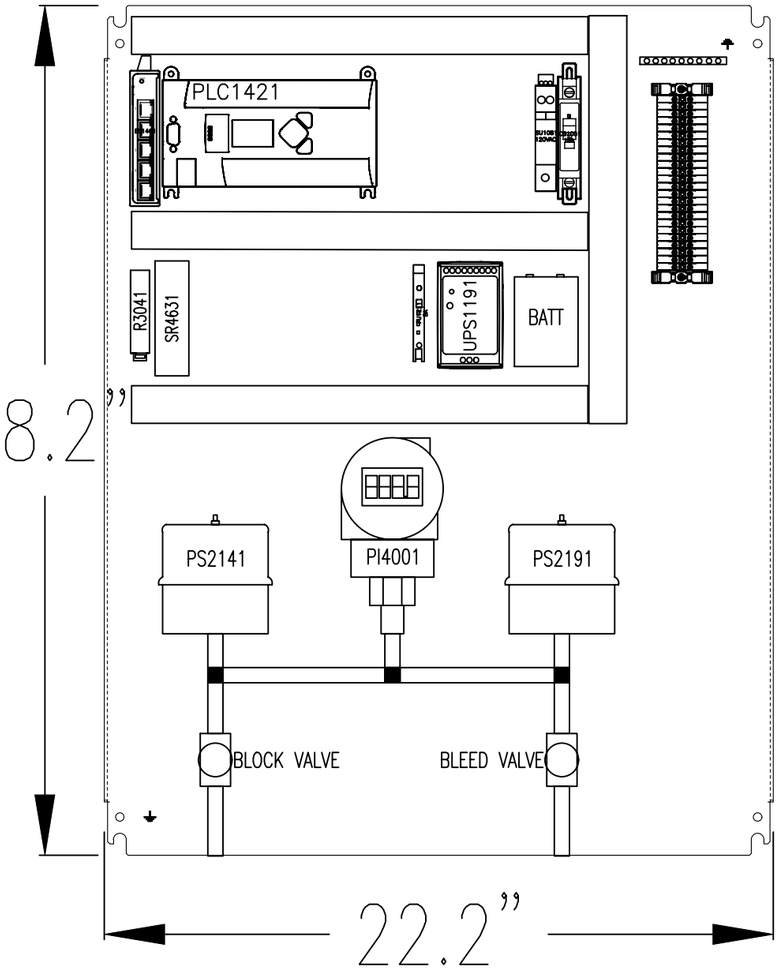
ENC



NEMA 12 ENCLOSURE GRAY EXTERIOR COLOR



NEMA 12 ENCLOSURE GRAY EXTERIOR COLOR



BACKPAN

BLOCK VALVE BLEED VALVE

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WWTP POTABLE WATER SYSTEM CONTROL PANEL

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B	AS BUILT	02/18	AO
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SECTION/INSTALLATION

LOCATION
PANEL

TYPE

PAGE 5 OF 6

ALTRONEX CONTROL SYSTEMS
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PH: (608) 222-8622 www.altronex.com

DRAWING D17296-B

PROJECT WISCONSIN DELLS, WI

BILL OF MATERIALS Installation:		Location: PANEL			
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
FU1211	1	*1	1492-H5	AB	FUSE, FINGER SAFE, TERMINAL BLOCK, 24VDC, LED
		*1	ABC-5-R	BUSSMANN	FUSE, GLASS TUBE, 5 AMP
		*1	1492-N37	AB	END BARRIER
PLC1421	1		1766-L32BXBA	AB	MICROLOGIX 1400, DC PWR, DC I/O WITH ANALOG I/O
SU1081	1		DS240S-120	CITEL	SURGE SUPPRESSOR, 120 VAC, 3W, 40 kA SCCR, REPLACEABLE MODULE
SR4631	1		84115503	CROUZET	SOLID STATE RELAY
BAT1231 BAT1232	2		DURA12-5F	DURACELL	BATTERY, 12 VDC, 5.0 Ah
PI4001	1		IGP10-A22D1F	FOXBORO	PRESSURE TRANSDUCER, DIRECT MOUNT, 10-300 PSI, 4-20 MADC LOOP POWERED, 1/2" MALE NPT, 1/4" FEMALE NPT
ES1461	1	*1	SPIDER5TX	HIRSCHMANN	5 PORT 10/100BASE TX RJ-45 PORTS
		*1	2288	MONOPRICE	CAT6 CABLE, 1FT
ENCLOSURE	1	*1	CSD30248	HOFFMAN	CONCEPT WALL-MOUNT ENCLOSURE
		*1	CP3024	HOFFMAN	BACKPAN
		*1	CMFK	HOFFMAN	WALL-MOUNTING BRACKET KITS
R3041	1	*1	RJ1S-CL-D24	IDEC	SLIM POWER RELAY, 1PDT, 24VDC, 12 AMP CONTACT
		*1	SJ1S-05BW	IDEC	SCREW TERMINAL BASE SOCKET
UPS1191	1		DRC-100B	MEANWELL	DC UPS WITH POWER SUPPLY, 100-240 VAC INPUT, 27.6 VDC OUTPUT, 2.25A
BLEED VALVE BLOCK VALVE	2		UPBA475B-1/4	MILWAUKEE VALVE	1/4" BALL VALVE, BRASS, 1/4" NPT
TB1	1	*1	3001035	PHOENIX CONTACT	STANDARD IEC TERMINAL BLOCK – UK 2,5 B
		*2	0800886	PHOENIX CONTACT	END BARRIER – E/NS 35 N
		*1	3001022	PHOENIX CONTACT	D-UK2.5 END COVER
TB1	19		3001035	PHOENIX CONTACT	STANDARD IEC TERMINAL BLOCK – UK 2,5 B
	1		PK9GTA	SQD	9 HOLE GROUND BAR KIT
CB1051	1		QOU110	SQD	CIRCUIT BREAKER, QOU, 10 A, 10 KAIC
PS2191	1		9013GHG2J20	SQD	PRESSURE SWITCH, TYPE 200/250 PSI, NEMA 1, 1/4" FEMALE NPSF, ADJ RANGE 20-40 PSI, 1 NO 1 NC
PS2141	1		9013GHG2J31H	SQD	PRESSURE SWITCH, TYPE 200/250 PSI, NEMA 1, 1/4" FEMALE NPSF, ADJ RANGE 90-120 PSI, 1 NO 1 NC

Installation:		Location: REMOTE			
TAG	QTY	SUB	CATALOG	MFG	DESCRIPTION
OI1611	1	*1	HMI5070L	MAPLE SYSTEMS	GRAPHIC HMI, TOUCH SCREEN, 7 " DISPLAY, (1) ETH PORT, (2) SERIAL PORTS, 1 USB, DC POWERED
		*1	CSD12126	HOFFMAN	
LI4101	1		7ML5670-0BA00-0AA0-Z+Y01(36")	SIEMENS	LC300 CAPACITANCE PROBE TRANSMITTER, 4-20 MADC LOOP POWERED, 1" NPT,

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SECTION/INSTALLATION

LOCATION: PANEL

TYPE

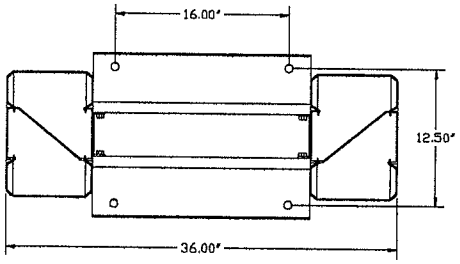
PAGE 6 OF 6

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PH: (608) 222-8622 www.altronex.com

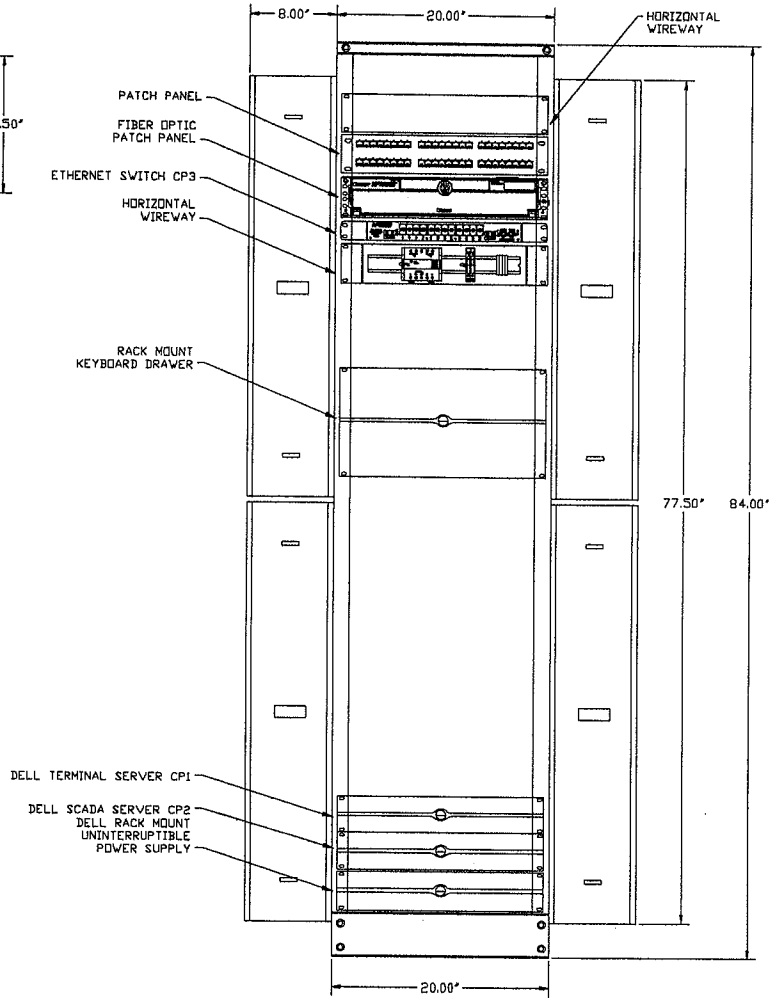
DRAWING: D17296-B

PROJECT: WISCONSIN DELLS, WI

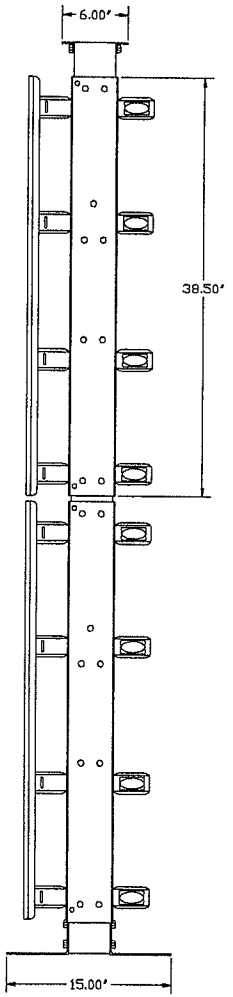
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TOP VIEW



FRONT VIEW



RIGHT VIEW

NOTES:

1. CABLE MANAGEMENT RELAY RACK ASSEMBLY HUBBELL CR1973.
2. FINISH IS BACK POWDER COAT.

SCALE

0 6" 12" 24"

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DATE LAST EDITED: 11/17/2006

REVISION	
DATE	DESCRIPTION
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

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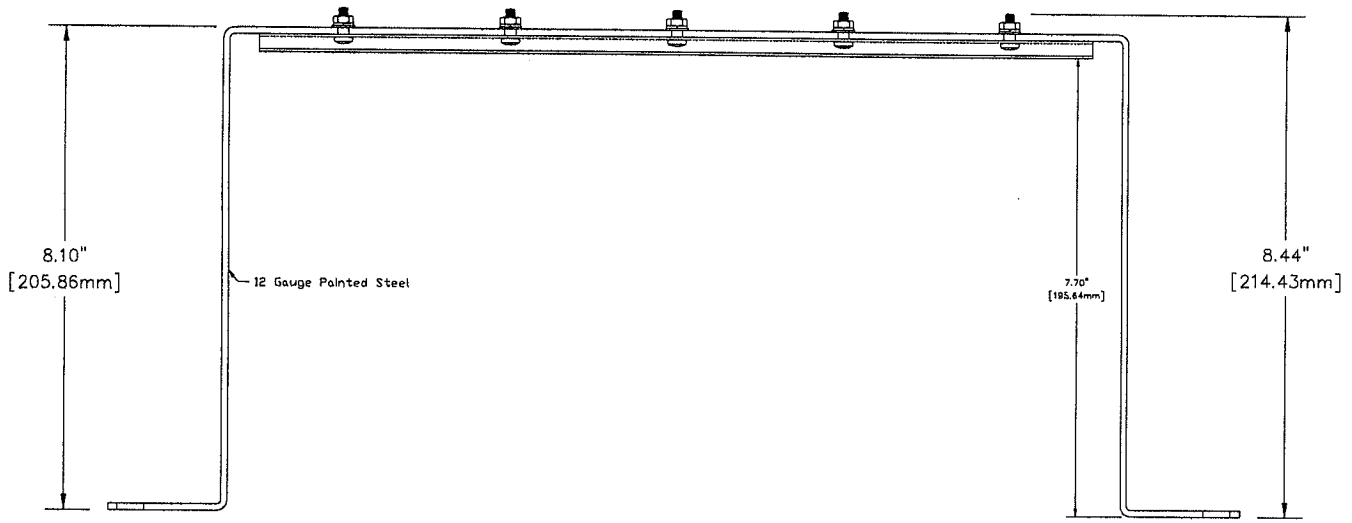
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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	1 OF 4

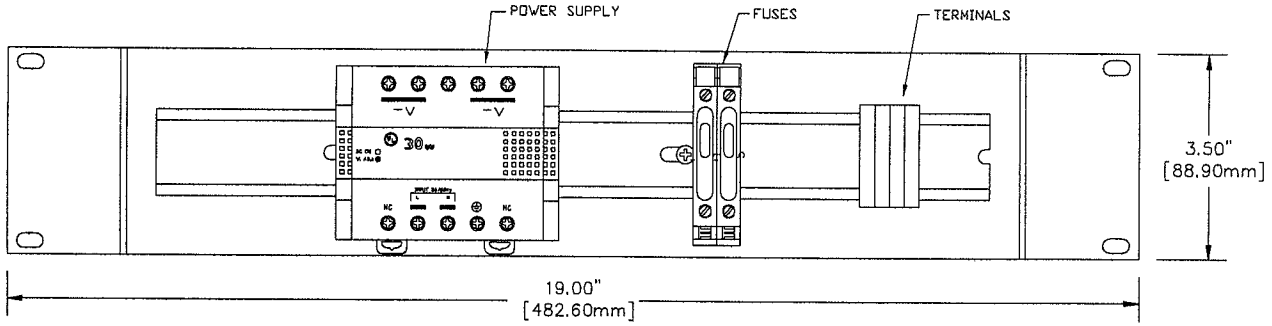
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

SCADA SYSTEM COMPUTER RACK
19" RACK MOUNT ASSEMBLY
RACK LAYOUT

PROJ. NO. 1520D

DWG. NO. 001





NOTES:
1. RACK MOUNT KIT N-TRON 900-RM

SCALE

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Plymouth, Minnesota 55441

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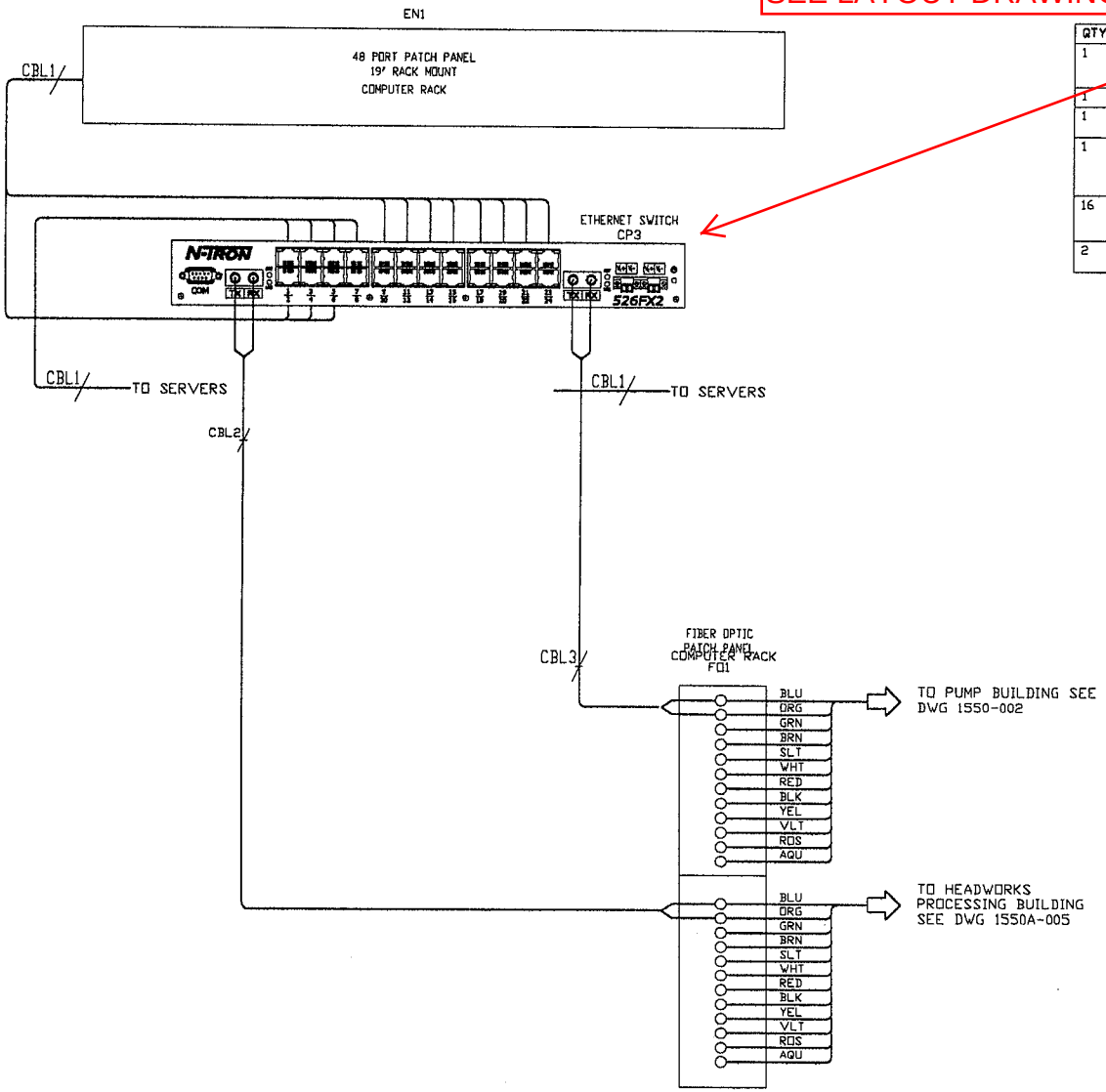
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DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	2 OF 4

PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF

SCADA SYSTEM COMPUTER RACK
19" RACK MOUNT ASSEMBLY
DETAIL

PROJ. NO. 1520D
DWG. NO. 002

MIKTROTIK CRS326-24G-2S-RM & N-TRON 708FX2-SC
SEE LAYOUT DRAWING



QTY	TAGS	DESCRIPTION	MFG	CATALOG
1	EN1	PATCH PANEL 48 PORT CAT6 P648U 3.5 INCH	HUBBELL	P648U
1	CP3	RACK MOUNT KIT	N-TRON	900-RM
1	CP3	TWO PORTS 100BASE FX MULTIMODE FIBER SC STYLE FIBER CONNECTOR	N-TRON	526FX2-A-SC-S
1	FO1	RACK MOUNT FIBER ENCLOSURE OPTICOM UP TO 72 FIBERS (9 FAPS)	PANDUIT	FRME2
16	CBL1	ETHERNET CABLE CAT 5E ETHERNET CABLE CUT TO LENGTH	GENERIC	CAT5E
2	CBL2 CBL3	FIBER OPTIC PATCH CABLE, ST-ST, MM 1 METER (1 PAIR) (2) FIBERS	GENERIC	GENERICFBO

ETHERNET PATCH PORTS			
NO.	DESTINATION	NO.	DESTINATION
1	TERMINAL SERVER	9	ROOM 1107
2	SCADA SERVER	10	ROOM 1108
3	SERVEILLANCE CAMERA	11	ROOM 1109
4	SERVEILLANCE CAMERA	12	ROOM 1112
5	ROOM 1103	13	ROOM 1112
6	ROOM 1103	14	ROOM 1114
7	ROOM 1105	15	ROOM 1114
8	ROOM 1105	16	SPARE

REVISION	
DATE	DESCRIPTION
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441

DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	3 OF 4

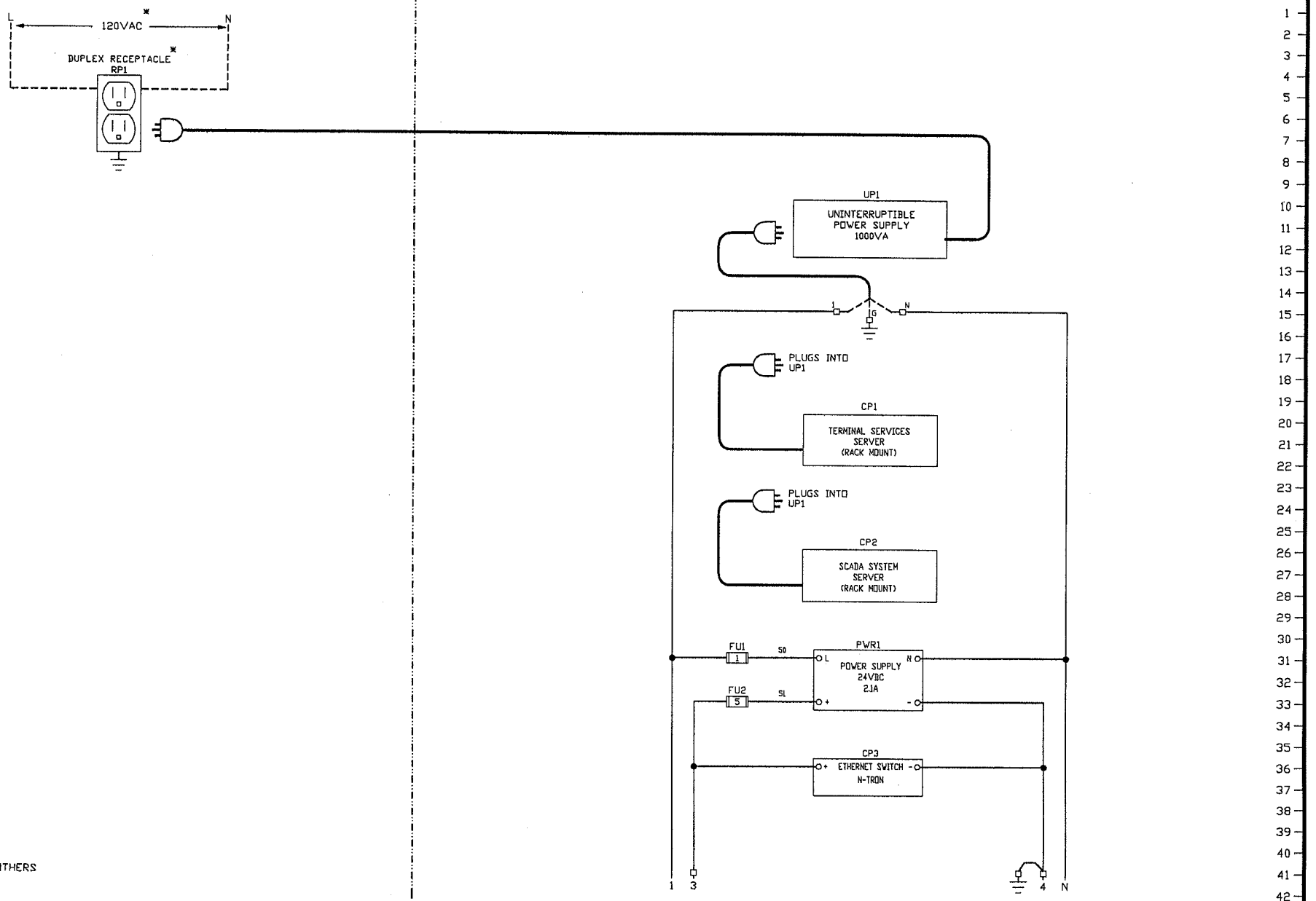
PROJECT: WISCONSIN DELLS - LAKE DELTON, WI WWTF
SCADA SYSTEM COMPUTER RACK ETHERNET AND FIBER OPTIC CONNECTIONS
PROJ. NO. 1520D
DWG. NO. 003

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FIELD OR AS NOTED

SCADA SYSTEM COMPUTER RACK



* PROVIDED BY OTHERS

REVISION	
DATE	DESCRIPTION
11/16/06	AS INSTALLED

INSTRUMENT CONTROL SYSTEMS
13005 16th Ave. North
Plymouth, Minnesota 55441
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DATE	9/27/05
DWN	JA
CKD.	GK
ENGR.	JJ
ASSEM.	
SHEET	4 OF 4

PROJECT
WISCONSIN DELLS - LAKE DELTON, WI WWTF

LCP-A
CONTROL POWER

PROJ. NO. 1520D
DWG. NO. 100

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A Division of **L.W. Allen, Inc.** • *www.lwallen.com*
Phone 608.222.8622 • Fax 608.222.9414

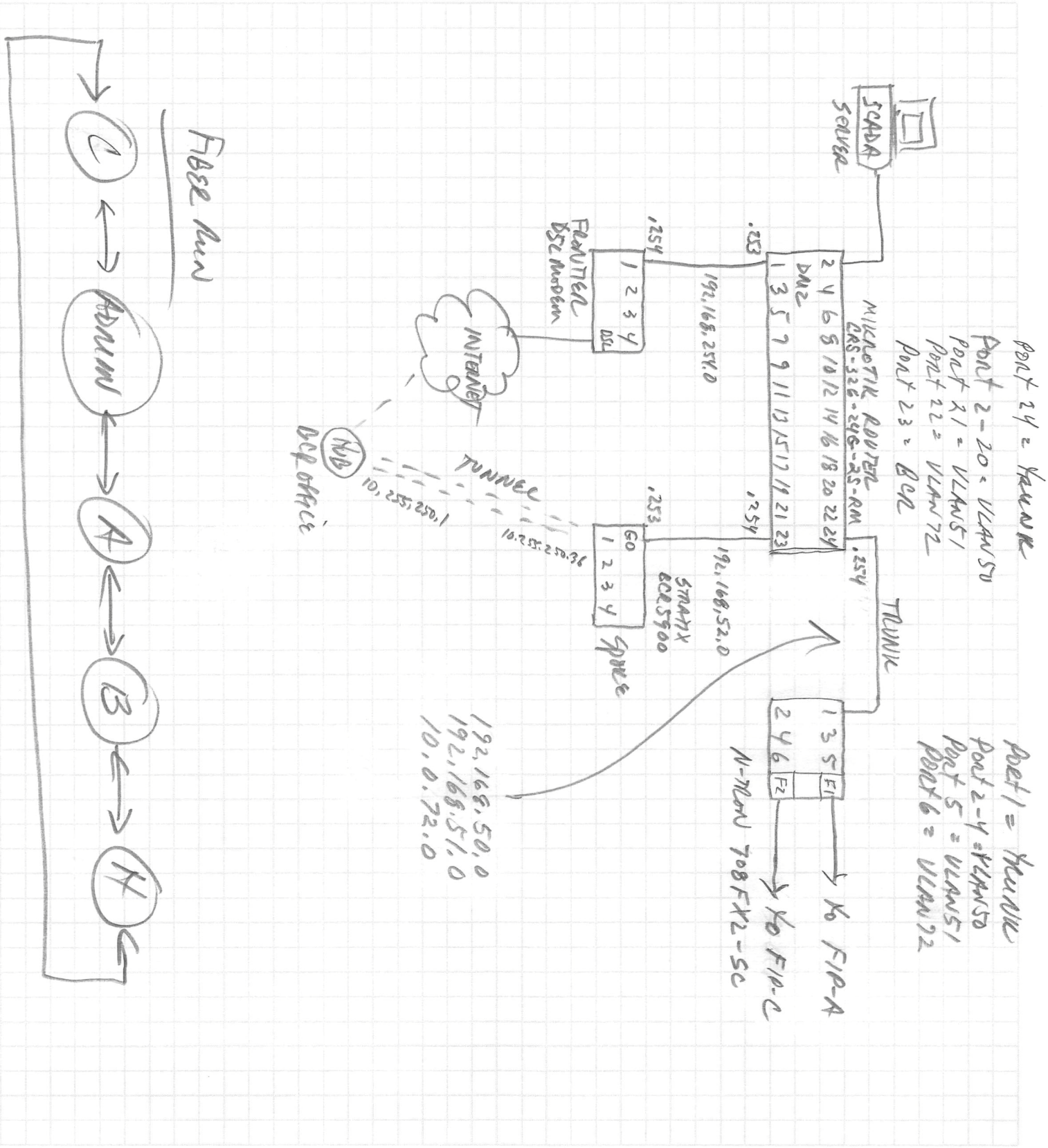
Water & Wastewater Control Solutions
Members: AWWA • WEF • WRWA • WWOA • CSIA

Project WISCONSIN DELLS

Date 2-11-19

Location ADMIN BUILDING

By MM

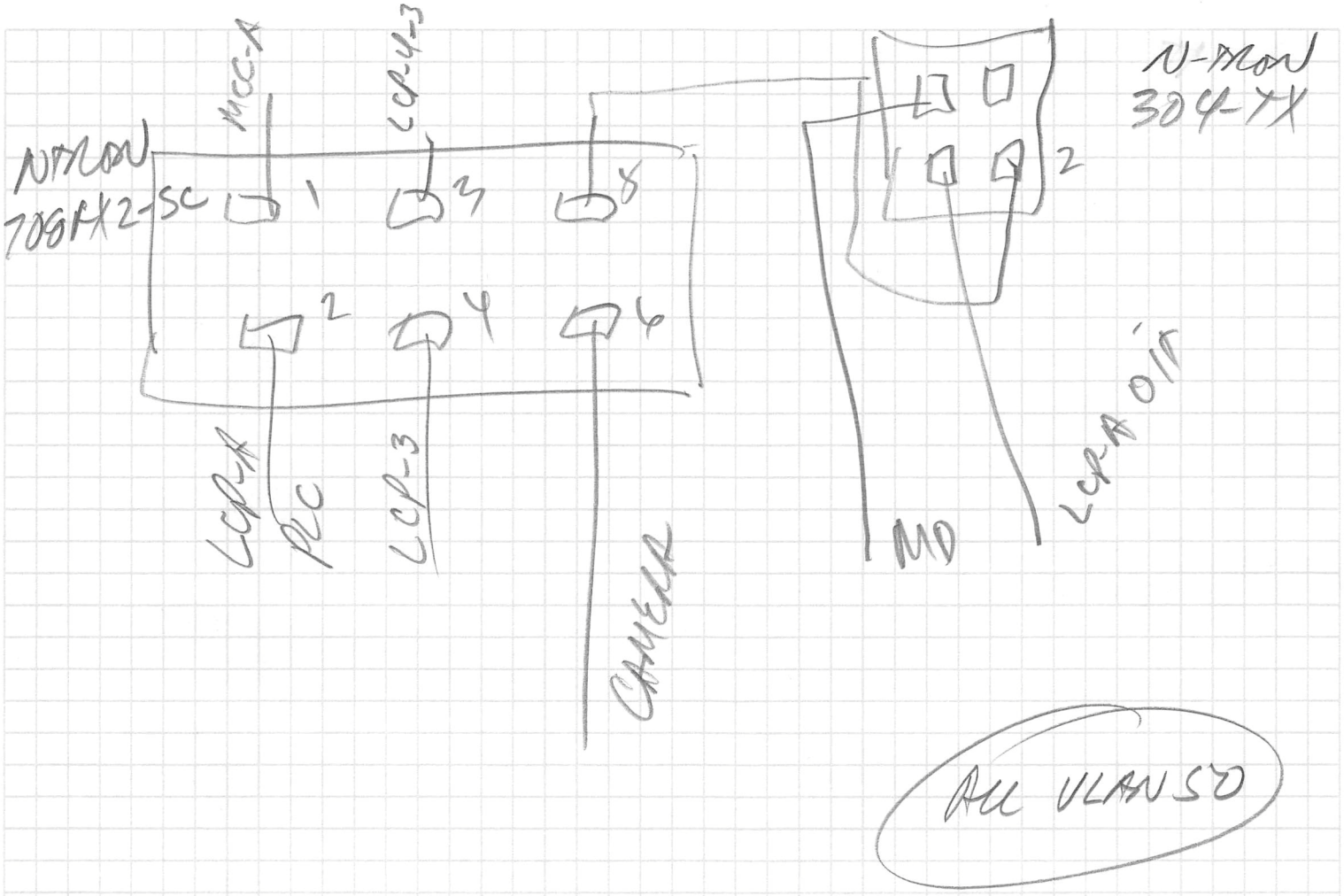


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Phone 608.222.8622 • Fax 608.222.9414

Water & Wastewater Control Solutions
Members: AWWA • WEF • WRWA • WWOA • CSIA

Project DELLS
Location FIP-A

Date 2-11-19
By MM



ALL VLANS 10

RING MANAGER LCP-A

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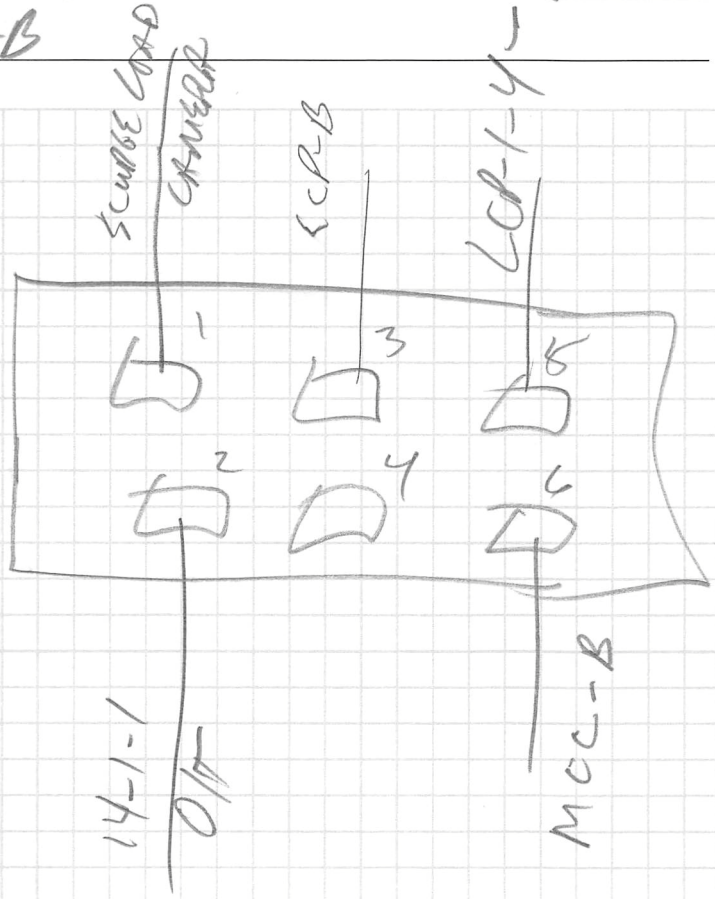
Water & Wastewater Control Solutions
Members: AWWA • WEF • WRWA • WWOA • CSIA

Project DELLS

Date 2-11-19

Location LCP-B

By MM



N-TRON
708-FX2-SC

ACC VLAN50

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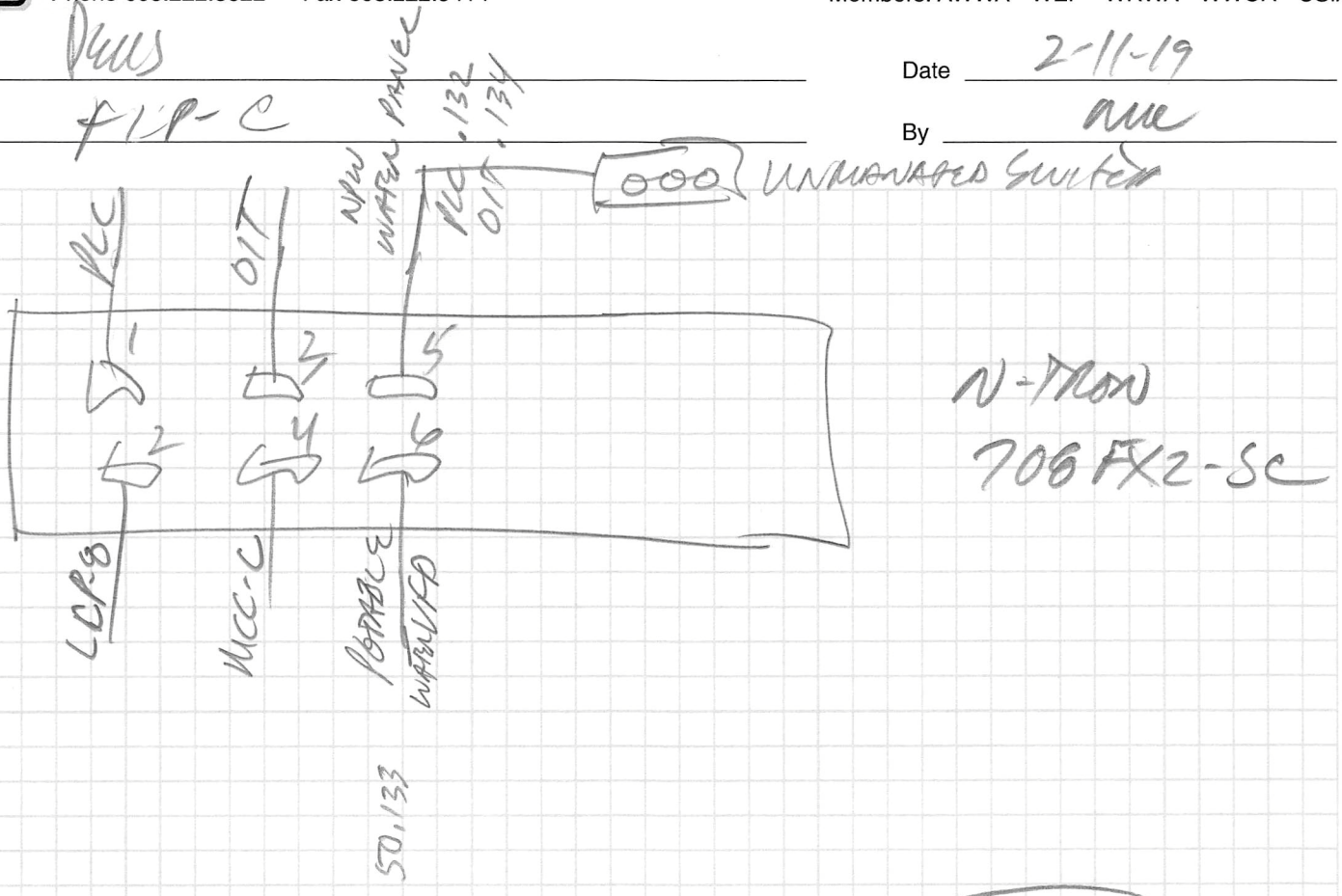
Water & Wastewater Control Solutions
Members: AWWA • WEF • WRWA • WWOA • CSIA

Project PWTS

Location FTP-C

Date 2-11-19

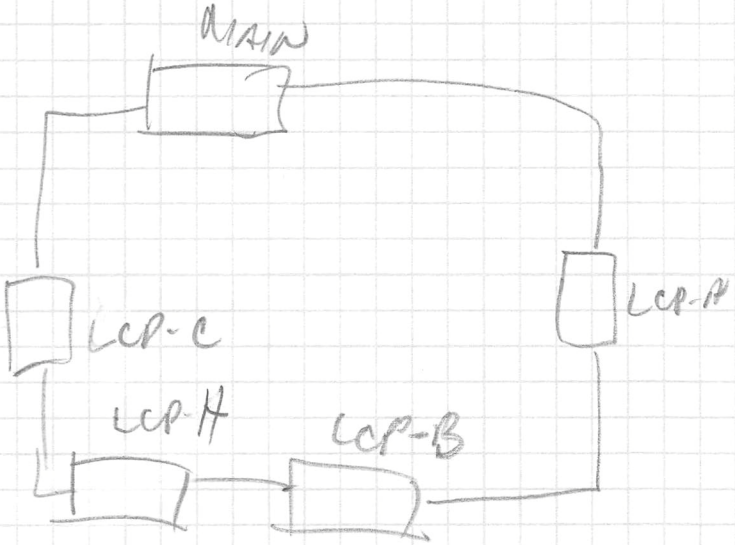
By ame

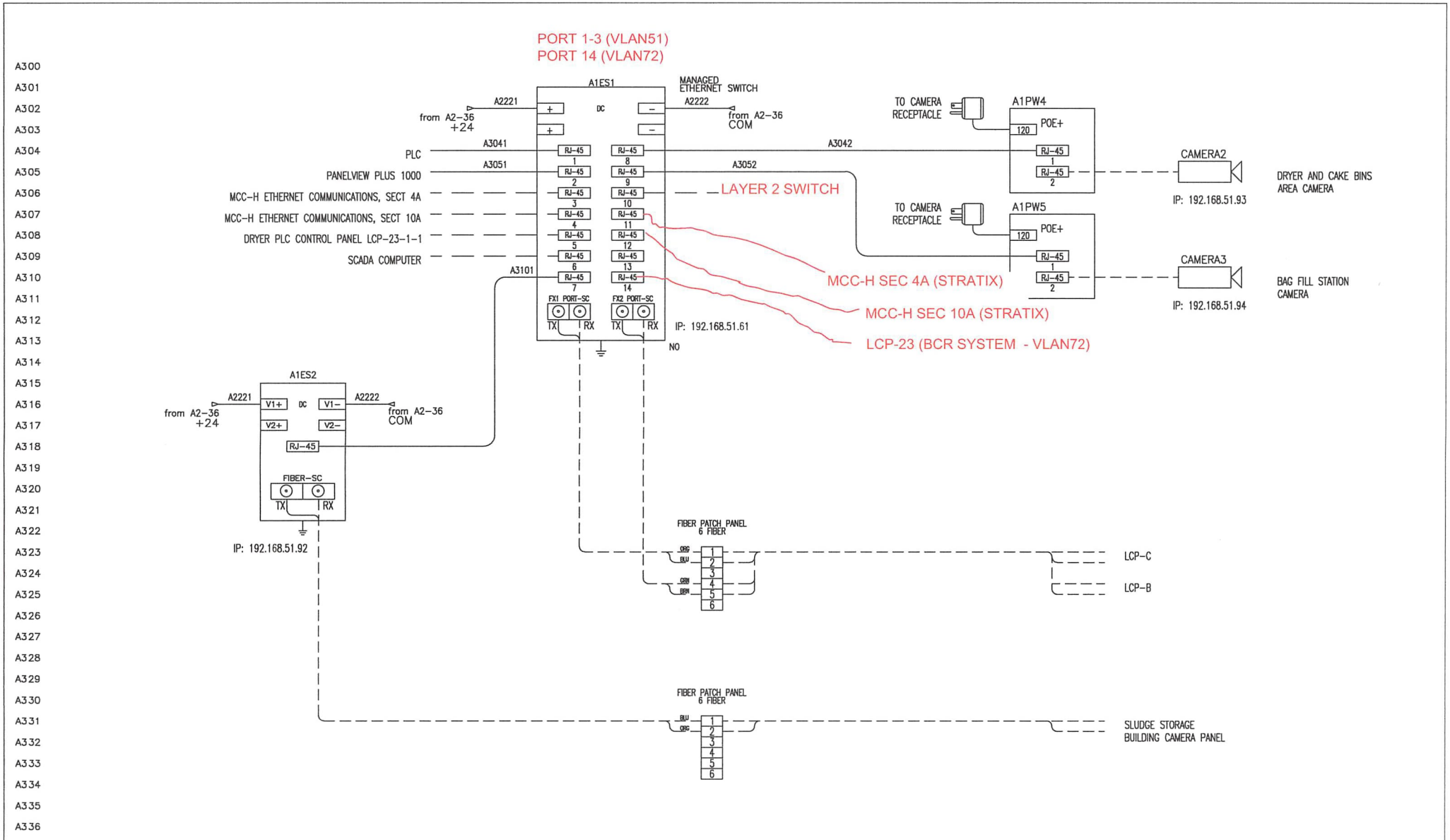


50.133

N-TRON
706FX2-SC

ALL VLAN 50





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WWTF SLUDGE DRYER BUILDING H
LCP-H

DES	K.ATWOOD	DATE	01/18/16
DRN	K.ATWOOD	DATE	01/18/16
APP	K.ATWOOD	DATE	01/18/16

REV	DESCRIPTION	DATE	INIT
B	AS BUILT	10/17	AO
A	RELEASED	04/17	AO

SECTION A1
LOCATION MCC
TYPE 101
PAGE A3 OF 116

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4633 TOMPKINS DRIVE MADISON, WI 53716
PH: (608) 222-8622 www.altronex.com

DRAWING D16007-B
PROJECT WISCONSIN DELLS, WI

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BIDDER:_____

BID
2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION
COLUMBIA COUNTY, WI

PROJECT #00090019

TABLE OF ARTICLES

Article Number	Article
1	Owner and Bidder
2	Attachments to this Bid
3	Basis of Bid – Lump Sum, and Unit Prices
4	Time of Completion
5	Bidders Acknowledgements: Acceptance Period, Instructions, and Receipt of Addenda
6	Bidder's Representations and Certifications

DO NOT SUBMIT
ACCEPTING ONLINE BIDS ONLY

BID FORM PROVIDED ON QUESTvBID

ONLINE BIDDING ONLY

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ARTICLE 1 - OWNER AND BIDDER

1.01 This Bid is submitted to:

Quest CDN/vBID (www.QuestCDN.com)

Access the electronic bid form by downloading the project documents, and select the online bidding button at the top of the advertisement. Contact Quest at (952) 233-1632 if you have questions on how to upload your bid.

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security _____

B. List of Proposed Subcontractors

_____

_____

_____

C. List of Proposed Suppliers

_____

_____

_____

D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;

E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;

F. Required Bidder Qualifications Statement with Supporting Data.

G. The following forms are required if there are no anticipated subcontractors:

1. No Anticipated Use of Subcontractors

H. The following DBE forms are required if there are anticipated subcontractors:

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1. DBE Solicitation Requirements:

   Environmental Improvement Fund (EIF) MBE/WBE/SBRA Contacts Worksheet Form 8700-294A (or equivalent list, with results) OR

   Copy of Class I Advertisement soliciting DBE subcontractors for the project and list of utilized DBEs

I. The following form is required if American Iron & Steel (AIS) applies;

1. Contractor AIS Acknowledgement Form, Consolidated Appropriations Act, 2014

ARTICLE 3 - BASIS OF BID – LUMP SUM

3.01 Lump Sum Bids

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s):

LUMP SUM BID PRICE _____ ($_____)

(use words) (figures)

ARTICLE 4 - TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder agrees that the Work will be substantially complete on or before August 27, 2027, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before October 27, 2027.

4.03 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5 - BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 Bid Acceptance Period

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 Instructions to Bidders

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 Receipt of Addenda

A. Bidder hereby acknowledges receipt of the following Addenda:

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Addendum Number	Addendum Date

ARTICLE 6 - BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 Bidder's Representations

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.

2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.

6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies

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between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 Bidder's Certifications

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:

a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

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BID BOND (PENAL SUM FORM)

Bidder	**Surety**
Name: **[Full formal name of Bidder]** Address *(principal place of business)*: **[Address of Bidder's principal place of business]**	Name: **[Full formal name of Surety]** Address *(principal place of business)*: **[Address of Surety's principal place of business]**
Owner	**Bid**
Name: **[Full formal name of Owner]** Address *(principal place of business)*: **[Address of Owner's principal place of business]**	Project *(name and location)*: **[Owner project/contract name, and location of the project]** Bid Due Date: **[Enter date bid is due]**
Bond Penal Sum: **[Amount]** Date of Bond: **[Date]**	

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

Bidder	Surety
_____ *(Full formal name of Bidder)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature) (Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title:	Title:

Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.

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1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
    3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
    3.2. All Bids are rejected by Owner, or
    3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

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NOTICE OF AWARD

Date of Issuance:

Owner: Owner's Contract No.:

Engineer: Engineer's Project No.:

Contract:

Bidder:

Bidder's Address:

You are notified that your Bid dated **[Bid Date]** for the above Contract, and that you are the Successful Bidder and are awarded a Contract for **[Project Name]**

[Describe Work, alternates, or sections of Work awarded.]

The Contract Price of your Contract is $**(Contract Price).** Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

[Number of copies sent] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

☐ Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner **[number of copies sent]** counterparts of the Agreement, signed by Bidder (as Contractor).

2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.

3. Other conditions precedent (if any): **[Describe other conditions that require Successful Bidder's compliance]**

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **[OWNER]**_____

By *(signature)*:_____

Name (printed):_____

Title: _____

Copy to Engineer

EJCDC® C-510, Notice of Award.
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AGREEMENT

THIS AGREEMENT is by and between WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION ("OWNER") and _____ ("CONTRACTOR").

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

OWNER and CONTRACTOR, hereby agree as follows:

ARTICLE 1 - WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: 2025 WWTF UPGRADE WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION, COLUMBIA COUNTY, WI.

ARTICLE 2 - THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: 2025 WWTF UPGRADE, WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION, COLUMBIA COUNTY, WI.

ARTICLE 3 - ENGINEER

3.01 The Owner has retained MSA Professional Services, Inc. ("Engineer") to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by Engineer.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 Contract Times: Dates

A. The Work will be substantially completed on or before August 27, 2027, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before October 27, 2027.

4.03 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time.

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Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner $1,850 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion until the Work is substantially complete.

2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay OWNER $1,100 for each day that expires after such time until the Work is completed and ready for final payment.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

A. For all Work, a lump sum of $[number].

All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

A. Contractor shall submit Applications for Payment no later than first week of the month in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

B. Contractor shall submit an updated American Iron and Steel (AIS) checklist and Product Certificates with all pay requests that include AIS products and/or materials. Payment for AIS products and materials will only be approved with a completed AIS Checklist and AIS certification.

6.02 Progress Payments; Retainage

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the third Tuesday of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

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1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

    a. 95% of Work completed (with the balance being retainage).

    b. Estimates may include any fabricated or manufactured materials and components specified, previously paid for by the Contractor and delivered to the work or properly stored and suitable for incorporation in the work embraced in the contract. Invoices showing the amount of the fabricated or manufactured materials and components specified must be submitted with proof of payment by the Contractor prior to being considered for payment. Retainage shall be as outlined in paragraph 6.02.A.1.a. above.

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 97.5% of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 100% of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

C. Contractor shall submit an updated American Iron and Steel (AIS) checklist and Product Certificates with all pay requests that include AIS products and/or materials. Payment for AIS products and materials will only be approved with a completed AIS Checklist and AIS certification.

6.03 Final Payment

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 Consent of Surety

A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 Interest

A. All amounts not paid when due will bear interest at the rate of five (5) percent per annum.

ARTICLE 7 - CONTRACT DOCUMENTS

7.01 Contents

A. The Contract Documents consist of all of the following:

1. This Agreement.

2. Bonds:

    a. Performance bond (together with power of attorney).

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b. Payment bond (together with power of attorney).

3. Contractor's Bid

4. General Conditions.

5. Supplementary Conditions.

6. Clean Water Revolving Fund and Drinking Water Revolving Fund Contract Packet for DBE Compliance.

7. Safe Drinking Water Loan Program and Clean Water Fund Program Contract Packet for DBE Compliance.

8. Employee Rights Under the Davis-Bacon Act

9. Complying with Davis-Bacon Requirements for SDWLP/CWFP Projects.

10. Federal Wage Rate Determinations for COLUMBIA COUNTY, WI; Construction Type(s) – WI08 Heavy and WI11 Building, current as of the bid date.

11. Specifications as listed in the table of contents of the project manual (copy of list attached).

12. Drawings (not attached but incorporated by reference) consisting of _____ sheets with each sheet bearing the following general title: 2025 WWTF Upgrade.

13. Addenda (numbers ___ to ___, inclusive).

14. Exhibits to this Agreement (enumerated as follows):

    a. N/A

15. List other required attachments (if any), such as documents required by funding or lending agencies.

    a. Utilization of DBE Subcontractors Documentation

        a. *No Anticipated Use of Subcontractors Form (if applicable)*
           OR
        b. *MBE/WBE Contacts Worksheet Form 8700-294A*
        c. *Contractor Acknowledgement Form for Use of American Iron and Steel Requirement*
           OR
        d. *Contractor Acknowledgement Form for Build America, Build America Requirement*

16. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:

    a. Notice to Proceed.

    b. Work Change Directives.

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c. Change Orders.

d. Field Orders.

e. Warranty Bond, if any.

B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8 - REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

5. Based on the information and observations referred to in the preceding paragraphs, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

6. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

7. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of

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discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

8. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

9. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 Contractor's Certifications

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 Standard General Conditions

A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

Owner:	Contractor:
Wisconsin Dells – Lake Delton Sewerage Commission	
(typed or printed name of organization)	*(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Name: Kimberlee Czuprynko *(typed or printed)*	Name: _____ *(typed or printed)*
Title: Secretary of the Board of Commissioners *(typed or printed)*	Title: _____ *(typed or printed)*
Date: _____ *(date signed)*	Date: _____ *(date signed)*
	(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)
Attest: _____ *(individual's signature)*	Attest: _____ *(individual's signature)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address for giving notices:	Address for giving notices:
8 Bowman Road	
Wisconsin Dells, WI 53965	
Phone: (608) 253-2171	Phone: _____
Email: _____	Email: _____
(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)	License No.: _____ *(where applicable)*
	State: _____

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NOTICE TO PROCEED

Owner:	_____	Owner's Project No.:	_____
Engineer:	_____	Engineer's Project No.:	_____
Contractor:	_____	Contractor's Project No.:	_____
Project:	_____		
Contract Name:	_____		
Effective Date of Contract:	_____		

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on **[date Contract Times are to start]** pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement: **[Select one of the following two alternatives, insert dates or number of days, and delete the other alternative.]**

The date by which Substantial Completion must be achieved is **[date for Substantial Completion, from Agreement]**, and the date by which readiness for final payment must be achieved is **[date for readiness, from Agreement]**.

[or]

The number of days to achieve Substantial Completion is **[number of days, from Agreement]** from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of **[date, calculated from commencement date above]**; and the number of days to achieve readiness for final payment is **[number of days, from Agreement]** from the commencement date of the Contract Times, resulting in a date for readiness for final payment of **[date, calculated from commencement date above]**.

Before starting any Work at the Site, Contractor must comply with the following:

[Note any access limitations, security procedures, or other restrictions]

Owner:	**[Full formal name of Owner]**
By *(signature)*:	_____
Name *(printed)*:	_____
Title:	_____
Date Issued:	_____

Copy: Engineer

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PERFORMANCE BOND

CONTRACTOR (*Name and Address*): Name: [Contractor] Address: [Contractor's Address] [Contractor's City], [Contractor's State] [Contractor's Zip]	SURETY (*Name and Address of Principal Place of Business*): Name: Address:
OWNER (*Name and Address*): Name: [Owner] Mailing Address: [Owner's Address] [Owner's City], [Owner's State] [Owner's Zip]	Contract Description (*Name and Location*): [Project Name] [Owner], [Owner's State] Contract Price: $ [Bid Amount] Effective Date of the Agreement

BOND
Bond Amount : [Bid Amount]
Date of Bond DATE
(Date of bond cannot be earlier than Effective Date of the Agreement):

Modifications to this Bond Form
: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ *(Full formal name of Contractor)*	_____ *(full formal name of Surety) (Corporate Seal)*
By: _____ *(Signature)*	By: _____ *Signature (attach power of attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title _____	Title _____
Attest: _____ *Signature*	Attest: _____ *Signature*
Name _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title	Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:

   3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;

   3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

   3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

   5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

   5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

   5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

   5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

      5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

      5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the

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payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

   7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

   7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

   7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

   14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

   14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

   14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

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14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

16. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

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PAYMENT BOND

CONTRACTOR (*Name and Address*): Name: [Contractor] Address: [Contractor's Address] [Contractor's City], [Contractor's State] [Contractor's Zip]	SURETY (*Name and Address of Principal Place of Business*): Name: Address:
OWNER (*Name and Address*): Name: [Owner] Mailing Address: [Owner's Address] [Owner's City], [Owner's State] [Owner's Zip]	Contract Description (*Name and Location*): [Project Name] [Owner], [Owner's State] Contract Price: $ [Bid Amount] Effective Date of the Agreement

BOND
Bond Amount : [Bid Amount]
Date of Bond DATE
(Date of bond cannot be earlier than Effective Date of the Agreement):

Modifications to this Bond Form
: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ *(Full formal name of Contractor)*	_____ *(full formal name of Surety) (Corporate Seal)*
By: _____ *(Signature)*	By: _____ *Signature (attach power of attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title _____	Title _____
Attest: _____ *Signature*	Attest: _____ *Signature*
Name _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title	Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond will arise after the following:

   5.1. Claimants who do not have a direct contract with the Contractor

      15..1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

      15..2. have sent a Claim to the Surety (at the address described in Paragraph 13).

   5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

   7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

   7.2. Pay or arrange for payment of any undisputed amounts.

   7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the

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Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1. *Claim*—A written statement by the Claimant including at a minimum:

116..1. The name of the Claimant;

116..2. The name of the person for whom the labor was done, or materials or equipment furnished;

116..3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;

116..4. A brief description of the labor, materials, or equipment furnished;

116..5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

116..6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

116..7. The total amount of previous payments received by the Claimant; and

116..8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

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16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

18. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

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Contractor's Application for Payment

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			
Application No.:		**Application Date:**	
Application Period:	**From**	**to**	

1. Original Contract Price		$ -
2. Net change by Change Orders		$ -
3. Current Contract Price (Line 1 + Line 2)		$ -
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)		$ -
5. Retainage		
a. _____ X $ - Work Completed		$ -
b. _____ X $ - Stored Materials		$ -
c. Total Retainage (Line 5.a + Line 5.b)		$ -
6. Amount eligible to date (Line 4 - Line 5.c)		$ -
7. Less previous payments (Line 6 from prior application)		
8. Amount due this application		$ -
9. Balance to finish, including retainage (Line 3 - Line 4)		$ -

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and

(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor: _____

Signature: _____ **Date:** _____

Recommended by Engineer		**Approved by Owner**	
By:		**By:**	
Title:		**Title:**	
Date:		**Date:**	
Approved by Funding Agency			
By:		**By:**	
Title:		**Title:**	
Date:		**Date:**	

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Progress Estimate - Lump Sum Work **Contractor's Application for Payment**

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			

Application No.: **Application Period:** **From** **to** **Application Date:**

A	B	C	D	E	F	G	H	I
			Work Completed					
Item No.	Description	Scheduled Value ($)	(D + E) From Previous Application ($)	This Period ($)	Materials Currently Stored (not in D or E) ($)	Work Completed and Materials Stored to Date (D + E + F) ($)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) ($)
			Original Contract					
			-			-		-
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						-		-
						-		-
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						-		-
						-		-
	Original Contract Totals	$ -	$ -	$ -	$ -	$ -		$ -

EJCDC C-620 Contractor's Application for Payment
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Progress Estimate - Lump Sum Work **Contractor's Application for Payment**

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			

Application No.: _____ **Application Period:** **From** _____ **to** _____ **Application Date:** _____

A	B	C	D	E	F	G	H	I
			Work Completed					
Item No.	Description	Scheduled Value ($)	(D + E) From Previous Application ($)	This Period ($)	Materials Currently Stored (not in D or E) ($)	Work Completed and Materials Stored to Date (D + E + F) ($)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) ($)
Change Orders								
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
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						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
	Change Order Totals	$ -	$ -	$ -	$ -	$ -		$ -
Original Contract and Change Orders								
	Project Totals	$ -	$ -	$ -	$ -	$ -		$ -

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Progress Estimate - Unit Price Work **Contractor's Application for Payment**

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			

Application No.: _____ **Application Period:** **From** _____ **to** _____ **Application Date:** _____

A	B	C	D	E	F	G	H	I	J	K	L
		Contract Information				Work Completed					
Bid Item No.	Description	Item Quantity	Units	Unit Price ($)	Value of Bid Item (C X E) ($)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) ($)	Materials Currently Stored (not in G) ($)	Work Completed and Materials Stored to Date (H + I) ($)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) ($)
Original Contract											
					-		-		-		-
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					-		-		-		-
				Original Contract Totals	$ -		$ -	$ -	$ -		$ -

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Progress Estimate - Unit Price Work **Contractor's Application for Payment**

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			

Application No.: _____ **Application Period:** **From** _____ **to** _____ **Application Date:** _____

A	B	C	D	E	F	G	H	I	J	K	L
		Contract Information				Work Completed					
Bid Item No.	Description	Item Quantity	Units	Unit Price ($)	Value of Bid Item (C X E) ($)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) ($)	Materials Currently Stored (not in G) ($)	Work Completed and Materials Stored to Date (H + I) ($)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) ($)
Change Orders											
					-		-		-		-
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				Change Order Totals	$ -		$ -	$ -	$ -		$ -
Original Contract and Change Orders											
				Project Totals	$ -		$ -	$ -	$ -		$ -

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Stored Materials Summary **Contractor's Application for Payment**

Owner: _____
Engineer: _____
Contractor: _____
Project: _____
Contract: _____

Owner's Project No.: _____
Engineer's Project No.: _____
Contractor's Project No.: _____

Application No.: _____ Application Period: From _____ to _____ Application Date: _____

A	B	C	D	E	F	G	H	I	J	K	L	M
						Materials Stored			Incorporated in Work			
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Previous Amount Stored ($)	Amount Stored this Period ($)	Amount Stored to Date (G+H) ($)	Amount Previously Incorporated in the Work ($)	Amount Incorporated in the Work this Period ($)	Total Amount Incorporated in the Work (J+K) ($)	Materials Remaining in Storage (I-L) ($)
								-			-	-
								-			-	-
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								-			-	-
					Totals	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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FIELD ORDER NO.: [Number of Field Order]

Owner:	Owner's Project No.:
Engineer:	Engineer's Project No.:
Contractor:	Contractor's Project No.:
Project:	
Contract Name:	
Date Issued:	Effective Date of Field Order:

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____

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WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner:	Owner's Project No.:
Engineer:	Engineer's Project No.:
Contractor:	Contractor's Project No.:
Project:	
Contract Name:	
Date Issued:	Effective Date of Work Change Directive:

Contractor is directed to proceed promptly with the following change(s):

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

Notes to User—Check one or both of the following

☐ Non-agreement on pricing of proposed change. ☐ Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: $ _____ [increase] [decrease] [not yet estimated].

Contract Time: _____ days [increase] [decrease] [not yet estimated].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

	Recommended by Engineer	Authorized by Owner
By:		
Title:		
Date:		

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CHANGE ORDER NO.: [Number of Change Order]

Owner: Owner's Project No.:
Engineer: Engineer's Project No.:
Contractor: Contractor's Project No.:
Project:
Contract Name:
Date Issued: Effective Date of Change Order:

The Contract is modified as follows upon execution of this Change Order:

Description:

[Description of the change]

Attachments:

[List documents related to the change]

Change in Contract Price	Change in Contract Times [State Contract Times as either a specific date or a number of days]
Original Contract Price: $ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. [Number of previous Change Order]: $ _____	[Increase] [Decrease] from previously approved Change Orders No.1 to No. [Number of previous Change Order]: Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: $ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] this Change Order: $ _____	[Increase] [Decrease] this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: $ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

Recommended by Engineer (if required)	Accepted by Contractor
By: _____	_____
Title: _____	_____
Date: _____	_____
Authorized by Owner	Approved by Funding Agency (if applicable)
By: _____	_____
Title: _____	_____
Date: _____	_____

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CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:
Engineer:
Contractor:
Project:
Contract Name:

Owner's Project No.:
Engineer's Project No.:
Contractor's Project No.:

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: [Enter date, as determined by Engineer]

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

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{INSERT OWNER NAME }

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

Date: _____

Engineer: MSA Professional Services Inc.

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

Date: _____

Contractor: {INSERT CONTRACTOR NAME }

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

Date: _____

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

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Prepared By

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National Society of Professional Engineers

1420 King Street, Alexandria, VA 22314-2794

(703) 684-2882

www.nspe.org

American Council of Engineering Companies

1015 15th Street N.W., Washington, DC 20005

(202) 347-7474

www.acec.org

American Society of Civil Engineers

1801 Alexander Bell Drive, Reston, VA 20191-4400

(800) 548-2723

www.asce.org

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STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract

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Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions,

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including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

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32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part

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thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

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4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

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2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

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2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

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3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in

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resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

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ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption,

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and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

   1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

   2. Abnormal weather conditions;

   3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

   4. Acts of war or terrorism.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

   1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

   2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

   3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

   1. The circumstances that form the basis for the requested adjustment;

   2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

   3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

   4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

   5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

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Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b)

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promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

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D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

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C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

    c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

    a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;

    b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

    c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

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F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

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D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

    c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

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5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely

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obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to

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indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

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6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

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H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

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2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

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C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.

2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to

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Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

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ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

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B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that the proposed item:

1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) has a proven record of performance and availability of responsive service; and

4) is not objectionable to Owner.

b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete

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and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

   a. will certify that the proposed substitute item will:

      1) perform adequately the functions and achieve the results called for by the general design;

      2) be similar in substance to the item specified; and

      3) be suited to the same use as the item specified.

   b. will state:

      1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

      2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

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3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from the item specified; and

2) available engineering, sales, maintenance, repair, and replacement services.

d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

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B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

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M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

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7.11 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

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2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

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7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

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b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

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8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

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B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

1. Observations by Engineer;

2. Recommendation by Engineer or payment by Owner of any progress or final payment;

3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses,

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damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

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2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay,

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disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

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2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

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9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is

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proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

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10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

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11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract

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Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

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C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:

1. A mutually acceptable fixed fee; or

2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

   a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;

   b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;

   c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

   d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

   e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

   f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

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11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

    a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

    b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

    The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

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C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

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D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the

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locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
5. Other costs consisting of the following:
    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
        1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not

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be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

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i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish

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and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of

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Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

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D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final

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payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

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14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work

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completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress,

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or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work;

   b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

   c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

   d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or

   e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

   a. the Work is defective, requiring correction or replacement;

   b. the Contract Price has been reduced by Change Orders;

   c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

   d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

   e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

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E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

    a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

    b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

    c. Contractor has failed to provide and maintain required bonds or insurance;

    d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

    e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

    f. The Work is defective, requiring correction or replacement;

    g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

    h. The Contract Price has been reduced by Change Orders;

    i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

    j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

    k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or

    l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

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15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

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F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

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2. The final Application for Payment must be accompanied (except as previously delivered) by:

    a. all documentation called for in the Contract Documents;

    b. consent of the surety, if any, to final payment;

    c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

    d. a list of all duly pending Change Proposals and Claims; and

    e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by

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Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;

2. correct such defective Work;

3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under

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Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take

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possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

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16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

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ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

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18.08 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

No suggested Supplementary Conditions in this Article.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.02 Copies of Documents

SC-2.02 Delete Paragraph 2.02.A in its entirety and insert the following new paragraph in its place:

A. Owner shall furnish to Contractor 3 printed copies of conformed Contract Documents (not larger than 11x17) incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies of the conformed Contract Documents will be furnished upon request at the cost of reproduction.

2.06 Electronic Transmittals

SC-2.06 Delete Paragraphs 2.06.B and 2.06.C in their entirety and insert the following in their place:

B. *Electronic Documents Protocol:* The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol ("EDP" or "Protocol") for exchange of electronic transmittals.

1. *Basic Requirements*

a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.

b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.

c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.

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d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.

f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. *System Infrastructure for Electronic Document Exchange*

a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.

1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is 20 MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.

2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.

b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.

c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.

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d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.

f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.

g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.

h. The Owner will operate a Project information management system (also referred to in this EDP as "Project Website") for use of Owner, Engineer and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this EDP or the General Conditions, use of the Project Website by the parties as described in this Paragraph will be mandatory for exchange of Project documents, communications, submittals, and other Project-related information. The following conditions and standards will govern use of the Project Website:

1) Describe the period of time during which the Project Website will be operated and be available for reliance by the parties;

2) Provide any minimum system infrastructure, software licensing and security standards for access to and use of the Project Website;

3) Describe the types and extent of services to be provided at the Project Website (such as large file transfer, email, communication and document archives, etc.); and

4) Include any other Project Website attributes that may be pertinent to Contractor's use of the facility and pricing of such use.

C. *Software Requirements for Electronic Document Exchange; Limitations*

1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.

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a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.

2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.

3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contactors Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner's and Engineer's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
a.6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	
Notes				
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.			
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.			
Key				

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Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive)
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version 1.6 or later
DWG	Autodesk® AutoCAD .dwg format Version 2018.
DOC	Microsoft® Word .doc or .docx format Version 365.
EXC	Microsoft® Excel .xls, .xlsx or .xml format Version 365.
DB	Microsoft® Access .mdb format Version 365.

ARTICLE 3 - DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

SC-3.01 Delete Paragraph 3.01.C. in its entirety.

ARTICLE 5 - SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.03 Subsurface and Physical Conditions

SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

ARTICLE 6 - BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2018 edition).

2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2018 edition).

6.03 Contractor's Insurance

SC-6.03 Add the following new paragraph immediately after Paragraph 603.C:

D. Other Additional Insureds: As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, and umbrella or excess policies must include as additional insureds (in addition to Owner and Engineer) the following:

1. Wisconsin Dells-Lake Delton Sewerage Commission - (*Owner listed as Certificate Holder*)

2. MSA Professional Services, Inc.

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E. Workers' Compensation and Employer's Liability: Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Bodily injury by accident—each accident	$100,000
Bodily injury by disease—Each Employee	$100,000
Bodily Injury by Disease – Policy Limit	$500,000

F. Commercial General Liability—Claims Covered: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,

2. damages insured by reasonably available personal injury liability coverage, and

3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.

   a. Such insurance must be maintained for three years after final payment.

   b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Severability of interests and no insured-versus-insured or cross-liability exclusions.

4. Underground, explosion, and collapse coverage.

5. Personal injury coverage.

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6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

H. *Commercial General Liability—Excluded Content*: The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).

2. Any exclusion for water intrusion or water damage.

3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.

4. Any exclusion of coverage relating to earth subsidence or movement.

5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).

6. Any limitation or exclusion based on the nature of Contractor's work.

7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	$2,000,000
Products—Completed Operations Aggregate	$2,000,000
Personal and Advertising Injury	$1,000,000
Bodily Injury and Property Damage—Each Occurrence	$1,000,000

J. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Property Damage	
Combined Single Limit	

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Automobile Liability	Policy limits of not less than:
Combined Single Limit (Bodily Injury and Property Damage)	$1,000,000

K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$5,000,000
General Aggregate	$5,000,000

L. *Contractor's Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	$1,000,000
General Aggregate	$1,000,000

☐ If box is checked, Contractor is not required to provide Contractor's Pollution Liability Insurance under this contract.

M. *Contractor's Professional Liability Insurance:* If Contractor will provide or furnish professional services under this *Contract*, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	$1,000,000
Annual Aggregate	$1,000,000

6.04 Builder's Risk and Other Property Insurance

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

F. *Builder's Risk Requirements:* The builder's risk insurance must:

1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke;

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theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).

a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.

b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.

2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).

4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier). If this coverage is subject to a sublimit, such sublimit will be a minimum of $1,000,000.

5. extend to cover damage or loss to insured property while in transit. If this coverage is subject to a sublimit, such sublimit will be a minimum of $1,000,000.

6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.

7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.

8. include performance/hot testing and start-up, if applicable.

9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.

10. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be

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insured will be referred to collectively as “insureds.” In addition to Owner, Contractor, and Subcontractors of every tier, include as insureds the following:

a. MSA Professional Services, Inc., 1230 South Boulevard, Baraboo, WI, 53913

ARTICLE 7 - CONTRACTOR’S RESPONSIBILITIES

7.02 Supervision and Superintendence

SC-7.02 Add the following paragraphs immediately after Paragraph 7.02.B.

7.02.C. Character of Workers

(1) Provide personnel necessary to supervise and complete all contract work as specified. Ensure workers have the experience and skills necessary to perform assigned work.

(2) Contractor will address non-compliance with Conduct expectations (paragraph 7.20(A)) and will take all reasonable action as is necessary to prevent and correct violations of the Conduct expectations, including and up to removal of workers from assigned work.

7.03 Labor; Working Hours

SC-7.03 Delete Paragraph 7.03.C in its entirety, and insert the following:

C. In the absence of any Laws or Regulations to the contrary, Contractor may perform the Work on holidays, during any or all hours of the day, and on any or all days of the week, at Contractor's sole discretion.

7.10 Taxes

SC 7.10 Add a new paragraph immediately after Paragraph 7.10.A:

B. Owner represents that it is a qualifying exempt entity under section 77.54(9m), Wis. Stats. (as created by 2015 Wis. Act 126) with respect to exemption from Wisconsin sales and use tax of certain items that become part of eligible facilities owned by the qualifying exempt entity. The contract price accounts for such sales and use tax exemptions, to the extent applicable. Contractor shall not be entitled to an increase in contract price if Contractor is not successful in obtaining an anticipated sales and use tax exemption, unless the reason for the inability to obtain the anticipated exemption is a formal determination by the State of Wisconsin that Owner is not a qualifying exempt entity.

1. OWNER’s exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by CONTRACTOR, or to supplies or materials not incorporated into the Work.

7.20 Conduct Expectations

SC-7.20 Add the following immediately following Paragraph 7.19 of the General Conditions.

7.20 Conduct Expectations

A. Contractor understands their obligations to provide a safe, respectful work environment for their employees, for the Owner’s employees, for the Engineer’s employees and the general public. The Contractor agrees that harassment on the job (unwelcome verbal, physical or other behavior that

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is related to sex, race, age, or protected class status) will not be tolerated and will be addressed timely and in compliance with anti-harassment laws.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.03 Project Representative

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:

1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.

2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.

3. *Liaison*

   a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

   b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

   c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.

4. *Review of Work; Defective Work*

   a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.

   b. Observe whether any Work in place appears to be defective.

   c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.

5. *Inspections and Tests*

   a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.

   b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.

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6. *Payment Requests:* Review Applications for Payment with Contractor.

7. *Completion*

   a. Participate in Engineer's visits regarding Substantial Completion.

   b. Assist in the preparation of a punch list of items to be completed or corrected.

   c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.

   d. Observe whether items on the final punch list have been completed or corrected.

D. The RPR will not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.

5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Authorize Owner to occupy the Project in whole or in part.

10.09 Character of Work

SC-10.09 Add the following new paragraph immediately after Paragraph 10.08 of the General Conditions:

10.09 Character of Workers

A. The Engineer may suspend the work in writing, withhold progress payments due the contractor, or both for the following reasons:

(1) The Contractor does not furnish suitable and sufficient personnel to perform the work.

(2) The Contractor fails to take sufficient actions to prevent and correct violations of the Conduct expectations (paragraph 7.20(A)), including and up to removal of workers from assigned work.

10.10 Conduct Expectations

SC-10.10 Add the following new paragraph immediately after Paragraph 10.09 of the General Conditions:

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10.11 Conduct Expectations

A. Engineer understands their obligations to provide a safe, respectful work environment for their employees, for the Contractor's employees, for the Owner's employees and the general public. The Engineer agrees that harassment on the job (unwelcome verbal, physical or other behavior that is related to sex, race, age, or protected class status) will not be tolerated and will be addressed timely and in compliance with anti-harassment laws.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

SC-13.01 Supplement Paragraph 13.01.B.5.c.(2) by adding the following sentence:

The equipment rental rate book that governs the included costs for the rental of machinery and equipment owned by Contractor (or a related entity) under the Cost of the Work provisions of this Contract is the most current edition of RS Means Data (www.rsmeans.com).

SC-13.01 Supplement Paragraph 13.01.C.2 by adding the following definition of small tools and hand tools:

a. For purposes of this paragraph, "small tools and hand tools" means any tool or equipment whose current price if it were purchased new at retail would be less than $500.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

SC-15.01 Add the following new Paragraph 15.01.F:

F. For contracts in which the Contract Price is based on the Cost of Work, if Owner determines that progress payments made to date substantially exceed the actual progress of the Work (as measured by reference to the Schedule of Values), or present a potential conflict with the Guaranteed Maximum Price, then Owner may require that Contractor prepare and submit a plan for the remaining anticipated Applications for Payment that will bring payments and progress into closer alignment and take into account the Guaranteed Maximum Price (if any), through reductions in billings, increases in retainage, or other equitable measures. Owner will review the plan, discuss any necessary modifications, and implement the plan as modified for all remaining Applications for Payment.

15.03 Substantial Completion

SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

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ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

Add the following after 17.01

17.02 *Arbitration*

A. All matters subject to final resolution under this Article will be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules (subject to the conditions and limitations of this Paragraph SC-17.02). Any controversy or claim in the amount of $100,000 or less will be settled in accordance with the American Arbitration Association's supplemental rules for Fixed Time and Cost Construction Arbitration. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.

B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in Article 17, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.

C. The arbitrator(s) must be licensed engineers, contractors, attorneys, or construction managers. Hearings will take place pursuant to the standard procedures of the Construction Arbitration Rules that contemplate in-person hearings. The arbitrators will have no authority to award punitive or other damages not measured by the prevailing party's actual damages, except as may be required by statute or the Contract. Any award in an arbitration initiated under this clause will be limited to monetary damages and include no injunction or direction to any party other than the direction to pay a monetary amount.

D. The Arbitrators will have the authority to allocate the costs of the arbitration process among the parties, but will only have the authority to allocate attorneys' fees if a specific Law or Regulation or this Contract permits them to do so.

E. The award of the arbitrators must be accompanied by a reasoned written opinion and a concise breakdown of the award. The written opinion will cite the Contract provisions deemed applicable and relied on in making the award.

F. The parties agree that failure or refusal of a party to pay its required share of the deposits for arbitrator compensation or administrative charges will constitute a waiver by that party to present evidence or cross-examine witness. In such event, the other party shall be required to present evidence and legal argument as the arbitrator(s) may require for the making of an award. Such waiver will not allow for a default judgment against the non-paying party in the absence of evidence presented as provided for above.

G. No arbitration arising out of or relating to the Contract will include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

    1. the inclusion of such other individual or entity will allow complete relief to be afforded among those who are already parties to the arbitration;

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2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration, and which will arise in such proceedings;

3. such other individual or entity is subject to arbitration under a contract with either Owner or Contractor, or consents to being joined in the arbitration; and

4. the consolidation or joinder is in compliance with the arbitration administrator's procedural rules.

H. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.

I. Except as may be required by Laws or Regulations, neither party nor an arbitrator may disclose the existence, content, or results of any arbitration hereunder without the prior written consent of both parties, with the exception of any disclosure required by Laws and Regulations or the Contract. To the extent any disclosure is allowed pursuant to the exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.

17.03 *Attorneys' Fees*

SC-17.03 Add the following new paragraph immediately after Paragraph 17.02. [Note: If there is no Paragraph 17.02, because neither arbitration nor any other dispute resolution process has been specified here in the Supplementary Conditions, then revise this to state "Add the following new Paragraph immediately after Paragraph 17.01" and revise the numbering accordingly].

17.03 *Attorneys' Fees*

A. For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

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Federal Department of Labor (DOL) Davis-Bacon Wage Determination

COLUMBIA COUNTY, WI
Type(s): WI08 Heavy (Sewer and Water Line and Tunnel)
WI11 Building

Applicable Federal wage rate determination will be current as of the date of the bid opening

Federal wage rates are available at https://sam.gov/content/wage-determinations.

All payroll submissions will be processed through eComply.

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"General Decision Number: WI20250008 09/19/2025

Superseded General Decision Number: WI20240008

State: Wisconsin

Construction Types: Heavy (Sewer and Water Line and Tunnel)

Counties: Wisconsin Statewide.

TUNNEL, SEWER & WATER LINE CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	02/07/2025

2	02/21/2025
3	05/23/2025
4	06/06/2025
5	06/27/2025
6	07/04/2025
7	07/11/2025
8	08/15/2025
9	08/29/2025
10	09/12/2025
11	09/19/2025

BRWI0001-002 06/01/2025

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.09	28.10

BRWI0002-002 06/01/2025

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 48.60	29.31

BRWI0002-005 06/01/2025

ADAMS, BARRON, BROWN, CALUMET, CHIPPEWA, CLARK, COLUMBIA, DODGE, DOOR, DUNN, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, JEFFERSON, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, ONEIDA, OUTAGAMIE, POLK, PORTAGE, RUSK, SAUK, SHAWANO, SHEBOYGAN, ST. CROIX, TAYLOR, VILAS, WALWORTH, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 46.01	29.31

BRWI0003-002 06/01/2024

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0004-002 06/01/2025

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.71	28.90

BRWI0006-002 06/01/2025

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER	$ 39.36	28.83

BRWI0007-002 06/01/2025

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.34	29.49

BRWI0008-002 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 45.72	27.42

BRWI0009-001 06/01/2024

GREEN LAKE, MARQUETTE, OUTAGAMIE, SHAWANO, WAUPACA, WASHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0011-002 06/01/2024

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0013-002 06/01/2025

DANE, GRANT, IOWA, AND RICHLAND COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.17	28.66

BRWI0019-002 06/01/2025

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 39.50	28.69

BRWI0021-002 06/01/2025

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.14	29.67

BRWI0034-002 06/01/2025

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.17	28.66

CARP0068-011 05/05/2025

BURNETT (W. of Hwy 48), PIERCE (W. of Hwy 29), POLK (W. of Hwys 35, 48 & 65), AND ST. CROIX (W. of Hwy 65) COUNTIES

	Rates	Fringes
CARPENTER	$ 47.57	31.17
PILEDRIVERMAN	$ 47.71	30.98

CARP0231-002 06/01/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
CARPENTER	$ 47.73	31.52

CARP0310-002 06/03/2024

ADAMS, ASHLAND, BAYFIELD (Eastern 2/3), FOREST, IRON, JUNEAU, LANGLADE, LINCOLN, MARATHON, ONEIDA, PORTAGE, PRICE, SHAWANO (Western Portion of the County), TAYLOR, VILAS, AND WOOD COUNTIES

	Rates	Fringes
CARPENTER	$ 42.44	28.44
Piledriver	$ 42.44	28.44

CARP0314-001 06/02/2025

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, JEFFERSON, LAFAYETTE, RICHLAND, ROCK, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
Carpenter	$ 42.45	28.78
Piledrivermen	$ 44.45	28.78

CARP0361-004 05/05/2025

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 46.82	31.92

CARP0731-002 06/03/2024

CALUMET (Eastern Portion of the County), FOND DU LAC (Eastern Portion of the County), MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
CARPENTER	$ 42.44	28.44
Piledriver	$ 42.44	28.44

CARP0955-002 06/03/2024

CALUMET (Western Portion of the County), FOND DU LAC (Western Portion of the County), GREEN LAKE, MARQUETTE, OUTAGAMIE, WAUPACA, WAUSHARA, AND WINNEBAGO

	Rates	Fringes
CARPENTER	$ 42.44	28.44
PILEDRIVER	$ 42.44	28.44

CARP1056-002 06/01/2024

ADAMS, ASHLAND, BARRON, BAYFIELD , BROWN, BUFFALO, BURNETT ,CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E. of Hwy. 29 & 65), POLK (E. of Hwy. 35, 48 & 65), PORTAGE, PRICE, RICHLAND, ROCK, RUSK, SAUK, SAWYER, SHAWANO, SHEBOYGAN, ST. CROIX (E. of Hwy. 65), TAYLOR, TREMPEALEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
MILLWRIGHT	$ 42.00	28.85

CARP1074-002 06/03/2024

BARRON, BURNETT, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, PEPIN, PIERCE (E. of Hwy. 29 & 65), POLK (E. of Hwy. 35, 48 & 65), RUSK, SAWYER, ST. CROIX (E. of Hwy. 65), AND WASHBURN

	Rates	Fringes
CARPENTER	$ 42.44	28.44
PILEDRIVER	$ 42.44	28.44

CARP1143-002 06/03/2024

BUFFALO, CRAWFORD, JACKSON, LA CROSSE, MONROE, TREMPEALEAU AND VERNON COUNTIES

	Rates	Fringes
CARPENTER	$ 42.44	28.44
PILEDRIVER	$ 42.44	28.44

CARP1146-002 06/03/2024

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, MENOMINEE, OCONTO, AND SHAWANO (Western Portion of the County) COUNTIES

	Rates	Fringes
CARPENTER	$ 42.44	28.44
PILEDRIVER	$ 42.44	28.44

CARP2337-009 06/03/2024

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
PILEDRIVERMAN	$ 42.21	34.07

CARP2337-010 06/03/2024

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
MILLWRIGHT	$ 42.31	32.21

ELEC0014-002 05/25/2025

ASHLAND, BARRON, BAYFIELD, BUFFALO, BURNETT, CHIPPEWA, CLARK (except Maryville, Colby, Unity, Sherman, Fremont, Lynn & Sherwood), CRAWFORD, DUNN, EAU CLAIRE, GRANT, IRON, JACKSON, LA CROSSE, MONROE, PEPIN, PIERCE, POLK, PRICE, RICHLAND, RUSK, ST CROIX, SAWYER, TAYLOR, TREMPEALEAU, VERNON, AND WASHBURN COUNTIES

	Rates	Fringes
Electricians:	$ 44.29	25.21

ELEC0127-002 06/01/2023

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 46.05	30%+13.15

ELEC0158-002 06/01/2024

BROWN, DOOR, KEWAUNEE, MANITOWOC (except Schleswig), MARINETTE(Wausuakee and area South thereof), OCONTO, MENOMINEE (East of a ine 6 miles West of the West boundary of Oconto County), SHAWANO (Except Area North of Townships of Aniwa and Hutchins) COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 40.25	29.75%+11.17

ELEC0159-003 05/26/2024

COLUMBIA, DANE, DODGE (Area West of Hwy 26, except Chester and Emmet Townships), GREEN, LAKE (except Townships of Berlin, Seneca, and St. Marie), IOWA, MARQUETTE (except Townships of Neshkoka, Crystal Lake, Newton, and Springfield), and SAUK COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 48.55	25.91

ELEC0219-004 06/01/2019

FLORENCE COUNTY (Townships of Aurora, Commonwealth, Fern, Florence and Homestead) AND MARINETTE COUNTY (Township of Niagara)

	Rates	Fringes
Electricians:		
Electrical contracts over $180,000	$ 33.94	21.80
Electrical contracts under $180,000	$ 31.75	21.73

ELEC0242-005 06/01/2025

DOUGLAS COUNTY

	Rates	Fringes
Electricians:	$ 47.46	33.34

ELEC0388-002 06/01/2024

ADAMS, CLARK (Colby, Freemont, Lynn, Mayville, Sherman, Sherwood, Unity), FOREST, JUNEAU, LANGLADE, LINCOLN, MARATHON, MARINETTE (Beecher, Dunbar, Goodman & Pembine), MENOMINEE (Area West of a line 6 miles West of the West boundary of Oconto County), ONEIDA, PORTAGE, SHAWANO (Aniwa and Hutchins), VILAS AND WOOD COUNTIES

	Rates	Fringes
Electricians:	$ 40.19	26%+12.45

ELEC0430-002 06/01/2024

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:	$ 48.50	26.25

ELEC0494-005 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Electricians:	$ 50.86	28.26

ELEC0494-006 06/01/2025

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:	$ 45.20	25.27

ELEC0577-003 05/26/2024

CALUMET (except Township of New Holstein), GREEN LAKE (N. part including Townships of Berlin, St Marie, and Seneca), MARQUETTE (N. part including Townships of Crystal Lake, Neshkoro, Newton, and Springfield), OUTAGAMIE, WAUPACA, WAUSHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
Electricians:	$ 40.00	22.69

ELEC0890-003 06/01/2024

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:	$ 43.65	25.95%+12.26

ENGI0139-003 06/02/2025

REMAINING COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1:	$ 50.53	27.89
Group 2:	$ 49.28	27.89
Group 3:	$ 45.73	27.89
Group 4:	$ 45.20	27.89
Group 5:	$ 43.13	27.89
Group 6:	$ 41.60	27.89

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of over 100 tons; Cranes, Tower Cranes, and Derricks with boom, leads and/or jib lengths 176 ft or longer.

GROUP 2: Backhoes (Excavators) weighing 130,00 lbs and over; Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; Cranes, Tower Cranes, and Derricks with boom, leads, and/or jib lengths 175 ft or less; Caisson Rigs; Pile Driver

GROUP 3: Backhoes (Excavators) weighing under 130,000 lbs; Travelling Crane (bridge type); Milling Machine; Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Laser Screed; Concrete Grinder and Planing Machine; Slipform Curb and Gutter Machine; Boring Machine

(Directional); Dredge Operator; Skid Rigs; over 46 meter Concrete Pump.

GROUP 4: Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 10 tons or less; Tractor, Bulldozer, or End Loader (over 40 hp); Motor Patrol; Scraper Operator; Bituminous Plant and Paver Operator; Screed-Milling Machine; Roller over 5 tons; Concrete pumps 46 meter and under; Grout Pumps; Rotec type machine; Hydro Blaster, 10,000 psi and over; Rotary Drill Operator; Percussion Drilling Machine; Air Track Drill with or without integral hammer; Blaster; Boring Machine (vertical or horizontal); Side Boom; Trencher, wheel type or chain type having 8 inch or larger bucket; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Straddle Carrier; Material Hoists; Stack Hoist; Man Hoists; Mechanic and Welder; Off Road Material Haulers.

GROUP 5: Tractor, Bulldozer, or Endloader (under 40 hp); Tampers -Compactors, riding type; Stump Chipper, large; Roller, Rubber Tire; Backfiller; Trencher, chain type (bucket under 8 inch); Concrete Auto Breaker, large; Concrete Finishing Machine (road type); Concrete Batch Hopper; Concrete Conveyor Systems; Concrete Mixers, 14S or over; Pumps, Screw Type and Gypsum); Hydrohammers, small; Brooms and Sweeeprs; Lift Slab Machine; Roller under 5 tons; Industrial Locomotives; Fireman (Pile Drivers and Derricks); Pumps (well points); Hoists, automatic; A-Frames and Winch Trucks; Hoists (tuggers); Boats (Tug, Safety, Work Barges and Launches); Assistant Engineer

GROUP 6: Shouldering Machine Operator; Farm or Industrial Tractor mounted equipment; Post Hole Digger; Auger (vertical and horizontal); Skid Steer Loader with or without attachments; Robotic Tool Carrier with or without attachments; Power Pack Vibratory/Ultra Sound Driver and Extractor; Fireman (Asphalt Plants); Screed Operator; Stone Crushers and Screening Plants; Air, Electric, Hydraulic Jacks (Slip Form); Prestress Machines; Air Compressor, 400 CFM or over; Refrigeration Plant/Freese Machine; Boiler Operators (temporary heat); Forklifts; Welding Machines; Generators; Pumps over 3""; Heaters, Mechanical; Combination small equipment operator; Winches, small electric; Oiler; Greaser; Rotary Drill Tender; Conveyor; Elevator Operator

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ENGI0139-007 06/02/2025

DODGE, FOND DU LAC, JEFFERSON, KENOSHA, MILWAUKEE, OZAUKEE, RACINE, SHEBOYGAN, WALWORTH, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 47.19	28.15
Group 2	$ 46.41	28.15
Group 3	$ 45.46	28.15
Group 4	$ 44.41	28.15
Group 5	$ 43.01	28.15

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cranes, Tower Cranes, and Derricks with or without attachments, with a lifting capacity of over 100 tons; or Cranes, Tower Cranes, and Derricks with boom, leads, and/or jib lengths measuring 176 feet or longer; Backhoes (Excavators) 130,000 lbs and over; Caisson Rigs and Pile Drivers

GROUP 2: Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or under; or Cranes, Tower Cranes, and Derricks with boom, lead, and\or jib lengths measuring 175 feet or under; Backhoes (Excavators) under 130,000 lbs; Skid Rigs; Dredge Operator: Traveling Crane (Bridge type); Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Pumps and Boring Machines (directional)

GROUP 3: Material Hoists; Stack Hoists; Tractor or Truck mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane, 5 tons or under; Manhoist; Tractor over 40 hp; Bulldozer over 40 hp; Endloader over 40 hp; Forklift, 25 ft and over; Motor Patrol; Scraper Operator; Sideboom; Straddle Carrier; Mechanic and Welder; Bituminous Plant and Paver Operator; Roller over 5 tons; Percussion Drill Operator; Rotary Drill Operator; Blaster; Air Track Drill; Trencher (wheel type or chain type having over 8 inch bucket); Elevator; Milling Machine and Boring Machine (horizontal or vertical); Backhoe Mounted Compactor

GROUP 4: Backfiller; Concrete Auto Breaker (large); Concrete Finishing Machine (road type); Roller, Rubber Tire; Concrete Batch Hopper; Concrete Conveyor System; Concrete Mixers (14S or over); Screw type Pumps and Gypsum Pumps; Grout Pumps; Tractor, Bulldozer, End Loader, under 40 hp; Pumps (well points); Trencher (chain type 8 inch or smaller bucket; Industrial Locomotives; Roller under 5 tons; Fireman (Piledrivers and Derricks); Robotic Tool Carrier with or without attachments.

GROUP 5: Hoists (Automatic); Forklift, 12 ft to 25 ft; Tamper-Compactors, riding type; A-Frame andWinch Trucks; Concrete Auto Breaker; Hydrohammer, small; Brooms and Sweepers; Hoist (Tuggers); Stump Chipper, large; Boats (Tug, Safety, Work Barges and Launch); Shouldering Machine Operator; Screed Operator; Farm or Industrial Tractor; Post Hole Digger; Stone Crushers and Screening Plants; Firemen (Asphalt Plants); Air Compressor (400 CFM or over); Augers (vertical and horizontal); Generators, 150 KW and over; Air, Electric Hydraulic Jacks (Slipform); Prestress Machines; Skid Steer Loader with or without attachments; Boiler operators (temporary heat); Forklift, 12 ft and under; Screed Operator Milling Machine; Refrigeration Plant/Freeze Machine; Power Pack Vibratory/Ultra Sound Driver and Extractor; Generators under 150 KW; Combination small equipment operator; Compressors under 400 CFM; Welding Machines; Heaters, Mechanical; Pumps; Winches, Small Electric; Oiler and Greaser; Conveyor; High pressure utility locating machine (daylighting machine).

IRON0008-002 06/01/2025

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC,

MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 44.66	33.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 47.52	33.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-001 06/01/2025

ADAMS, COLUMBIA, CRAWFORD, DANE, DODGE, FLORENCE, FOREST, GRANT, GREENE, (Excluding S.E. tip), GREEN LAKE, IOWA, JEFFERSON, JUNEAU, LA CROSSE, LAFAYETTE, LANGLADE, MARATHON, MARQUETTE, MENOMINEE, MONROE, PORTAGE, RICHLAND, ROCK (Northern area, vicinity of Edgerton and Milton), SAUK, VERNON, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
IRONWORKER	$ 44.00	32.66

IRON0498-005 06/01/2025

GREEN (S.E. 1/3), ROCK (South of Edgerton and Milton), and WALWORTH (S.W. 1/3) COUNTIES:

	Rates	Fringes
IRONWORKER	$ 48.74	49.65

IRON0512-008 05/01/2025

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON, PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 46.35	36.86

IRON0512-021 05/01/2025

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 42.89	36.86

LABO0113-004 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Open Cut)		
Group 1	$ 19.99	24.42
Group 2	$ 22.54	24.42
Group 3	$ 26.53	24.42
Group 4	$ 37.05	24.42
Group 5	$ 37.23	24.42
Group 6	$ 37.29	24.42
Group 7	$ 41.62	24.42
Group 8	$ 44.78	24.42
Group 9	$ 45.51	24.42

LABORERS CLASSIFICATIONS [OPEN CUT]

GROUP 1: Yard Laborer

GROUP 2: Landscaper

GROUP 3: Flag Person

GROUP 4: Paving Laborer

GROUP 5: General Laborer on Surface; Top Man

GROUP 6: Mud Mixer

GROUP 7: Mucker; Form Stripper; Bottom Digger and Misc; Bottom Man and Welder on Surface

GROUP 8: Concrete Manhole Builder; Caisson Worker; Miner; Pipe Layer; Rock Driller and Joint Man; Timber Man and Concrete Brusher; Bracer in Trench Behind Machine & Tight Sheeting; Concrete Formsetter and Shoveler; Jackhammer Operator

GROUP 9: Blaster

LABO0113-005 06/01/2025

SEWER, TUNNEL & UNDERGROUND

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
Laborers:		
Group 1	$ 27.49	24.42
Group 2	$ 34.17	24.42
Group 3	$ 38.89	24.42
Group 4	$ 40.88	24.42

TUNNEL WORK UNDER COMPRESSED AIR: 0-15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS

GROUP 1: Flagperson

GROUP 2: Top Man, General Laborer, Wellpoint Installation, Wire Mesh and Reinforcement, Concrete Worker, Form Stripper, Strike-off Work

GROUP 3: Machine and Equipment Operator, Sheeting, Form Setting, Patch Finisher, Bottom Man, Joint Sawer, Gunnite Man, Manhole Builder, Welder-Torchman, Blaster, Caulker, Bracer, Bull Float, Conduit Worker, Mucker and Car Pusher, Raker and Luteman, Hydraulic Jacking of Shields, Shield Drivers, Mining Machine, Lock Tenders, Mucking Machine Operator, Motor Men & Gauge Tenders and operation of incidental Mechanical Equipment and all Power Driven Tools

GROUP 4: Pipelayer, Miner and Laser Operator

LABO0113-008 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON & WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Tunnel-Free Air)		
Group 1	$ 26.53	24.42
Group 2	$ 37.23	24.42
Group 3	$ 37.29	24.42
Group 4	$ 41.62	24.42
Group 5	$ 41.77	24.42
Group 6	$ 44.78	24.42
Group 7	$ 45.51	24.42

LABORERS CLASSIFICATIONS [TUNNEL - FREE AIR]:

GROUP 1: Flagperson

GROUP 2: General Laborer on surface; Tower Man

GROUP 3: Saw Man; Top Man

GROUP 4: Form Stripper; Car Pusher

GROUP 5: Mucker; Dinkey; Welder (rate on surface)

GROUP 6: Concrete Manhole Builder; Mucking Machine; Miner; Mining Machine; Welder; Rock Driller; Concrete Buster; Jack Hammer Operator; Caisson Worker; Pipelayer and Joint Man; Bracerman

GROUP 7: Blaster

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* LABO0113-009 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON & WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Tunnel -		
*COMPRESSED AIR 0 - 15 lbs.)		

Group 1	$ 26.53	24.42
Group 2	$ 37.23	24.42
Group 3	$ 42.22	24.42
Group 4	$ 43.12	24.42
Group 5	$ 43.27	24.42
Group 6	$ 46.30	24.42
Group 7	$ 46.99	24.42

LABORERS CLASSIFICATIONS [TUNNEL - COMPRESSED AIR]:

*Compressed Air 15 - 30 lbs add $2.00 to all classifications
*Compressed Air over 30 lbs add $3.00 to all classifcations

GROUP 1: Flagperson

GROUP 2: General Laborer on surface

GROUP 3: Lock Tender on surface

GROUP 4: Form Stripper; Car Pusher

GROUP 5: Mucker; Dinkey

GROUP 6: Mucking Machine; Miner; Mining Machine; Welder & Rock Driller; Lock Tender in tunnel; Concrete Buster; Jack Hammer Operator; Caisson Worker; Pielayer and Joint Man; Bracerman; Nozzle Man on Gunite; Timber Man; Concrete Brusher

GROUP 7: Blaster

NOTE: Hazardous & Toxic Waste Removal: add $0.15 per hour.

LABO0140-005 06/01/2025

ADAMS, ASHLAND, BARRON, BROWN, BUFFALO, CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE,FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LACROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RICHLAND, ROCK, RUSK, ST CROIX, SAUK, SAWYER, SHAWANO, SHEBOYGAN, TAYLOR, TREMMPEALEAU, VERNON, VILAS, WALWWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
LABORER (SEWER & WATER)		
Group 1	$ 36.98	19.97
Group 2	$ 38.83	19.97
Group 3	$ 39.13	19.97
Group 4	$ 39.78	19.97

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR: 0-15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORER CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: General Laborer, Wellpoint Installation; Form

Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Drivers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

LABO0464-002 06/01/2025

DANE AND DOUGLAS COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 36.88	19.97
Group 2	$ 39.08	19.97
Group 3	$ 39.38	19.97
Group 4	$ 40.03	19.97

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR: 0 - 15 lbs add $1.00, 15- 30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: General Laborer; Wellpoint Installation; Concrete Worker; Form Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Dirvers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

LABO1091-010 06/01/2025

BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
Laborers: (SEWER & WATER)		
Group 1	$ 36.67	19.97
Group 2	$ 38.73	19.97
Group 3	$ 39.03	19.97
Group 4	$ 39.68	19.97

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR:
0 - 15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: Laborers, Wellpoint Installation; Form Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Dirvers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

PLAS0599-002 06/01/2025

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area A	$ 47.22	31.90
Area C	$ 40.06	28.65
Area D	$ 42.28	26.43
Area E	$ 41.16	27.54
Area F	$ 37.33	31.38

AREA DESCRIPTIONS:

AREA A: ASHLAND, BURNETT, BAYFIELD, DOUGLAS, IRON, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA C: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE, MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA D: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA E: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA F: KENOSHA AND RACINE COUNTIES

TEAM0039-001 06/01/2025

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 39.57	28.70
3 or more Axles; Euclids, Dumptor & Articulated, Truck Mechanic	$ 39.72	28.70

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this

contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to

reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

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"General Decision Number: WI20250011 09/12/2025

Superseded General Decision Number: WI20240011

State: Wisconsin

Construction Type: Building

Counties: Adams, Ashland, Barron, Bayfield, Buffalo, Burnett, Clark, Columbia, Crawford, Dodge, Door, Dunn, Florence, Fond Du Lac, Forest, Grant, Green, Green Lake, Iowa, Iron, Jackson, Jefferson, Juneau, Kewaunee, Lafayette, Langlade, Lincoln, Manitowoc, Marinette, Marquette, Menominee, Monroe, Oconto, Oneida, Pepin, Polk, Portage, Price, Richland, Rusk, Sauk, Sawyer, Shawano, Taylor, Trempealeau, Vernon, Vilas, Walworth, Washburn, Waupaca, Waushara and Wood Counties in Wisconsin.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	02/28/2025
2	05/30/2025
3	06/06/2025
4	06/27/2025
5	07/11/2025
6	07/25/2025
7	08/08/2025
8	08/15/2025
9	08/22/2025
10	08/29/2025
11	09/05/2025
12	09/12/2025

ASBE0019-002 06/01/2025

COLUMBIA, CRAWFORD, DODGE, GRANT, GREEN, IOWA, JEFFERSON, JUNEAU, LAFAYETTE, MARQUETTE, MONROE, RICHLAND, SAUK, VERNON, AND WALWORTH COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems. Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 45.88	38.15

ASBE0034-005 06/09/2025

BARRON, BUFFALO, DUNN, PEPIN, AND POLK COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials; protective coatings, coverings, and finishes to all types of mechanical systems. Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 55.34	34.03

ASBE0049-003 05/01/2025

ASHLAND, BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials; protective coverings, coatings, and finishes to all types of mechanical systems. Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 49.17	23.83

ASBE0127-002 06/01/2025

ADAMS, CLARK, DOOR, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, JACKSON, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARINETTE, MENOMINEE, OCONTO, ONEIDA, PORTAGE, PRICE, RUSK, SHAWANO, TAYLOR, TREMPEALEAU, VILAS, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
Heat and Frost Insulator (Includes the application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems; and the application of firestopping material in walls, floors, ceilings. Includes preparation, wetting, stripping, removal, scrapping vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 45.24	30.56

BOIL0107-001 01/01/2025

	Rates	Fringes
BOILERMAKER		
Boilermaker	$ 46.52	34.63

BRWI0001-003 06/01/2025

CRAWFORD,JUNEAU, MONROE,TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
Bricklayer & Tile Setter	$ 40.09	28.10

BRWI0002-003 06/01/2025

ASHLAND, BURNETT, IRON, WASHBURN

	Rates	Fringes
BRICKLAYER		
Bricklayer, Tile Setter	$ 48.60	29.31
Cement Mason/Concrete Finisher	$ 46.01	29.31

BRWI0002-004 06/01/2025

BAYFIELD COUNTY

	Rates	Fringes
BRICKLAYER		
Bricklayer & Tile Setter	$ 48.60	29.31

BRWI0003-001 06/01/2024

DOOR, KEWAUNEE, FLORENCE, FOND DU LAC, GREEN LAKE, MANITOWOC, MARINETTE, MARQUETTE, OCONTO, SHAWANO, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Setter	$ 38.45	27.41

BRWI0004-003 06/01/2025

WALWORTH COUNTY

	Rates	Fringes
BRICKLAYER	$ 44.71	28.90
CEMENT MASON/CONCRETE FINISHER	$ 40.50	28.90
TILE SETTER	$ 39.19	28.90

BRWI0006-001 06/01/2025

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MENOMINEE, ONEIDA, PORTAGE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer,Cement Mason,Tile Setter	$ 39.36	28.83

BRWI0006-004 06/01/2025

PRICE COUNTY

	Rates	Fringes
Bricklayer & Tile Setter	$ 39.36	28.83

BRWI0007-003 06/01/2025

GREEN AND LAFAYETTE COUNTIES

	Rates	Fringes

Bricklayer & Tile Setter.....$ 40.34 29.49

BRWI0013-003 06/01/2025

GRANT, IOWA, AND RICHLAND COUNTIES

	Rates	Fringes
Bricklayer	$ 41.17	28.66
Tile Layer	$ 38.39	29.79

BRWI0019-004 06/01/2025

BARRON, BURNETT (Southern half), DUNN, PEPIN, POLK, RUSK, AND WASHBURN (Southern half) COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 39.50	28.69

BRWI0019-005 06/01/2025

SAWYER COUNTY

	Rates	Fringes
Bricklayer & Tile Setter	$ 39.50	28.69

BRWI0021-001 06/01/2025

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 40.14	29.67

BRWI0034-001 06/01/2025

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 41.17	28.66

CARP0068-013 05/05/2025

BURNETT (West of highway 48) AND POLK(West of Highways 35, 48 & 65) COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical work)	$ 48.54	28.84

CARP0310-007 06/01/2024

ADAMS, BAYFIELD (Eastern 2/3), FOREST, IRON, ONEIDA, PORTAGE, PRICE, SHAWANO (Western Portion of the County), TAYLOR, VILAS, AND WOOD COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 40.44	28.43
Piledriverman	$ 40.44	28.43

CARP0310-008 06/01/2024

ASHLAND COUNTY

	Rates	Fringes
CABINET INSTALLER (Including Drywall Hanging & Acoustical Work)	$ 40.44	28.43

CARP0314-006 06/02/2025

COLUMBIA, DODGE, GRANT, GREEN, IOWA, JEFFERSON, LAFAYETTE, RICHLAND, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
Carpenter (Including Drywall Hanging, Acoustical Work)	$ 42.45	28.78
Piledriverman	$ 44.45	28.78

CARP0361-006 05/05/2025

BAYFIELD COUNTY (West of Hwy 63)

	Rates	Fringes
Carpenters: (Including Drywall Hanging, Acoustical work)	$ 40.79	27.90

CARP0731-006 06/01/2024

FOND DU LAC (Eastern Portion of the County) AND MANITOWOC COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 40.44	28.43
Piledriverman	$ 40.44	28.43

CARP0955-004 06/01/2024

FOND DU LAC (Western Portion of the County), GREEN LAKE, MARQUETTE, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 40.44	28.43

Piledriverman	$ 40.44	28.43

CARP1056-004 06/01/2024

ADAMS, ASHLAND, BARRON, BAYFIELD (Eastern 2/3), BUFFALO, BURNETT, CLARK, COLUMBIA, CRAWFORD, DODGE, DOOR, DUNN, FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, PEPIN, POLK (E. of Hwy. 35, 48 & 65), PORTAGE, PRICE, RICHLAND, RUSK, SAUK, SAWYER, SHAWANO, TAYLOR, TREMPEALEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
MILLWRIGHT	$ 42.00	28.85

CARP1074-009 06/01/2024

BARRON, BURNETT (East of Hwy 48), CLARK, DUNN, POLK (East of Hwy 35, 48, 65), RUSK, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 40.44	28.43
Piledriverman	$ 40.44	28.43

CARP1143-006 06/01/2024

BUFALO, CRAWFORD, JACKSON, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 40.44	28.43
Piledriverman	$ 40.44	28.43

CARP1146-006 06/01/2024

DOOR, FLORENCE (Except area bordering Michigan), KEWAUNEE, MARINETTE (Except N.E. corner), MENOMINEE, OCONTO, AND SHAWANO (Western Portion of the County) COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical Work)	$ 40.44	28.43
Piledriverman	$ 40.44	28.43

CARP1348-006 05/01/2025

BAYFIELD COUNTY (Western 1/3)

	Rates	Fringes
MILLWRIGHT	$ 41.90	29.51

ELEC0014-001 05/25/2025

ASHLAND, BARRON, BAYFIELD, BUFFALO, BURNETT, CHIPPEWA, CLARK (Except Colby, Fremont, Lynn, Maryville, Sherman, Sherwood, Unity), CRAWFORD, DUNN, GRANT, IRON, JACKSON, MONROE, PEPIN, POLK, PRICE, RICHLAND, RUSK, SAWYER, TAYLOR, TREMPEALEAU, VERNON, AND WASHBURN COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 44.29	25.21

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* ELEC0014-005 05/25/2025

	Rates	Fringes
Electricians (Teledata System Installer/Technician)	$ 31.17	20.08

Low voltage construction, installation, maintenance and removal of teledata facilities (voice, data, and video) including outside plant, telephone and data inside wire, interconnect, terminal equipment, central offices, PABX, fiber optic cable and equipment, micro waves, V-SAT, bypass, CATV, WAN (wide area networks), LAN (local area networks), and ISDN (integrated systems digital network).

ELEC0158-007 06/01/2024

DOOR, KEWAUNEE, MANITOWOC (except Schleswig), MARINETTE(Wausuakee and area South thereof), OCONTO, MENOMINEE (East of a ine 6 miles West of the West boundary of Oconto County), SHAWANO (Except Area North of Townships of Aniwa and Hutchins) COUNTIES

	Rates	Fringes
Electricians:	$ 40.25	29.75%+11.17

ELEC0159-001 05/26/2024

COLUMBIA, DODGE (West of Hwy 26 except Chester and Emmet Twps), GREEN LAKE COUNTY (Except Townships of Berlin, Seneca & St. Marie), IOWA, MARQUETTE COUNTY (Except Townships of Neshkoka, Crystal Lake, Newton, and Springfield), AND SAUK COUNTIES

	Rates	Fringes
Electricians:	$ 48.55	25.91

ELEC0219-006 06/01/2019

FLORENCE COUNTY (Townships of Aurora, Commonwealth, Fern, Florence and Homestead) AND MARINETTE COUNTY (Township of Niagara)

	Rates	Fringes
ELECTRICIAN		
Electrical contracts over $180,000	$ 33.94	21.80

Electrical contracts under $180,000.....$ 31.75 21.73

ELEC0388-004 06/01/2024

ADAMS, CLARK (Colby, Freemont, Lynn, Mayville, Sherman, Sherwood, Unity), FOREST, JUNEAU, LANGLADE, LINCOLN, MARINETTE (Beecher, Dunbar, Goodman & Pembine), MENOMINEE (Area West of a line 6 miles West of the West boundary of Oconto County), ONEIDA, PORTAGE, SHAWANO (Aniwa and Hutchins), VILAS AND WOOD COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 40.19	26%+12.45

ELEC0494-010 06/01/2025

DODGE COUNTY (Area East of Hwy 26 including all of Chester Township, but excluding Emmet Township), FOND DU LAC (except Waupun), AND MANITOWOC (Schleswig) COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 45.20	25.27

ELEC0494-014 06/01/2025

DODGE (Area East of Hwy 26 including Chester Twp but excluding Emmet Twp), FOND DU LAC (Except Waupun), AND MANITOWOC (Schleswig) COUNTIES

	Rates	Fringes
Sound & Communications		
Installer	$ 37.13	21.58
Technician	$ 37.13	21.58

Installation, testing, maintenance, operation and servicing of all sound, intercom, telephone interconnect, closed circuit TV systems, radio systems, background music systems, language laboratories, electronic carillion, antenna distribution systems, clock and program systems and low-voltage systems such as visual nurse call, audio/visual nurse call systems, doctors entrance register systems. Includes all wire and cable carrying audio, visual, data, light and radio frequency signals. Includes the installation of conduit, wiremold, or raceways in existing structures that have been occupied for six months or more where required for the protection of the wire or cable, but does not mean a complete conduit or raceway system. work covered does not include the installation of conduit, wiremold or any raceways in any new construction, or the installation of power supply outlets by means of which external electric power is supplied to any of the foregoing equipment or products

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ELEC0577-001 05/26/2024

GREEN LAKE (N. Part including Twps of Berlin, St Marie, and Seneca), MARQUETTE (N. part including Twps of Crystal Lake,

Neshkoro, Newton, and Springfield), WAUPACA, AND WAUSHARA COUNTIES,

	Rates	Fringes
ELECTRICIAN	$ 40.00	22.69

ELEC0890-005 06/01/2024

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, AND WALWORTH COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 43.65	25.95%+12.26

ENGI0139-004 06/02/2025

	Rates	Fringes
OPERATOR: Power Equipment		
(1) Cranes, Tower Cranes with or w/o attachments over 100 tons; Cranes, tower Cranes with boom, leads and or jib length 176 ft or longer	$ 50.53	27.89
(2) Cranes, Tower Cranes with or w/o attachments 100 tons or less; Cranes, Tower Cranes with boom, leads, and or jib lengths 175 ft or less	$ 49.28	27.89
(3) Travelling Crane (bridge type)	$ 45.73	27.89
(4) Hydraulic Crane, 10 tons or less	$ 45.20	27.89
(6) Forklift	$ 41.60	27.89

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

IRON0008-012 06/01/2025

CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMIE, SHAWANO AND WALWORTH (Northeastern part) COUNTIES

	Rates	Fringes
IRONWORKER	$ 44.66	33.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-004 06/01/2025

ADAMS, COLUMBIA, CRAWFORD, DODGE, FLORENCE, FOREST, GRANT,

GREENE (Except S.E. tip), GREEN LAKE, IOWA, JEFFERSON, JUNEAU, LAFAYETTE, LANGLADE, MARATHON, MARQUETTE, MENOMINEE, MONROE, PORTAGE, RICHLAND, SAUK, VERNON, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
IRONWORKER	$ 44.00	32.66

IRON0498-007 06/01/2025

GREEN (S.E. 1/3) AND WALWORTH (Except N.E. part) COUNTIES

	Rates	Fringes
IRONWORKER	$ 48.74	49.65

IRON0512-009 05/01/2025

BARRON, BUFFALO, CLARK, DUNN, JACKSON, PEPIN, POLK, RUSK, TAYLOR AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 46.35	36.86

IRON0512-023 05/01/2025

ASHLAND, BAYFIELD, BURNETT, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 42.89	36.86

LABO0140-003 06/01/2025

BUFFALO, CRAWFORD, GRANT, JACKSON, JUNEAU, MONROE, RICHLAND, TREMPEALEAU (Southern part), AND VERNON COUNTIES

	Rates	Fringes
Laborer, General	$ 37.70	19.97
Laborer: Asbestos/hazardous material remover (Preparation, Removal and Encapsulation of Hazardous Materials from Non-Mechanical Systems)	$ 36.65	19.97

NOTE: Mason Tender $1.00 over general laborer scale; Pipelayer $1.00 over general laborer scale

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LABO0268-005 06/02/2025

AREA 1: BARRON, CLARK (West 1/3), DUNN, PEPIN, POLK, RUSK TAYLOR (West 1/3)

AREA 2: CLARK (East 2/3), LANGLADE, LINCOLN, ONEIDA, PRICE, TAYLOR (East 2/3), VILAS, WOOD

AREA 3: BURNETT, IRON, SAWYER, WASHBURN

	Rates	Fringes
Laborer, General		
Area 1	$ 37.70	19.97
Area 2	$ 37.05	19.97
Area 3	$ 36.35	19.97
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)		
Area 1, 2, and 3	$ 36.65	19.97

NOTE: Mason Tender $1.00 over general laborer. Burnett, Iron, Sawyer & Washburn $.70 over general laborer.

LABO0330-001 06/01/2025

DODGE, DOOR, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, KEWAUNEE, MANITOWOC, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, PORTAGE, SHAWANO, WAUPACA,WAUSHARA

	Rates	Fringes
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)	$ 36.65	19.97
Laborers, General	$ 37.05	19.97

NOTE: Mason Tender $1.00 over general laborer.

LABO0464-005 06/01/2025

ADAMS, COLUMBIA, GREEN, IOWA, JEFFERSON, LAFAYETTE, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
Laborer, General		
Adams County	$ 37.05	19.97
Remaining Area	$ 37.70	19.97
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous Materials from Non-mechanical Systems)		
Adams County	$ 36.65	19.97
Remaining Area	$ 36.65	19.97

LABO0464-008 06/01/2025

	Rates	Fringes

Landscape Laborer.....$ 21.52 18.94

LABO1091-001 05/01/2025

BAYFIELD (West of County Trunk A including the Iron River National Fish Hatchery and Great Lakes Transmission Co., Station 6) COUNTY

	Rates	Fringes
Laborer, General.....	$ 36.04	23.47
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems).....	$ 37.04	23.47

LABO1091-002 05/01/2025

ASHLAND & BAYFIELD (East of County Trunk A exclusive of the Iron River National Fish Hatchery and Great Lakes Transmission Co., Station 6) COUNTIES

	Rates	Fringes
Laborer, General.....	$ 34.59	23.47
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems).....	$ 35.59	23.47

PLAS0599-003 06/01/2025

PEPIN COUNTY

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	$ 37.25	27.84
PLASTERER.....	$ 39.75	25.10

PLAS0599-007 06/01/2025

BUFFALO, CRAWFORD, JACKSON, JUNEAU, MONROE, POLK, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	$ 37.25	27.84
PLASTERER.....	$ 39.75	25.10

PLAS0599-011 06/01/2025

GRANT, GREEN, IOWA, AND LAFAYETTE COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	$ 43.27	25.69
PLASTERER.....	$ 39.89	28.04

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* PLAS0633-046 06/01/2025

BAYFIELD, PRICE, AND SAWYER COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 47.22	31.90
PLASTERER	$ 40.84	25.66

PLUM0011-009 05/06/2024

ASHLAND BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 49.32	27.18

PLUM0075-006 06/01/2025

DODGE (Watertown), GREEN, JEFFERSON, AND LAFAYETTE COUNTIES

	Rates	Fringes
PLUMBER (Including HVAC work)	$ 60.05	27.90

PLUM0075-008 06/01/2025

COLUMBIA, IOWA, MARQUETTE, RICHLAND, AND SAUK COUNTIES

	Rates	Fringes
PLUMBER (Including HVAC work)	$ 60.57	27.34

PLUM0118-003 06/01/2025

WALWORTH COUNTY

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 57.35	29.37

PLUM0400-002 06/01/2025

ADAMS, CALUMET, DODGE (Except Watertown), DOOR, FOND DU LAC, GREEN LAKE, KEWAUNEE, MANITOWOC, MARINETTE (Except Niagara), MENOMINEE, OCONTO, OUTAGAMIE, SHAWANO, WAUPACA, WAUSHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)		
(1) Small buildings (except industrial and power plants) where plumbing or heating is $50,000 or less	$ 50.02	23.29
(2) All other work	$ 53.23	23.40

PLUM0434-004 06/01/2025

BARRON, BUFFALO, CLARK, CRAWFORD, DUNN, FLORENCE, FOREST,

GRANT, JACKSON, JUNEAU, LANGLADE, LINCOLN, MONROE, ONEIDA, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RUSK, TAYLOR, TREMPEALEAU, VERNON, VILAS, AND WOOD COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 50.94	25.98

PLUM0601-006 06/01/2025

DODGE (Watertown), GREEN, JEFFERSON, AND LAFAYETTE COUNTIES

	Rates	Fringes
PIPEFITTER (Including HVAC work)	$ 58.92	31.34

PLUM0601-008 06/01/2025

COLUMBIA, IOWA, MARQUETTE, RICHLAND, AND SAUK COUNTIES

	Rates	Fringes
PIPEFITTER (Including HVAC work)	$ 60.13	30.16

SHEE0010-031 05/01/2025

ASHLAND, BAYFIELD AND IRON COUNTIES

	Rates	Fringes
SHEET METAL WORKER	$ 40.43	29.99

SHEE0010-035 06/05/2023

	Rates	Fringes
SHEET METAL WORKER (HVAC Duct Installation Only)	$ 31.97	20.67

SHEE0018-003 06/01/2025

FOND DU LAC AND MANITOWOC COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 45.07	31.04

SHEE0018-004 06/01/2025

ADAMS, DOOR, FLORENCE, FOREST, GREEN LAKE, KEWAUNEE, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, SHAWANO, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 46.47	31.33

SHEE0018-014 06/01/2025

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 58.03	29.98

SHEE0018-015 09/01/2025

WALWORTH COUNTY

	Rates	Fringes
SHEET METAL WORKER (Including HVAC work)	$ 48.92	38.21

SHEE0018-017 06/01/2025

GREEN AND IOWA COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 48.51	35.86

SHEE0018-022 06/01/2025

BARRON, BUFFALO, BURNETT, CLARK, DUNN, JACKSON, PEPIN, POLK, PRICE, RUSK, SAWYER, TAYLOR, TREMPEALEAU, AND WASHBURN COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 42.00	31.56

SHEE0018-023 06/02/2025

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 51.92	34.78

SHEE0018-024 06/01/2025

CRAWFORD, GRANT, JUNEAU, MONROE, RICHLAND, AND VERNON COUNTIES

	Rates	Fringes
SHEET METAL WORKER (Including HVAC work)	$ 45.63	29.02

SHEE0018-036 05/26/2025

LANGLADE, LINCOLN, ONEIDA, PORTAGE, AND WOOD COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 42.90	32.47

TEAM0346-003 05/01/2025

ASHLAND, BAYFIELD, BURNETT, SAWYER & WASHINGTON COUNTIES

	Rates	Fringes
TRUCK DRIVER		
2 Axle Trucks	$ 35.79	24.13

TEAM0662-002 06/01/2025

ADAMS, BARRON, BUFFALO, CLARK , DOOR, DUNN, JACKSON, JUNEAU, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MENOMINEE, OCONTO, ONEIDA, PEPIN, POLK, PORTAGE, PRICE, RUSK, SHAWANO, TAYLOR, TEMPEALEAU, WAUPACA & WOOD COUNTIES

	Rates	Fringes
TRUCK DRIVER		
2 Axle Trucks	$ 39.57	28.57
3 or more Axles	$ 39.72	28.57

* SUWI2002-001 01/23/2002

	Rates	Fringes
Fence Installers	$ 15.00 **	2.37
GLAZIER	$ 20.21	1.86
Painters:		
Brush & Roller (Excluding Drywall Finishing)	$ 14.64 **	2.55
Spray	$ 13.72 **	2.25
Power Equipment Operator		
Backhoe	$ 17.454 **	7.61
Excavator	$ 17.37 **	7.45
Front End Loader	$ 23.36	4.61
ROOFER	$ 15.52 **	3.21
TRUCK DRIVER (3-Axle)	$ 15.28 **	4.78

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.75) or 13658 ($13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours

they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be

directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

SECTION 00 80 00
FUNDING REQUIREMENTS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. It is anticipated that a variety of Federal, State and Local funds will be utilized for the project. The Contractor shall follow all requirements outlined in the following funding provision sections and elsewhere in the Contract Documents for each type of funding.
   1. DNR Clean Water Fund and/or Safe Drinking Water Section 00 80 01

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS

A. Contractor shall submit American Iron and Steel (AIS) Product Certificates with all pay requests that include AIS products and/or materials. Payment for AIS products and materials will only be approved with a completed AIS Certification.

B. Contractor shall submit certified payrolls reports and supporting documentation weekly through eComply Software. Payment for labor will only be approved when pay application related payrolls are in full compliance.

C. Closeout Procedures, Section 01 77 00, 1.05 Submittals. Note that some submittals are ongoing throughout the project.

PART 2 PRODUCTS AND MATERIALS

2.01 FUNDING REQUIREMENTS

A. Products and materials associated with the funding requirements of the project is considered incidental and no additional payments will be made for satisfying these requirements.

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT

4.01 FUNDING REQUIREMENTS

A. Work associated with the funding requirements of the project is considered incidental and no additional payments will be made for satisfying these requirements.

END OF SECTION

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DNR Safe Drinking Water/Clean Water Fund Provisions
(With American Iron and Steel)
Section 00 80 01

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Contractor Acknowledgement Form
Consolidated Appropriations Act, 2014
Use of American Iron and Steel Provisions ("AIS")

The Contractor acknowledges to and for the benefit of the WISCONSIN DELLS – LAKE DELTON SEWERAGE COMMISSION ("Purchaser") and the State of Wisconsin (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

_____ _____
Contractor Signature Date

_____
Name and Title of Signee (please print)

_____
Contractor Firm Name

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AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
	Obligation:	AIS Product Certification is required to be submitted with Shop Drawings, if possible, and prior to delivery of product on site. Payment will not be made on items unless Engineer has receipt of AIS Product Certification.
	Warning:	Contractor is liable for all non-compliant installed items. Liability includes all necessary work to replace non-compliant item(s).
CONTRACTOR:	**Instructions:**	If "AIS Applicable", check box and enter specification section number(s); If "AIS Non-Applicable", check box and no further action is necessary; If "AIS De-Minimis", indicate primary specification section(s) numbers where applicable or provide comment on items. *NOTE: Only certain small items and fasteners are permissible as de-minimis, and Contractor is responsible/required to keep spreadsheet of all de-minimis items.* If AIS-regulated item is not listed in this spreadsheet, add it to the list. This AIS Product List is not a comprehensive list. *Refer to AIS documents on the EAP website: https://www.epa.gov/cwsrf/american-iron-and-steel-requirement-guidance-and-questions-and-answers*

AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
EXAMPLE										
☑	☐	☐	PCCP (Pre-Stressed Concrete Cylinder Pipe) - Reinforced Precast Concrete	40 23 36						AIS Cert coming prior to installation. Pay Application line #32
☐	☐	☐	Access Hatches - Municipal Castings							
☐	☐	☐	Access Ramps - Construction Materials							
☐	☐	☐	Angles - Construction Materials							
☐	☐	☐	Angles (>3") - Structural Steel							
☐	☐	☐	Ballast Screen - Municipal Castings							
☐	☐	☐	Bar - Construction Materials							
☐	☐	☐	Benches - Municipal Castings							
☐	☐	☐	Bollards - Municipal Castings							
☐	☐	☐	Cable Hanging Systems - Construction Materials							
☐	☐	☐	Casing - Construction Materials							
☐	☐	☐	Cast Bases - Municipal Castings							
☐	☐	☐	Cast Iron Hinged Hatches (square or rectangular) - Municipal Castings							
☐	☐	☐	Cast Iron Products (Other) - Municipal Castings							
☐	☐	☐	Cast Iron Riser Rings - Municipal Castings							
☐	☐	☐	Catch Basin Inlet - Municipal Castings							
☐	☐	☐	Channel (>3") - Structural Steel							
☐	☐	☐	Cleanout/Monument Boxes - Municipal Castings							
☐	☐	☐	Concrete Reinforcing Bar - Construction Materials							
☐	☐	☐	Construction Covers and Frames - Municipal Castings							
☐	☐	☐	Corrugated Steel Pipe							

AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
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AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
☐	☐	☐	Couplings - Fittings							
☐	☐	☐	Cross Ties - Structural Steel							
☐	☐	☐	Curb and Corner Guards - Municipal Castings							
☐	☐	☐	Curb Openings - Municipal Castings							
☐	☐	☐	Decking - Construction Materials							
☐	☐	☐	Detectable Warning Plates - Municipal Castings							
☐	☐	☐	Dome Structures - Construction Materials							
☐	☐	☐	Door Hardware - Construction Materials							
☐	☐	☐	Doors - Construction Materials							
☐	☐	☐	Doors - Overhead							
☐	☐	☐	Downspout Shoes (Boot, Inlet) - Municipal Castings							
☐	☐	☐	Drainage Gates, Frames, Curb Inlets - Municipal Castings							
☐	☐	☐	Ductwork - Construction Materials							
☐	☐	☐	Expansion Joints - Fittings							
☐	☐	☐	Fasteners (nuts and bolts) - Construction Materials							
☐	☐	☐	Fencing and Fence Tubing - Construction Materials							
☐	☐	☐	Fire Escapes - Construction Materials							
☐	☐	☐	Flanges - Construction Materials							
☐	☐	☐	Framing - Construction Materials							
☐	☐	☐	Grating - Construction Materials							
☐	☐	☐	Guardrails - Construction Materials							
☐	☐	☐	H-Piles - Structural Steel							

AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
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AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
☐	☐	☐	Hydrants							
☐	☐	☐	I-Beam shapes - Structural Steel							
☐	☐	☐	Inlets - Municipal Castings							
☐	☐	☐	Joists - Construction Materials							
☐	☐	☐	Junction Boxes - Municipal Castings							
☐	☐	☐	Ladders - Construction Materials							
☐	☐	☐	Lampposts - Municipal Castings							
☐	☐	☐	Lined Fittings							
☐	☐	☐	Lined Pipes							
☐	☐	☐	Manhole Covers							
☐	☐	☐	Manhole Covers, Rings and Frames, Risers - Municipal Castings							
☐	☐	☐	Manhole Risers and Chimneys - Reinforced Precast Concrete							
☐	☐	☐	Manhole Steps - Construction Materials							
☐	☐	☐	Meter Boxes - Municipal Castings							
☐	☐	☐	Other rolled flanged shapes - Structural Steel							
☐	☐	☐	PCCP (Pre-Stressed Concrete Cylinder Pipe) - Reinforced Precast Concrete							
☐	☐	☐	Pipe Clamps and Restraints, Couplings, Joints, Flanges, Saddles, Service Sleeves, Tees							
☐	☐	☐	Pipe Connectors - Fittings							
☐	☐	☐	Railings - Construction Materials							
☐	☐	☐	Reinforced Precast Concrete							
☐	☐	☐	Roofing - Construction Materials							
☐	☐	☐	Service Box - Municipal Castings							

AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
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AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
☐	☐	☐	Sheet Piling - Structural Steel							
☐	☐	☐	Stairs - Construction Materials							
☐	☐	☐	Stationary Screens - Construction Materials							
☐	☐	☐	Steel Hinged Hatches (square or rectangular) - Municipal Castings							
☐	☐	☐	Steel Riser Rings - Municipal Castings							
☐	☐	☐	Surface Drains - Construction Materials							
☐	☐	☐	Tanks							
☐	☐	☐	Tees - Structural Steel							
☐	☐	☐	Tie Plates - Structural Steel							
☐	☐	☐	Trash Receptacles - Municipal Castings							
☐	☐	☐	Tree Grates - Municipal Castings							
☐	☐	☐	Tree Guards - Municipal Castings							
☐	☐	☐	Trench Gates - Municipal Castings							
☐	☐	☐	Trusses - Construction Materials							
☐	☐	☐	Tubing - Construction Materials							
☐	☐	☐	Unlined Fittings							
☐	☐	☐	Unlined Pipes							
☐	☐	☐	Valve Boxes, Covers and Risers - Municipal Castings							
☐	☐	☐	Valves							
☐	☐	☐	Wall Panels - Construction Materials							
☐	☐	☐	Welding Rods - Construction Materials							
☐	☐	☐	Wide-flanged shapes - Structural Steel							

AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
	Obligation:	AIS Product Certification is required to be submitted with Shop Drawings, if possible, and prior to delivery of product on site. Payment will not be made on items unless Engineer has receipt of AIS Product Certification.
	Warning:	Contractor is liable for all non-compliant installed items. Liability includes all necessary work to replace non-compliant item(s).
CONTRACTOR:	**Instructions:**	If "AIS Applicable", check box and enter specification section number(s); If "AIS Non-Applicable", check box and no further action is necessary; If "AIS De-Minimis", indicate primary specification section(s) numbers where applicable or provide comment on items. *NOTE: Only certain small items and fasteners are permissible as de-minimis, and Contractor is responsible/required to keep spreadsheet of all de-minimis items.* If AIS-regulated item is not listed in this spreadsheet, add it to the list. This AIS Product List is not a comprehensive list. *Refer to AIS documents on the EAP website: https://www.epa.gov/cwsrf/american-iron-and-steel-requirement-guidance-and-questions-and-answers*

AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
☐	☐	☐	Wire - Construction Materials							
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AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 20 2014

OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014

FROM: For Andrew D. Sawyers, Director
Office of Wastewater Management (4201M)

Peter C. Grevatt, Director
Office of Ground Water and Drinking Water (4601M)

TO: Water Management Division Directors
Regions I - X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

Implementation

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out

the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

1) What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

5) What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

6) What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

7) What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

8) What if a project has split funding from a non-SRF source?

Many States intend to fund projects with "split" funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A "project" consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger

project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

9) What about refinancing?

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12)

Covered Iron and Steel Products

11) What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

Lined or unlined pipes or fittings;
Manhole Covers;
Municipal Castings (defined in more detail below);
Hydrants;
Tanks;
Flanges;
Pipe clamps and restraints;
Valves;
Structural steel (defined in more detail below);
Reinforced precast concrete; and
Construction materials (defined in more detail below).

12) What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does 'produced in the United States' mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the

material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of 'municipal castings'?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;

Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

20) What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and

data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Compliance

25) How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer,

processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

26) How should a State ensure assistance recipients are complying with the AIS requirement?

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-

888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://www.epa.gov/oig/hotline.htm.

28) How do international trade agreements affect the implementation of the AIS requirements?

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

Reasonably Available Quantity: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process

Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: cwsrfwaiver@epa.gov. For DWSRF waiver requests, please send the application to: dwsrfwaiver@epa.gov.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.gov/grants_funding/aisrequirement.cfm

2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachments

Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General • Waiver request includes the following information: — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor		
Cost Waiver Requests • Waiver request includes the following information: — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		

Appendix 2: HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost Waiver Requests • Does the waiver request include the following information? — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products				
— Relevant excerpts from the bid documents used by the contractors to complete the comparison				
— A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market				
• Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?				
Availability Waiver Requests • Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested? — Supplier information or other documentation indicating availability/delivery date for materials — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials				
• Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers?				
• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information)				
• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include: — Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State — Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States — Correspondence with construction trade associations indicating the non-availability of the materials				
• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?				

Appendix 3: Example Loan Agreement Language

ALL ASSISTANCE AGREEMENT MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN SRF ASSISTANCE AGREEMENTS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE LAW:

Comply with all federal requirements applicable to the Loan (including those imposed by the 2014 Appropriations Act and related SRF Policy Guidelines) which the Participant understands includes, among other, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel Requirement") unless (i) the Participant has requested and obtained a waiver from the Agency pertaining to the Project or (ii) the Finance Authority has otherwise advised the Participant in writing that the American Iron and Steel Requirement is not applicable to the Project.

Comply with all record keeping and reporting requirements under the Clean Water Act/Safe Drinking Water Act, including any reports required by a Federal agency or the Finance Authority such as performance indicators of program deliverables, information on costs and project progress. The Participant understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities and (ii) failure to comply with the Clean Water Act/Safe Drinking Water Act and this Agreement may be a default hereunder that results in a repayment of the Loan in advance of the maturity of the Bonds and/or other remedial actions.

Appendix 4: Sample Construction Contract Language

ALL CONTRACTS MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN ALL CONTRACTS IN PROJECTS THAT USE SRF FUNDS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE OR LOCAL LAW:

The Contractor acknowledges to and for the benefit of the City of _____ ("Purchaser") and the _____ (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

Appendix 5: Sample Certifications

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

American Iron & Steel (AIS) Requirement of the Consolidated Appropriations Act of 2014 (Public Law 113-76) Q&A Part 1: Valves and Hydrants

Q1: Does the AIS requirement of the Consolidated Appropriations Act of 2014 require minor, miscellaneous components within a covered valve or hydrant, such as nuts, bolts and washers, to be made in the U.S.?

A1: The definition of "iron and steel products" that must either be domestically produced or subject to a waiver in order to comply with the AIS requirement of the Consolidated Appropriations Act of 2014 includes valves and hydrants. Unlike many other of the "iron and steel products" that are listed in the definition, valves and hydrants are typically precision mechanical products with multiple fitted, operating parts and connections. Valves and hydrants, unlike most of the other listed products, contain other minor components, such as small washers, nuts, and bolts that are of unknown origin but are added to the valve or hydrant during the manufacturing process. For purposes of the 2014 AIS requirement, EPA considers only the significant iron and steel components of a covered valve or hydrant – the body, bonnet, shoe, stem, and wedge/disc/gate/ball – to be within the definition of "iron and steel products" that must either be made domestically, or otherwise must comply with the AIS requirement. The minor components represent a very small percentage of the iron and steel in the hydrants and valves that are defined as "iron and steel products." These minor components, which EPA has learned through our research are currently difficult to find domestically in sufficient quantity, such as minor nuts, bolts, and washers, are not required to be of U.S. origin.

Q2: Do the actuators/control systems attached to valves have to comply with the AIS requirement, or just the valve itself?

A2: The AIS requirement of the Consolidated Appropriations Act of 2014 includes valves in its definition of "iron and steel products" that recipients must make certain are either domestically made or subject to a waiver in order to comply with the AIS requirement. Actuators and control systems are not included in the definition. Only the valve itself is required to be either domestically produced or subject to a waiver in order to be compliant with the AIS requirement. Absent a waiver, EPA considers valves and hydrants to be domestically produced if the significant iron and steel components of a covered valve or hydrant – the body, bonnet, shoe, stem, and wedge/disc/gate/ball – if made of iron or steel, is produced in the U.S. See Q1 above for a discussion about minor components. The valves and actuators, while often purchased and shipped together, are two unique products that are manufactured separately and typically attached together during the final step of the process. Valves are included in the definition of "iron and steel products" in the AIS requirement. Actuators, whether manual, electric, hydraulic or pneumatic, are not listed as an "iron and steel product" under the AIS requirement of the Consolidated Appropriations Act of 2014, nor are they considered construction materials. Therefore, they do not need to be domestically produced in the U.S. in order to comply with the requirement.

Q3: Are electric powered motor operated valves excluded based on the valve being motorized equipment (i.e. electrical equipment)?

A3: No, electric powered motor operated valves are not excluded based on the valve being motorized equipment. The actuator, a motor that controls the valve, is considered a separate product, which is not

listed as an “iron and steel product” under the AIS requirement of the Consolidated Appropriations Act of 2014, nor is it considered a construction material. Therefore, the actuator does not need to be domestically produced in the U.S. in order to comply with the requirement. See Q2 for further clarification.

Q4: Based on EPA’s AIS guidance dated March 20, 2014, gates are not considered construction materials and therefore do not have to be produced in the U.S. Does that include gate valves?

A4: No, valves are specifically listed in the Consolidated Appropriations Act of 2014 as an “iron and steel product” and therefore, absent a waiver, must be produced in the U.S. to be in compliance with the requirement if they are “primarily” iron and steel. Gates as referenced in the EPA March 20, 2014 guidance refer only to common sluice and slide gates, and not to gate valves.

American Iron & Steel (AIS) Requirement of the Consolidated Appropriations Act of 2014
(Public Law 113-76)

Q&A Part 2

PRODUCT QUESTIONS

1. **Q: Do all fasteners qualify for de minimis exemption?**

   A: No. There is no broad exemption for fasteners from the American Iron and Steel (AIS) requirements. Significant fasteners used in SRF projects are not subject to the de minimis waiver for projects and must comply with the AIS requirements. Significant fasteners include fasteners produced to industry standards (e.g., ASTM standards) and/or project specifications, special ordered or those of high value. When bulk purchase of unknown-origin fasteners that are of incidental use and small value are used on a project, they may fall under the national de minimis waiver for projects. The list of potential items could be varied, such as big-box/hardware-store-variety screws, nails, and staples. The key characteristics of the items that may qualify for the de minimis waiver would be items that are incidental to the project purpose (such as drywall screws) and not significant in value or purpose (such as common nails or brads). See the following: http://water.epa.gov/grants_funding/upload/Deminimis-Waiver-04-15-14.pdf.

   EPA also clarifies that minor components of two listed products – valves and hydrants -- may not need to meet the AIS requirements if the minor components compromise a very small quantity of minor, low-cost fasteners that are of unknown origin. See EPA's questions and answers on the subject at the following: http://water.epa.gov/grants_funding/upload/AIS-QandA-Part-1-Valves-and-Hydrants-final.pdf.

2. **Q: Does PCCP pipe have to be domestically produced?**

   A: Yes. Pre-stressed concrete cylinder pipe (PCCP) or other similar concrete cylinder pipes would be comparable to pre-cast concrete which is specifically listed in the Consolidated Appropriations Act of 2014 as a product subject to the AIS requirement.

3. **Q: If the iron or steel is made from recycled metals will the vendor/supplier have to provide a certification document certifying that the recycled metals are domestically produced?**

   A: No. Recycled source materials used in the production of iron and steel products do not have to come from the U.S. Iron or steel scrap, for instance, are considered raw materials that may come from anywhere. While certification is not required for the raw material, EPA does recommend that additional final processing of iron and steel be certified to have occurred in the U.S.

4. **Q: Do tanks used for filtration systems, if delivered to the construction site separately and then filled with filtration media onsite, have to be domestically produced?**

A: No. Tanks that are specifically designed to be filters, or as parts of a filtration system, do not have to be domestically produced because these parts are no longer simply tanks, even if the filter media has not been installed and will be installed at the project site, as is customary to do for shipping purposes. These parts have only one purpose which is to be housing for filters and cannot be used in another fashion.

5. **Q: Can a recipient use non-domestic flanged pipe?**

   A: No. While the Consolidated Appropriations Act of 2014 does not specifically mention flanged pipe, since it does mention both pipe and flanges, both products would need to be domestically produced. Therefore, flanged pipe would also need to be domestically produced.

6. **Q: Can a recipient use non-domestic couplings, expansion joints, and other similar pipe connectors?**

   A: No. These products would be considered specialty fittings, due to their additional functionality, but still categorized under the larger "fitting" categorization. Fittings are defined as a material that joins pipes together or connects to a pipe (AWWA, The Drinking Water Dictionary, 2000). Therefore, these products must comply with the AIS requirements and be produced domestically.

7. **Q: Can a recipient use non-domestic service saddles and tapping sleeves?**

   A: No. These products are necessary for pipe repair, to tap a water main, or to install a service or house connection. Therefore, they are included under the larger "pipe restraint" category which is a specifically identified product subject to the domestic preference in the Consolidated Appropriations Act of 2014.

8. **Q: The AIS guidance does not appear to cover reused items (i.e., existing pipe fittings, used storage tanks, reusing existing valves). How should reused items be addressed?**

   A: The AIS guidance does not address reuse of items. Reuse of items that would otherwise be covered by AIS is acceptable provided that the item(s) was originally purchased prior to January 17, 2014, the reused item(s) is not substantially altered from original form/function, and any restoration work that may be required does not include the replacement or addition of foreign iron or steel replacement parts. EPA recommends keeping a log of these reused items by including them on the assistance recipient's de minimis list, and stating therein that these items are reused products. The donation of new items (such as a manufacturer waiving cost for certain delivered items because of concerns regarding the origin of a new product) is not, however, considered reuse.

9. **Q: What does "time needed" mean in the AIS guidance, in reference to the definition of "Reasonably Available Quantity"?**

A: For considering whether a product would meet reasonably available quantity, "time needed" is based on the construction schedule. If the item is delayed and there is substantial impact on the overall construction schedule, this would not be according to the "time needed."

10. **Q: If a product is not specifically included on the list of AIS covered products, must it comply with AIS?**

    A: Possibly. The AIS requirements include a list of specifically covered products, one of which is construction materials, a broad category of potential products. For construction materials, EPA's AIS guidance includes a set of example items that it considers construction materials composed primarily of iron and steel and covered by the Act. This example list in the guidance is not an all-inclusive list of potential construction materials. However, the guidance also includes a list of items that EPA specifically does not consider construction materials, generally those of electrical or complex-mechanical nature. If a product is similar to the ones in the non-construction material list (and it is also not specifically listed by the Act), it is not a construction material. For all other items specifically included in the Act, coverage is generally self-evident.

11. **Q: If a listed iron and steel product is used as a part for an assembled product that is non-domestic, do the AIS requirements apply?**

    A: AIS requirements only apply to the final product as delivered to the work site and incorporated into the project. Other assemblies, such as a pumping assembly or a reverse osmosis package plant, are distinct products not listed and do not need to be made in the U.S. or composed of all U.S. parts. Therefore, for the case of a non-covered product used in a larger non-domestic assembly, the components, even if specifically listed in the Consolidated Appropriations Act, do not have to be domestically produced.

12. **Q: Is cast iron excluded from the AIS requirements?**

    A: No. Cast iron products that fall under the definition of iron and steel products must comply with the AIS requirements.

13. **Q: The guidance states that "construction materials" do not include mechanical equipment, but then identifies ductwork as a construction material. Please clarify.**

    A: Ductwork is not mechanical equipment, therefore it is considered a "construction material" and must comply with the AIS requirements.

14. **Q: Do "meters" mentioned in EPA's guidance as non-construction materials include both flow meters and water meters?**

    A: Yes. "Meters" includes any type of meter, including: flow meters, wholesale meters, and water meters/service connections.

15. **Q: Must coiled steel be domestic?**

    A: Yes. Coiled steel is an intermediate product used in the production of steel pipe and must come from a U.S. source or subject to a waiver in order to comply with the AIS requirements.

16. **Q: Are pig iron, direct reduced iron (DRI), and ingot considered raw materials?**

    A: No. These are considered intermediate products used in the production of iron or steel and must come from a U.S. source or subject to a waiver in order to comply with the AIS requirements.

17. **Q: Can assistance recipients rely on a marking that reads, "Made in the USA," as evidence that all processes took place in the U.S.?**

    A: No. This designation is not consistent with our requirements that all manufacturing processes of iron and steel products must take place in the U.S.

18. **Q: When determining what constitutes a product made "primarily" of iron or steel, who makes this determination?**

    A: The manufacturer will show if its product qualifies as primarily made of iron or steel. The recipient should expect the manufacturer to provide documentation/ certification that its product is AIS compliant.

19. **Q: Do aerators need to be produced domestically in order to comply with AIS?**

    A: No. Aerators, similar to pumps, are mechanical equipment that do not need to meet the AIS requirements. "Blowers/aeration equipment, compressors" are listed in EPA's guidance as non-construction materials.

20. **Q: Are Sluice and Slide Gates considered valves?**

    A: No. Valves are products that are generally encased / enclosed with a body, bonnet, and stem. Examples include enclosed butterfly, ball, globe, piston, check, wedge, and gate valves. Furthermore, "gates" (meaning sluice, slide or weir gates) are listed in EPA's guidance as non-construction materials.

AIS PROCESS QUESTIONS

21. **Q: Will notices of waiver applications be published in the federal register?**

    A: No. Applications for waivers will be published on EPA's website (http://water.epa.gov/grants_funding/aisrequirement.cfm**).** EPA will provide 15 days for open public comment, as noted on the website.

22. Q: Will states be collecting the step certification paper trail, as presented in the AIS guidance?

A. No. Assistance recipients must maintain documentation of compliance with AIS. EPA recommends use of the step certification process. This process is a best practice and traces all manufacturing of iron and steel products to the U.S. If the process is used, the state does not have to collect the documentation. The documents must be kept by the assistance recipient and reviewed by the state during project reviews.

23. Q: Why is it considered a best practice for states to conduct site visits, when it is the assistance recipient's responsibility to meet the AIS requirements?

A: It is both the assistance recipient's and the state's responsibility to ensure compliance with the AIS requirements. The state is the recipient of a federal grant and must comply with all grant conditions, including a condition requiring that the AIS requirements be adhered to. Therefore, it is recommended that states conduct site visits of projects during construction and review documentation demonstrating the assistance recipient's proof of compliance.

24. Q: Please further define the state's role in the waiver process.

A: The state's role in the waiver process is to review any waiver requests submitted to the state in order to ensure that all necessary information has been provided by the assistance recipient prior to forwarding the request to EPA. If a state finds the request lacking, the state should work with the assistance recipient to help obtain complete information.

25. Q: How much time does EPA have to evaluate the waiver during the evaluation step?

A: At a minimum, EPA is required to provide 15 days for open public comment. There is no specific deadline or time limit for EPA to review waiver requests. Each waiver request will come with its own specific details and circumstances and may require a different amount of time for review and analysis. For example, public interest waivers in general may take longer to review than availability waivers which are typically more straightforward. However, EPA understands that construction may be delayed while waiting for a waiver and will make every effort to review and issue decisions on waiver requests in a timely manner.

PROJECT QUESTIONS

26. Q: What if a project is funded by another funding entity (i.e., United States Department of Agriculture – Rural Development) where AIS is not required and begins construction after January 17, 2014 but then applies to the SRF to refinance the project? Are they ineligible?

A: The project is not ineligible. AIS requirements will apply to any construction that occurs after the assistance agreement is signed, through the end of construction. If construction is complete, there is no retroactive application of the AIS requirements.

27. **Q: If the assistance recipient can demonstrate through market research that the AIS requirement will exceed the 25 percent cost threshold, is the entire project exempt from the AIS requirement?**

    A: If the waiver application shows that the inclusion of American iron and steel products causes the entire cost of the project to increase by more the 25 percent, a waiver may be granted for the entirety of the project.

28. **Q: Can the recipient use non-SRF funds to pay for the non-compliant item.**

    A: No. It is not an acceptable to use non-SRF funds to pay for a non-compliant item. The Consolidated Appropriations Act of 2014 requires that all iron and steel products, no matter the source of funding, must be made in the U.S. if SRF funds are used in the project.

29. **Q: What constitutes "satisfactory quality" as defined in the AIS guidance, in reference to the availability waiver process.**

    A: "Satisfactory quality" means the product meets the project design specifications. A waiver may be granted if a recipient determines that the project plans and design would be compromised because there are no American made products available that meet the project design specifications.

30. **Q: The guidance states that the AIS requirement applies to any project "funded in whole or in part" by an SRF. Where is this in the Act?**

    A: The Act states that, "None of the funds made available by a … [State SRF program] … shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States." This sentence clearly states that no SRF program may use its funds for a project unless all of the iron and steel products used in the project are made in the U.S. This is true even if only $1 of SRF funding is used in the project.

31. **Q: There is always an expectation on the part of an assistance recipient that the construction phase of a planning and/or design only loan will be funded through the SRF. If the original planning and/or design only loan was executed prior to a January 17, 2014, does this mean the entire project will be exempt from the AIS requirement?**

    A: If the original loan includes construction, and was executed prior to January 17, 2014, then the AIS provision does not apply to the project. If the original loan was only for planning and/or design, then a written commitment or documented "expectation" is needed to show exemption from the

requirements. Appearance on a priority list in an Intended Use Plan along with written reasonable assurance from the state that the recipient will receive SRF funding for project construction could provide sufficient evidence of "expectation of funding".

32. **Q: What if there has been a change order or redesign requiring new plans and specifications to be approved and they were approved after January 17, 2014: does the project now have to comply with AIS?**

    A: In most cases, no. Change orders are typically small enough changes that the original plan and specification date will still hold true. For example, if a pipe alignment has to be changed for a block or two due to unforeseen conditions, but new plans and specifications had to be submitted for this section of the project, then that could be considered a minor change. However, if there has been a major redesign, perhaps the whole project had to be redesigned starting from scratch, then the new plans and specification approval date would apply.

33. **Q: What if the bids on a project with plans and specifications approved before January 17, 2014 but the loan is signed after January 17, 2014 come in low, and there is significant funding remaining in the loan agreement, so the community designs a second project with the remaining funds: does that project have to comply with the AIS requirements?**

    A: If the second project is closely related in purpose, place and time to the first project, then the second project would be exempt from the AIS requirements. It is the assistance recipient's responsibility (with state oversight) to show that a project is closely related, or not, in purpose, place and time.

34. **Q: What if the assistance agreement was signed after January 17, 2014, state approval of plans for the first phase of the project was in place prior to January 17, 2014, but state approval of the plans for the second phase of the project was received after January 17, 2014?**

    A: In such a case, the AIS provision would not apply to the first phase of the project. If the second phase of the project is considered the same project as the first phase, due to its close relation in purpose, place and time, the entire project may be exempt. It is the assistance recipient's responsibility (with state oversight) to show that phases of a project is closely related, or not, in purpose, place and time.

35. **Q: Do products purchased through procurement-only contracts have to be comply with AIS?**

    A: Yes. For projects funded by SRF, the products procured under any form of contract must comply with AIS. A procurement-only contract generally involves the bulk purchase of common items (such as pipe, concrete, and/or pumps) of independent timing from a set of planned projects. If products which are purchased through a procurement-only contract are being installed under another contract, the procurement-only contract would probably not be considered a separate project in purpose, place and time; and therefore, would have to comply with the AIS requirements.

March 2015

American Iron & Steel Requirement for the Clean Water and Drinking Water State Revolving Funds

Q&A Part 3

*For CWSRF and DWSRF: On **January 17, 2014**, Public Law 113-76, the "Consolidated Appropriations Act, 2014," was enacted and included an American Iron and Steel requirement for the Clean Water and Drinking Water State Revolving Fund programs through the end of fiscal year 2014. Since then, the AIS requirement has continued for both programs, but through different statutes, with a few changes as described in the questions and answers provided below.*

*For CWSRF: On **June 10, 2014**, the Water Resources Reform and Development Act amended the Clean Water Act to include permanent requirements for the use of AIS products in CWSRF assistance agreements. Section 608 of the CWA now contains requirements for AIS that repeat those of the Consolidated Appropriations Act, 2014. All CWSRF assistance agreements must comply with Section 608 of the CWA for implementation of the permanent AIS requirement.*

*For DWSRF: On **December 16, 2014**, the President signed Public Law 113- 235, the "Consolidated and Further Continuing Appropriations Act, 2015," which provides fiscal year 2015 full-year appropriations through September 30, 2015. This law continues the requirement for the use of AIS products in DWSRF assistance agreements through September 30, 2015.*

CWSRF PROGRAM

1. **Q: The Water Resources Reform and Development Act amended the Clean Water Act to include permanent requirements for the use of AIS for CWSRF funded assistance agreements. Does the CWA include an exemption for plans and specifications approved prior to the enactment of the legislation similar to the exemption included in the Consolidated Appropriations Act (CAA) 2014?**

   A: Yes. The WRRDA amendment to the CWA, which included AIS requirements, included a similar exemption as the CAA 2014. For any CWSRF assistance agreement signed on or after October 1, 2014, if the plans and specifications were approved prior to June 10, 2014 (the enactment of WRRDA), then the project is exempt from AIS requirements. For assistance agreements signed prior to October 1, 2014, the previous dates in the CAA 2014 apply (see March 20, 2014, AIS guidance document).

   If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of this exemption in Section 608 (f).

   The following table summarizes AIS exemptions based on the plans and specifications approval date for CWSRF funded projects.

CWSRF AIS Project Exemption Based on Plans and Specifications Approval Date		
Assistance Agreement Signed:	Exempt from AIS if Plans and Specifications Were Approved Before:	Basis for Exemption:
1/17/2014 through 9/30/2014	4/15/2014	• Consolidated Appropriations Act 2014 • National waiver signed 4/15/2014*
On or after 10/1/2014	6/10/2014	• Clean Water Act Section 608

** To be covered by the national waiver, the plans and specifications had to be submitted to the state prior to 1/17/2014*

2. **Q: Does the AIS requirement apply to refinanced CWSRF projects?**

   A: Yes, in some cases. If a project began construction, financed from a non-CWSRF source prior to June 10, 2014, but is refinanced through a CWSRF assistance agreement executed on or after October 1, 2014, AIS requirements will apply to all construction that occurs on or after June 10, 2014, through completion of construction, unless engineering plans and specifications were approved by the responsible state agency prior to June 10, 2014. For CWSRF projects funded on or after October 1, 2014, there is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to June 10, 2014.

DWSRF PROGRAM

3. **Q: The Consolidated and Further Continuing Appropriations Act 2015 continues the AIS requirements for DWSRF funded assistance agreements. Does the Act include an exemption for plans and specifications approved prior to the enactment of the legislation, similar to the exemption included in the Consolidated Appropriations Act (CAA) 2014?**

   A: Yes. The Consolidated and Further Continuing Appropriations Act 2015 includes a similar exemption as the CAA 2014. For any assistance agreement signed on or after December 16, 2014 (the enactment of the Act), if the plans and specifications were approved prior to December 16, 2014, then the project is exempt from the AIS requirements. For assistance agreements signed prior to December 16, 2014, the previous dates in the CAA 2014 apply (see March 20, 2014 AIS guidance document).

   If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of the exemption in Section 424(f).

4. **Q: Do DWSRF assistance agreements signed during the time period between September 30, 2014, and December 16, 2014, still have to comply with the AIS requirements?**

A: Yes. The Continuing Appropriations Resolution 2015 was signed on September 19, 2014, which extended funding for the DWSRF with the same conditions that were made applicable by the language in the Fiscal Year 2014 appropriations, including the requirement for the use of American Iron and Steel products in projects receiving financial assistance from the DWSRF. Therefore, all assistance agreements starting October 1, 2014, through the enactment of the Consolidated and Further Continuing Appropriations Act 2015 (signed December 16, 2014), must include the AIS requirements. However, if the plans and specifications for any of these projects were approved prior to April 15, 2014 (the date the national waiver was signed), then the project is exempt from the AIS requirements.

The following table summarizes AIS exemptions based on the plans and specifications approval date for DWSRF funded projects.

DWSRF AIS Project Exemption Based on Plans and Specifications Approval Date		
Assistance Agreement Signed:	Exempt from AIS if Plans and Specifications Were Approved Before:	Basis for Exemption:
1/17/2014 through 9/30/2014	4/15/2014	• Consolidated Appropriations Act 2014 • National waiver signed 4/15/2014*
10/1/2014 through 12/15/2014	4/15/2014	• Continuing Appropriations Resolution 2015 (continued CAA 2014 requirements)** • National waiver signed 4/15/2014*
12/16/2014 through 9/30/2015	12/16/2014	• Consolidated and Further Continuing Appropriations Act 2015

** To be covered by the national waiver, the plans and specifications had to be submitted to the state prior to 1/17/2014*

*** Following the first continuing resolution, there were two additional CRs to fill the gap between 12/11/2014 and 12/16/2014*

5. **Q: Does the AIS requirement apply to refinanced DWSRF projects?**

A: Yes, in some cases. If a project began construction, financed from a non-DWSRF source prior to December 16, 2014, but is refinanced through a DWSRF assistance agreement executed on or after December 16, 2014, AIS requirements will apply to all construction that occurs on or after December 16, 2014, through completion of construction, unless engineering plans and

specifications were approved by the responsible state agency prior to December 16, 2014. For DWSRF projects funded on or after December 16, 2014, there is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to December 16, 2014.

BOTH CWSRF AND DWSRF PROGRAMS

6. **Q: If a coating is applied to the external surface of a domestic iron or steel component, and the application takes place outside of the United States, would the product be compliant under the AIS requirements?**

   A: Yes. The product would still be considered a compliant product under AIS requirements. Any coating processes that are applied to the external surface of iron and steel components that would otherwise be AIS compliant would not disqualify the product from meeting the AIS requirements regardless of where the coating processes occur, provided that final assembly of the product occurs in the United States.

   The exemption above only applies to coatings on the *external surface* of iron and steel components. It does not apply to coatings or linings on internal surfaces of iron and steel products, such as the lining of lined pipes. All manufacturing processes for lined pipes, including the application of pipe lining, must occur in the United States for the product to be compliant with AIS requirements.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: De Minimis Waiver of Section 436 of P.L. 113-76, Consolidated Appropriations Act (CAA), 2014

FROM: Nancy K. Stoner
Acting Assistant Administrator

The EPA is hereby granting a nationwide waiver pursuant to the "American Iron and Steel (AIS)" requirements of P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), section 436 under the authority of Section 436(b)(1) (public interest waiver) for de minimis incidental components of eligible water infrastructure projects. This action permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the materials used in and incorporated into a project.

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel" (AIS) requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Fiscal Year 2014, unless the agency determines it necessary to waive this requirement based on findings set forth in Section 436(b). The Act states, "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency…finds that— (1) applying subsection (a) would be inconsistent with the public interest" 436(b)(1).

In implementing section 436 of the Act, the EPA must ensure that the section's requirements are applied consistent with congressional intent in adopting this section and in the broader context of the purposes, objectives, and other provisions applicable to projects funded under the SRF. Water infrastructure projects typically contain a relatively small number of high-cost components incorporated into the project. In bid solicitations for a project, these high-cost components are generally described in detail via project specific technical specifications. For these major components, utility owners and their contractors are generally familiar with the conditions of availability, the potential alternatives for each detailed specification, the approximate cost, and the country of manufacture of the available components.

Every water infrastructure project also involves the use of thousands of miscellaneous, generally low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. For many of these incidental components, the country of manufacture and the availability of alternatives is not always readily or reasonably identifiable prior to procurement in the normal course of business; for other incidental components, the country of manufacture may be known but the miscellaneous character in conjunction with the low cost, individually and (in total) as typically procured in bulk, mark them as properly incidental. Examples of incidental components could include small washers, screws, fasteners (i.e., nuts and bolts), miscellaneous wire, corner bead, ancillary tube, etc. Examples of items that are clearly not incidental include significant process fittings (i.e., tees, elbows, flanges, and brackets), distribution system fittings and valves, force main valves, pipes for sewer collection and/or water distribution, treatment and storage tanks, large structural support structures, etc.

The EPA undertook multiple inquiries to identify the approximate scope of de minimis incidental components within water infrastructure projects during the implementation of the American Reinvestment and Recovery Act (ARRA) and its requirements (Buy American provisions, specifically). The inquiries and research conducted in 2009 applies suitably for the case today. In 2009, the EPA consulted informally with many major associations representing equipment manufacturers and suppliers, construction contractors, consulting engineers, and water and wastewater utilities, and performed targeted interviews with several well-established water infrastructure contractors and firms who work in a variety of project sizes, and regional and demographic settings to ask the following questions:

- What percentage of total project costs were consumables or incidental costs?

- What percentage of materials costs were consumables or incidental costs?

- Did these percentages vary by type of project (drinking water vs. wastewater treatment plant vs. pipe)?

The responses were consistent across the variety of settings and project types, and indicated that the percentage of total costs for drinking water or wastewater infrastructure projects represented by these incidental components is generally not in excess of 5 percent of the total cost of the materials used in and incorporated into a project. In drafting this waiver, the EPA has considered the de minimis proportion of project costs generally represented by each individual type of these incidental components within the many types of such components comprising those percentages, the fact that these types of incidental components are obtained by contractors in many different ways from many different sources, and the disproportionate cost and delay that would be imposed on projects if the EPA did not issue this waiver.

Assistance recipients who wish to use this waiver should in consultation with their contractors determine the items to be covered by this waiver and must retain relevant documentation (i.e., invoices) as to those items in their project files.

If you have any questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at connor.timothy@epa.gov or (202) 566-1059 or Kirsten Anderer, Environmental Engineer, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Issued on: APR 15 2014

Approved by: _____

Nancy K. Stoner
Acting Assistant Administrator

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: Plans and Specifications Waiver of Section 436 of P.L. 113-76, Consolidated Appropriations Act (CAA), 2014

FROM: Nancy K. Stoner
Acting Assistant Administrator

The EPA is hereby granting a nationwide waiver of the American Iron and Steel requirement pursuant to Section 436(b)(1) (public interest waiver), of the Consolidated Appropriations Act (CAA), 2014, for eligible projects that had engineering plans and specifications submitted to an appropriate state agency prior to and including January 17, 2014, the date of enactment of the CAA, and approved between and including January 17, 2014, and the date of this waiver, where the state agency that approved such plans and specifications did so under the normal course of business for that agency. This action permits the use of non-domestic iron and steel products in such projects funded by a Clean or Drinking Water State Revolving Fund that may otherwise be prohibited under section 436.

If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of this national waiver.

The basis for the nationwide waiver is that due to the uncertainty about whether an American Iron and Steel requirement would be included in this year's appropriation, potential assistance recipients did not have the opportunity to plan for a possible American Iron and Steel requirement. Until detailed guidance was issued, potential assistance recipients were unable to solicit bids from construction firms with appropriate definitions of key terms contained in the CAA language. Additionally, projects that submitted engineering plans and specifications prior to and including January 17, 2014, without knowledge of the American Iron and Steel requirement, and with the anticipation that such plans would be quickly approved, but such approval did not occur until on or after January 17, 2014, would be required to redesign elements of the project, investigate potential domestic products, revise engineering drawings and bid specifications, and resubmit such plans and specifications for approval, thereby delaying the initiation of construction substantially. Those projects which do not require approved plans and specifications, but were bid prior to the guidance being issued, also could be required to rebid the project or submit change orders to comply with the new requirements, which would also delay initiation of construction.

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The imposition of CAA's American Iron and Steel requirement on projects eligible for SRF assistance whose assistance applicants had submitted complete engineering plans and specifications prior to and including January 17, 2014, the date on which those requirements were imposed, and had such plans and specifications approved prior to and including the date on which this waiver is signed, would require the time-consuming and expensive redesign of those projects. Specifically, those projects that can show a reasonable basis for the submission of plans and specification prior to the passage of the CAA would be harmed by the imposition of these requirements post submission. This imposition would conflict with both EPA's, as well as the states', interest in providing funding to eligible recipients in an expeditious and efficient manner, as required by the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA). Project delays would increase the time necessary to comply with CWA and SDWA requirements and adversely impact the protection of public health and the environment.

CAA Section 436(b) (1) authorized the Administrator to waive the requirements of Section 436(a) in any case or category of cases in which she finds that applying subsection (a) would be inconsistent with the public interest. Therefore, for the foregoing reasons, imposing American Iron and Steel requirements on projects that submitted engineering plans and specifications to an appropriate state agency for approval, or the bid advertisement date for a project that does not require approved engineering plans and specifications, prior to and including January 17, 2014, and approved between and including January 17, 2014, through the date on which this waiver was signed, is not in the public interest.

If you have any questions concerning the contents of this memorandum, please contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kirsten Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Issued on: APR 15 2014

Approved by:

Nancy K. Stoner
Acting Assistant Administrator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 18 2015

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: National Product Waiver for Pig Iron and Direct Reduced Iron for State Revolving Fund Projects

FROM: Kenneth J. Kopocis
Deputy Assistant Administrator

The U.S. Environmental Protection Agency is hereby granting a national product waiver pursuant to the "American Iron and Steel" provisions of the Clean Water Act and Public Law 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," for certain intermediate goods used in the manufacture of iron and steel products.[1] This waiver permits the use of pig iron and direct reduced iron manufactured outside of the United States in domestic manufacturing processes for iron and steel products used in projects funded by a Clean Water or Drinking Water State Revolving Fund that may otherwise be prohibited absent this waiver. The waiver is retroactive and thus also applies to the use of non-domestic pig iron and direct reduced iron before the signature date.

Background: Pig iron and direct reduced iron are intermediate products of iron and steel manufacturing used as material feed sources in iron and steel foundries and steel mills. Pig iron is a product of iron ore smelting in a blast furnace. It is made from molten iron, which has been cast in the shape of "pigs" as it comes from the blast furnace. Direct reduced iron ore is produced from iron ore, pellets or fines, which are reduced in a solid state using natural gas. Hot briquetted iron, or HBI, is a compacted form of direct reduced iron with enhanced physical characteristics for shipment and storage.

Coverage: This waiver permits the use of iron and steel products that were manufactured using non-domestic pig iron and direct reduced iron in projects that receive funds from either the CWSRF or DWSRF. Any project that received or will receive funds from the CWSRF or DWSRF beginning with the enactment of P.L. 113-76, the "Consolidated Appropriations Act, 2014," may use this waiver for iron and steel that use these intermediate goods.

Rationale: The AIS provisions require CWSRF and DWSRF assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded

[1]Absent a waiver, all treatment works and drinking water facilities that are constructed, in whole or in part, with funds from the CWSRF or the DWSRF, must use American made iron and steel. EPA is allowed under certain circumstances to provide waivers of this requirement.

through an SRF assistance agreement unless the Agency determines that it is necessary to waive this requirement. EPA has authority to issue waivers in accordance with Section 608(c)(2) of the Clean Water Act and the AIS provisions extended by P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2). The provision states in part: "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency…finds that – iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality."

Product manufacturers and suppliers informed EPA of concerns about the sufficient availability of domestically produced pig iron and direct reduced iron. The iron and steel products produced at steel mills and foundries that use non-domestic intermediate goods are not compliant with the AIS requirements. AIS compliant products used at water and wastewater projects could be in extremely short supply should a waiver of the intermediate goods not be available.

EPA conducted extensive market research on the supply of pig iron and direct reduced iron and found that domestic supplies of these goods sold on the open market are generally not available. There are three major types of facilities that manufacture iron and steel finished products: basic oxygen furnace steel mills (BOF), electric arc furnace steel mills (EAF) and foundries. BOF steel mills undertake both iron making and steel making, as molten iron from the blast furnace is the required feedstock for BOF steel production. EAF steel mills and foundries, on the other hand, use iron and steel scrap as their principal feedstock, which must be supplemented with the use of pig iron and/or direct reduced iron in their manufacturing processes to achieve required steel qualities.

EPA market research has shown that BOF steel mills are able to produce adequate amounts of pig iron to meet their own demands, but these mills use the bulk of this production for their own processes and do not sell pig iron on the open market in sufficient quantities. At this time, there is only one producer of direct reduced iron operating in the U.S. and the company uses the output internally for EAF steel production. Therefore, EAF steel mills and foundries must import pig iron and direct reduced iron to meet their iron needs.

At least 60 percent of the nation's steel production comes from the EAF steel mills that use non-domestic pig iron and direct reduced iron in their manufacturing processes. Consequently, the majority of steel used in water and wastewater projects would not be compliant with the AIS requirements absent this waiver. Similarly, most, if not all, of the iron foundries in the United States use non-domestic pig iron and direct reduced iron to produce cast and ductile iron products used by water and wastewater projects. Therefore, the majority of iron used in water and wastewater projects would not be compliant with the AIS requirements absent this waiver. Hence, EPA is hereby providing a nationwide waiver pursuant to AIS requirements to cover the non-domestic intermediate iron goods used in the manufacture of iron and/or steel components and products for water and wastewater projects.

Public Comments: EPA requested comments on the draft national waiver and a majority of the comments received were supportive of a national waiver. The commenters in support of the waiver agreed with the Agency's conclusion that pig iron and direct reduced iron are not

produced in the United States in sufficient and reasonably available quantities to meet the needs of many domestic foundries and steel mills. These commenters believe that the waiver will ensure that pig iron and direct reduced iron are treated similarly to raw material inputs in iron and steel manufacturing and by doing so the EPA will preserve the viability of the AIS requirement. These commenters also state that the waiver would treat pig iron and direct reduced iron in a manner consistent with the implementation of other similar federal laws such as the Federal Highway Administration's Buy America requirement. The FHWA issued a similar nationwide waiver of the Buy America requirements in 1995 for pig iron and processed, pelletized and reduced iron ore.

A few commenters challenged the Agency's issuance of a nationwide waiver of the AIS requirements for pig iron and direct reduced iron. These commenters disagreed with the Agency's interpretation of the AIS requirements and stated that raw materials used in iron and steel production must also be produced in the United States. In addition, the commenters questioned whether the Agency could exempt iron and steel products that are composed of non-domestic materials.

The statutory language lists the categories of products that are considered "iron and steel products." The statutory requirements include provisions that allow the EPA to issue waivers under defined conditions, including the case where iron and steel products are not produced in the United States in sufficient and reasonably available quantities. The Agency's market research, supported by comments from manufacturers, has shown that pig iron and direct reduced iron are not produced in the United States in sufficient and reasonably available quantities. Therefore the Agency is authorized to issue a waiver for iron and steel products composed of non-domestic pig iron and direct reduced iron.

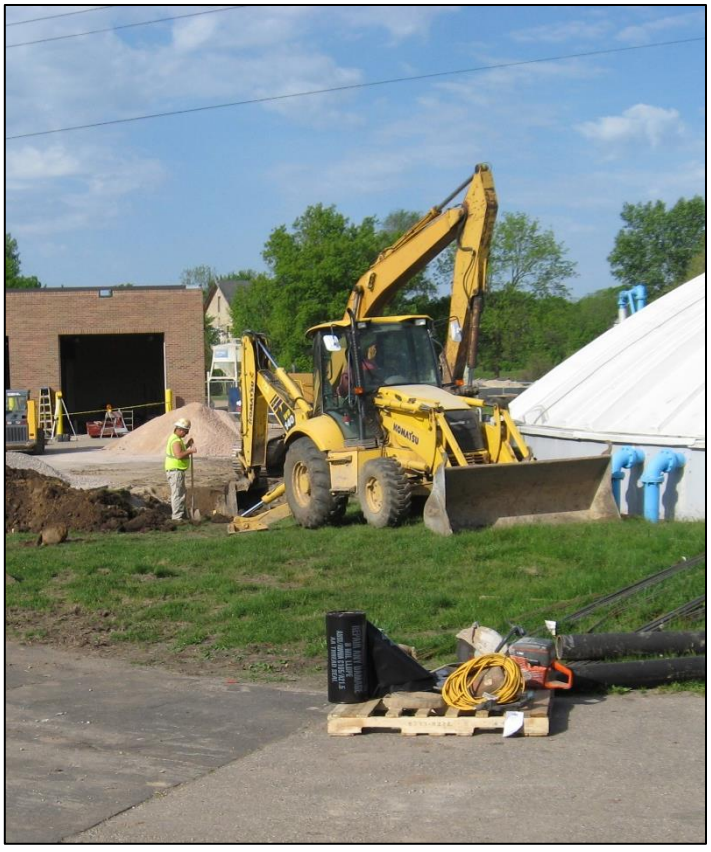
Legal Authority: Legal authority for the AIS requirements for CWSRF projects is included under Sec. 608(c)(2) of the Clean Water Act and previously under P.L. 113-76, the "Consolidated Appropriations Act, 2014," under the authority of Section 436(b)(2). Legal authority for the AIS requirements for DWSRF projects is included under P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2) and also previously under P.L. 113-76. This waiver will continue in force for DWSRF projects under any continuing resolutions or statutes that use similar language as in Section 424 of the "Consolidated and Further Continuing Appropriations Act, 2015."

If you have questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at connor.timothy@epa.gov or (202) 566-1059 or Kiri Anderer, Environmental Engineer, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

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Contract Packet for Disadvantaged Business Enterprise Compliance

This packet contains important information and required forms for compliance with the U.S. Environmental Protection Agency's Disadvantaged Business Enterprise (DBE) requirements, which are contained in 40 CFR Part 33, and ss. NR 162.09(4) and NR 166.12(4), Wis. Adm. Code. Information is also available on the Environmental Loans website at dnr.wi.gov/aid/documents/EIF/guide/DBE.html.



Acronyms
CWFP: Clean Water Fund Program
DBE: Disadvantaged Business Enterprise
EPA: Environmental Protection Agency
MBE: Minority Business Enterprise
SDWLP: Safe Drinking Water Loan Program
WBE: Women Business Enterprise

Program implementation details are outlined in chs. NR 162 and NR 166, Wis. Adm. Code. Legal notice: This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in federal regulations or state statutes or administrative rules are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing federal regulations and state statutes and administrative rules to the relevant facts. The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services, and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of Interior, Washington, D.C. 20240. This publication is offered in other formats upon request, call 608-267-9481.

WISCONSIN DEPT. OF NATURAL RESOURCES

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WHICH DBE REQUIREMENTS APPLY TO YOUR PROJECT?

Throughout this Packet:
- **items in red text apply to ALL municipalities and projects**
- **items in blue text apply to each project designated as Federal Equivalency***

Specific DBE Requirement	CWFP and SDWLP Non-Federal Equivalency Projects	CWFP and SDWLP Federal Equivalency w/ Project Cost *@ or Below* $250,000	CWFP and SDWLP Federal Equivalency w/ Project Cost *Over* $250,000
Solicit for DBEs	X	X	X
Submit Good Faith Certification Form	X	X	X
Establish and Keep a Bidders List			X
Include Extra Conditions in Contracts		X	X
Meet Contract Administration Requirements		X	X

***The department must designate some projects as Federal Equivalency projects each year, see dnr.wi.gov/aid/federalEquivalency. Any recipient whose project is Federal Equivalency must meet ALL of the requirements summarized in the table above.

THE SIX GOOD FAITH EFFORTS

All CWFP and SDWLP financial assistance recipients must comply with the Six Good Faith Effort requirements.

What is the purpose of the Six Good Faith Efforts?

The Six Good Faith Efforts are required for financial assistance agreement recipients to ensure that all DBEs have the opportunity to compete for procurements funded by EPA financial assistance, and to ensure nondiscrimination in the award of contracts resulting from those procurements.

What are the Six Good Faith Efforts?

In order to demonstrate a good faith effort, the recipient must, at a minimum, fulfill the following six affirmative steps:

1. Include qualified DBEs on solicitation lists.

2. Assure that potential DBEs are solicited whenever they are potential sources.

3. Divide scope of work (total requirements), when economically feasible, into smaller tasks or quantities to permit maximum participation of DBEs.

4. Establish delivery schedules (for projects where the requirements of the work allow) that will encourage participation by DBEs.

5. Use the services and assistance of the following, as appropriate:
   - Small Business Administration
   - Minority Business Development Agency
   - U.S. Department of Commerce
   - See list of Unified Certification Programs (UCPs) in Wisconsin and bordering states that certify DBEs and provide similar services and assistance at dnr.wi.gov/aid/documents/EIF/guide/MBElist.html

6. If the prime contractor awards contracts/procurements, require the prime contractor to take the affirmative steps 1-5 above.

How can recipients comply with the DBE solicitation requirements of ss. NR 162.09(4) and NR 166.12(4), Wis. Adm. Code?

All municipalities and prime contractors must make good faith efforts to solicit DBEs whenever required to bid construction work, equipment, raw materials, or supplies for a project according to state procurement laws. DBEs include, but are not limited to, MBEs and WBEs.

Municipalities and prime contractors when applicable, must do ***at least one*** of 1., 2., or 3.:

1. ***Include language* in bid advertisements** that encourages DBEs to submit bid proposals. If contracts are advertised separately, each advertisement should include the DBE language.

   - ***MUNICIPALITIES:*** To make a good faith effort when hiring prime contractors, the municipality should add a statement to its advertisements for prime contractors such as "We encourage DBEs, including MBEs and WBEs, to submit bid proposals." The advertisements must appear at least in the official newspaper of public record for the municipality. ***The municipality must then submit a copy of the advertisement and an affidavit of publishing to the DNR along with other bid documents.***

- ***PRIME CONTRACTORS:*** To make a good faith effort when subcontracting, a contractor can advertise for subcontractors with an ad that includes a statement like "DBEs, including MBEs and WBEs, are encouraged to submit proposals." If just one advertisement is published for all areas of work that may be subcontracted, it should indicate those types of work that could be subcontracted. The advertisement(s) must appear in an industry trade publication and/or the official newspaper of public record for the municipality. ***The prime contractor should supply a copy of the advertisement to the consulting engineer or the municipality so they can submit it to the DNR along with other bid documents.***

2. ***Contact DBEs*** **on a Unified Certification Program (UCP) List** to solicit bids from these firms (e.g., firms registered in the WisDOT UCP, wisconsindot.gov/Pages/doing-bus/civil-rights/dbe/certified-firms.aspx). Individuals that make the contacts should document all the contacts, preferably using Form 8700-294a, the DBE Contacts Worksheet.

   The UCP lists are the main sources of certified DBEs for the CWFP and SDWLP (see dnr.wi.gov/aid/documents/EIF/guide/MBElist.html), but there are other sources available. Any certification must meet the same requirements as those used for UCP-listed businesses.

3. ***Utilize DBEs*** **registered with the UCP** (e.g., WisDOT UCP, wisconsindot.gov/Pages/doing-bus/civil-rights/dbe/certified-firms.aspx). If DBEs are utilized, municipalities must report the expected utilization on Form 8700-294 or Form 8700-294a depending on the solicitation method. ***Municipalities must then submit those forms to DNR along with other bidding documents prior to loan closing.*** When closing out the loan, municipalities will also have to report on the actual details of DBE utilization, so please maintain proper documentation.

When Solicitation Requirements Are Not Met

If none of the above options are used by the municipality and the construction contractor(s) to meet DBE solicitation requirements for a project, ***8% of the construction*** costs in the project budget will be ineligible for SDWLP funding or eligible only for the market interest rate in the CWFP.

MUNICIPALITIES: If a contractor follows at least one of the options to meet DBE solicitation requirements for a project contract, but the municipality uses none of the options to meet DBE solicitation requirements for a project contract, ***1% of the construction costs*** in the project budget for that contract will be ineligible for SDWLP funding or eligible only for the market interest rate in the CWFP.

PRIME CONTRACTORS: If a municipality uses at least one of the options to meet DBE solicitation requirements for a project contract, but the prime contractor uses none of the options to meet DBE solicitation requirements, ***7% of the costs*** of that specific construction contract that would have been eligible for subsidy will instead be ineligible for SDWLP funding or eligible only for market interest rate in the CWFP.

FEDERAL EQUIVALENCY VS. NON-FEDERAL EQUIVALENCY PROJECT REQUIREMENTS

As noted above, **all municipalities** must comply with the ***Six Good Faith Efforts*** **and** ***other steps*** identified ***in Form 8700-294***. These are the only DBE requirements for projects that are non-Federal Equivalency.

Projects designated as Federal Equivalency must comply with the above requirements AND all of the requirements described in the remaining pages of this Contract Packet.

CONTRACT ADMINISTRATION REQUIREMENTS

What are the Contract Administration requirements?

A number of provisions are designed to prevent unfair practices that adversely affect DBEs. Those provisions are as follows:

1) A loan recipient must require its prime contractor to pay its subcontractor for satisfactory performance no later than 30 days from the prime contractor's receipt of payment from the loan recipient.

2) A loan recipient must be notified in writing by its prime contractor prior to any termination of a DBE subcontractor for convenience by the prime contractor.

3) If a DBE subcontractor fails to complete work under the subcontract for any reason, the loan recipient must require the prime contractor to employ the six good faith efforts if soliciting a replacement subcontractor.

4) A loan recipient must require its prime contractor to employ the six good faith efforts even if the prime contractor has achieved its fair share objectives.

What is the Bidders List requirement?

- According to the US EPA: "The purpose of the bidders list is to provide the recipient [DNR] and entities receiving identified loans who conduct competitive bidding [municipalities] with a more accurate database of the universe of MBE/WBE and non-MBE/WBE prime contractors and subcontractors. The bidders list is intended to be a list of all firms that are participating, or attempting to participate, on EPA assisted contracts."

- "The list must include all firms that bid or quote on prime contracts or bid or quote on subcontracts under EPA assisted projects, including both MBE/WBEs and non-MBE/WBEs."

- The bidders list must be kept until construction and the project closeout process are complete.

What information must be retained on the Bidders List?

1) Entity's name with point of contact;

2) Entity's mailing address, telephone number, and email address;

3) The procurement on which the entity bid or quoted, and when; and

4) Entity's status as an MBE/WBE or non-MBE/WBE.

What is the exemption from the Bidders List requirement?

- A municipality receiving funds in the amount of $250,000 or less in any single financial assistance agreement, or in more than one financial assistance agreement with a combined total of $250,000 or less in any one fiscal year, is exempt from the requirement to create and maintain a bidders list.

- This exemption is limited to the bidders list requirements only.

REQUIRED CONTRACT CONDITIONS

Include the following language in all construction contracts associated with a Federal Equivalency project.

This project is being financed in whole or in part by the Wisconsin Department of Natural Resources through the Clean Water Fund Program (CWFP) or the Safe Drinking Water Loan Program (SDWLP). Municipalities constructing projects designated as Federal Equivalency must comply with the following federal laws and all applicable state and federal laws, rules, and regulations and must ensure that their contractor(s) also comply with these laws, rules, and regulations.

1) Title VI of the Civil Rights Act of 1964 (P.L 88-352), the Rehabilitation Act of 1973 (P.L. 93-1123, 87 Stat. 355, 29 U.S.C. Sec. 794), the Older Americans Amendments of 1975 (P.L. 94-135 Sec. 303, 89 Stat. 713, 728, 42 U.S.C. Sec. 6102), and subsequent regulations ensure access to facilities or programs regardless of race, color, national origin, sex, age, or handicap.

2) Executive Order 11246, as amended by Executive Orders 11375 and 12086 and subsequent regulations, prohibits employment discrimination on the basis of race, color, religion, sex, or national origin. Inclusion of the seven clauses in Section 202 of E.O. 11246 as amended by E.O. 11375 and 12086 are required in all project related contracts and subcontracts for municipalities over 3,300 population.

3) Executive Orders 11625, 12138, and 12432; 40 CFR part 33; Section 129 of P.L. 100-590 Small Businesses Reauthorization & Amendment Act of 1988; Public Law 102-389 (42 USC. 437d); a 1993 appropriations act ("EPA's 8% statute"); and Public Law 101-549, Title X of the Clean Air Acts Amendments of 1990 (42 USC. 7601 note) ("EPA's 10% statute") encourage recipients to award construction, supply, and professional service contracts to minority and women's business enterprises (MBE/WBE) and small businesses and require recipients to utilize affirmative steps in procurement.

4) 40 CFR Part 33 - Participation by Disadvantaged Business Enterprises in Procurement under Environmental Protection Agency (EPA) Financial Assistance Agreements sets forth a narrowly tailored EPA program to serve the compelling government interest of remedying past and current racial discrimination through agency-wide DBE procurement objectives.

5) Executive Order 12549, 3 CFR, 189; and 40 CFR Part 32, Subparts B and C, prohibit entering into contracts or subcontracts with individuals or businesses who are debarred or suspended. Borrowers are required to check the status of all contractors (construction and professional services) and must require contractors to check the status of subcontractors for contracts expected to be equal to or over $25,000 at SAM.gov/content/exclusions.

6) Executive Order 13202, as amended by Executive Order 13208, does not allow bid specifications, project agreements, or other controlling agreements to require or prohibit bidders, contractors, or subcontractors to enter into or to adhere to project labor agreements.

7) Section 513 of the Federal Water Pollution Control Act (33 USC 1372) or Section 1450(e) of the Safe Drinking Water Act (42 USC 300j-9(e)), as applicable, requires that all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to this Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code. With respect to the labor standards specified in this section, the Secretary of Labor has the authority and functions set forth in Reorganization Plan Numbered 14 of 1950 (64 Stat. 1267; 5 USC. App.) and section 3145 of title 40, United State Code. **Please note this provision (Davis-Bacon) applies to ALL loan recipients.**

FORMS

Use the following forms to document good faith efforts and DBE utilization. You can obtain all DBE-related forms from our website at dnr.wi.gov/aid/documents/EIF/forms/forms.html, or by contacting Casey Sweeney at (608) 852-1576 or Casey.Sweeney@Wisconsin.gov.

1. ***8700-294*** **– DBE Good Faith Certification Form**. This mandatory form asks the municipality to certify that required steps were taken to utilize DBEs, including MBEs and WBEs, in its EIF project. The municipality must answer several questions and provide explanations or justification for any "no" answers as to why specific steps were not taken.
2. ***8700-294a*** **– DBE Contacts Worksheet**. It is not mandatory to submit this form when following Option 2 to solicit DBEs, but we encourage municipalities and contractors to use Form 8700-294a. This form provides an easy format for documenting contacts and provides DNR with all the information needed to conduct a review of DBE good faith efforts.

ADDITIONAL INFORMATION

For additional information regarding DBE procurement requirements, contact the DNR project manager assigned to your project or contact Casey Sweeney at (608) 852-1576 or Casey.Sweeney@Wisconsin.gov. Information is also available on the Environmental Loans website at dnr.wi.gov/aid/documents/EIF/guide/DBE.html.

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State of Wisconsin
Department of Natural Resources
Bureau of Community Financial Assistance
101 S. Webster St., PO Box 7921
Madison WI 53707-7921
Phone No. (608) 266-7555 FAX (608) 267-0496
Website: dnr.wi.gov/Aid/EIF.html

Environmental Improvement Fund (EIF) DBE Contacts Worksheet

Form 8700-294A (R 03/17)

NOTE: This form is authorized by chs. NR 162 and NR 166, Wis. Adm. Code. The information requested on this form is necessary for the review of solicitation of Disadvantaged Business Enterprises (DBEs). This form is intended to be a tool to assist those seeking funding from the EIF (Clean Water Fund Program or Safe Drinking Water Loan Program) to meet the DBE requirements of EIF programs. Submitting this form to the Department is optional. Applicants may submit the form as the required documentation of solicitation efforts or provide the information in some other format. Personally identifiable information provided on this form will only be used in determining whether or not DBE requirements are met. Failure to complete or submit this form has no impact on the applicant. For complete information regarding DBE requirements, see the Contract Packet for DBE Compliance on DNR's website at http://dnr.wi.gov/Aid/documents/EIF/Guide/DBE.html.

Contact DBEs on a Unified Certification Program (UCP) List to solicit bids from DBE firms (e.g., firms registered in the WisDOT UCP, http://wisconsindot.gov/pages/doing-bus/civil-rights/dbe/certified-firms.aspx). The individual that makes the contacts should document all contacts. Contact at least 2 minority business enterprises (MBEs) and 2 women's business enterprises (WBEs); additional contacts may be to any type of DBE. Only contacts made to DBEs on DOT's UCP list can be considered in determining whether a good faith effort was made to solicit DBEs.

Project Information

Name of Municipality	EIF Project Number
Name of Prime Contractor	Information Prepared By (Name and Phone or E-Mail Address)

Contacts

Information Needed For Review	Contact 1	Contact 2	Contact 3
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 4	Contact 5	Contact 6
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 7	Contact 8	Contact 9
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 10	Contact 11	Contact 12
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 13	Contact 14	Contact 15
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 16	Contact 17	Contact 18
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information on Utilized Firms

Business Name	Street Address	City, State, Zip	Type of Product or Service	Subcontract Amount

SAMPLE AD FORMAT

ATTENTION WBE/MBE/DBE
SUBCONTRACTORS & SUPPLIERS

REQUEST FOR PROPOSALS
(PROJECT NAME)

_____(*Name of Company*)_____ is seeking proposals for the following disciplines:

_____ - Description (optional)
subcontract

_____ - Description (optional)
subcontract

_____ - Description (optional)
subcontract

Disadvantaged Business Enterprises (DBEs) including but not limited to Minority Business Enterprises (MBEs), and Women Business Enterprises (WBEs) are encouraged to submit proposals.

Proposals must be received by _____(*Date & Time*)_____.

For information regarding specific jobs and any assistance you may need, please contact our office.

Company Name
Address
City, State zip
Phone Number
Email address
EEO Employer

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No Anticipated Use of Subcontractors

Name of Bidder:_____
Business Address:_____

_____
Bid Date: _____

The above named Bidder hereby certifies that the Bidder plans to perform the work using its own personnel and resources and does not anticipate using any subcontractors. This statement is provided in lieu of the Environmental Improvement Fund (EIF) MBE/WBE Contacts Worksheet, Form 8700-294A. The Contacts Worksheet is not applicable because the Bidder is not using subcontractors as a part of this bid.

Authorized Signature:_____
Name (Typed or Printed):_____
Title: _____

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Complying with Davis-Bacon Requirements

Learn about the Environmental Loans programs and find guidance at dnr.wi.gov/aid/eif.html

Davis-Bacon and Related Acts (DBRA) apply to projects funded by the U.S. Environmental Protection Agency (EPA) via the Clean Water and Drinking Water State Revolving Funds (SRFs). The DBRA require all contractors and sub-contractors performing on federally-funded construction contracts in excess of $2,000 to pay their laborers and mechanics no less than the locally prevailing wage rates and fringe benefits for corresponding work on similar projects in the area as determined by the Secretary of Labor for inclusion in Davis-Bacon-covered contracts. See the U.S. Department of Labor (DOL) Wage and Hour Division (WHD) Government Contracts Compliance Assistance for information on Davis-Bacon and Related Acts.

Municipal Responsibilities

- Obtain wage determination and monitor it through contract award.
- Ensure all bid, contract, and subcontract documents and sole source contracts contain the wage determination and Davis-Bacon labor standards clauses (prime contractor and sub-contractors).
- For prime contracts over $100,000, comply with Contract Work Hours and Safety Standards Act (CWHSSA).
- Ensure no contracts are awarded to ineligible contractors.
- Ensure the Davis-Bacon poster and wage determination are posted at work site.
- Collect certified payroll reports and statements of Davis-Bacon compliance weekly.
- Spot-check payroll reports/related records.
- Conduct confidential, onsite interviews using Standard Form 1445, Labor Standards Interview.
- Periodically review use of apprentices and trainees.
- Report all alleged Davis-Bacon violations.
- Maintain full documentation of payrolls, certifications, interview forms, etc., for 3 years after project completion in the event the Office of Inspector General examines the project.

Contracts

Municipalities must ensure bids, contracts, and subcontracts contain the applicable wage determination and the Davis-Bacon labor standards clauses found in 29 CFR § 5.5 (Code of Federal Regulations), titled Contract Provisions and Related Matters. The labor standards describe contractor responsibilities and provide remedies for noncompliance. A wage determination (WD) is a set of wages, fringe benefits, and work rules that the DOL has ruled to be prevailing for a given labor category in a given locality. Note that if federal and state wage rates apply, contracts must contain both wage decisions/contract standards and employers must pay the higher of the two rates.

The EPA requires the following language (or a variation thereof) to be included in all bid solicitations and resulting contracts:

> "The successful bidder will be required to conform to the wage requirements prescribed by the federal Davis-Bacon and Related Acts which requires that all laborers and mechanics employed by contractors and sub-contractors performing on contracts funded in whole or in part with federal funds in excess of $2,000 pay their laborers and mechanics not less than the prevailing wage rates and fringe benefits, as determined by the Secretary of Labor, for corresponding classes of laborers and mechanics employed on similar projects in the area." – U.S. Department of Labor Wage and Hour Division May 29, 2009, Guidance.

The following items must be included in the contract with the prime contractor:

- DOL Davis-Bacon wage determination for the project type and location.
- Requirement for sub-contractors to apply the same wage determination.

Program implementation details are outlined in chs. NR 162 and NR 166, Wis. Adm. Code. Legal notice: This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in federal regulations or state statutes or administrative rules are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing federal regulations and state statutes and administrative rules to the relevant facts. The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services, and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of Interior, Washington, D.C. 20240. This publication is offered in other formats upon request, call 608-267-9481.

WISCONSIN DEPT. OF NATURAL RESOURCES

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- Requirement for the wage determination and Davis-Bacon Poster WH1321 to be posted in all relevant languages at all times by the contractor and sub-contractors at the project/work site in a prominent and accessible place for laborers and mechanics.

Additionally, prime contractors and sub-contractors must provide certifications with submitted bids agreeing to comply with Davis-Bacon requirements. **If Davis-Bacon language is included in the sub's contract and the sub signs the contract, this would cover the certification.** If any portion of the construction contract is receiving funding subject to Davis-Bacon, the entire contract is subject to Davis-Bacon. If the punchlist work is included in the construction contract and will be invoiced and paid thru the contractor, then Davis-Bacon applies.

Wage Determination (WD)

Prior to issuing a request for bids or proposals, the municipality must obtain the WD for the project area by accessing Wage Determinations at SAM.gov/content/wage-determinations, then selecting the Davis-Bacon Act (DBA) option, the state and county where the work will be performed, and the DBA construction type. The municipality must include the generated WD document in all bid specifications and resulting contracts. If you are unsure about the funding source, a project can be bid with alternates—one including federal wage rates and one without. (Note: SAM.gov replaced WDOL.gov)

DBA construction types

The construction types are building, residential, highway, and heavy. Most SRF projects will fall under the "heavy" type. The "building" type is for sheltered enclosures, especially with windows, doors, and roofs, that house machinery and equipment, and will be occupied at times. Municipalities should ask their consulting engineer what type to use if they are unsure. A contract can contain more than one construction type. If over 80% of the project cost falls into one construction type, the municipality can use that type for the WD; this may be a benefit or a detriment depending on the project. Contact your DNR Construction Management Engineer (CME) with questions.

Monitor the WD

During the bid advertisement period, municipalities or their consulting engineers **must** monitor SAM.gov to ensure DOL has not changed the wage determination. If the WD changes more than 10 days before bid opening, the bid specifications must be amended with the new WD. Once the bids have been opened, the wage determination is valid for 90 days. If contract award is more than 90 days after bid opening, the WD must be updated. The Davis-Bacon WD included in the contract at the time of contract award stays in effect for the duration of the project.

Request additional classifications

If the WD is missing a wage rate needed for a specific work/job classification, construction type, and/or project location, contact your DNR CME for guidance on requesting a conformance using the Request for Authorization of Additional Classification and Rate Standard Form 1444. The municipality should incorporate the final conformance rate into the bid specifications and construction contracts, and copies of the conformance letter should be kept on file.

Ineligible Contractors

Municipalities cannot knowingly award an SRF construction project to a contractor who has been debarred or suspended by the Federal government. During the bid evaluation period, municipalities must look up all bidders at SAM.gov/content/exclusions to determine if they are ineligible contractors. Municipalities should make a note of verification in the contract file. Contractors are responsible for verifying the eligibility of sub-contractors. Note that SAM.gov replaced Excluded Parties List System (EPLS).

Payroll Reports

Municipalities must collect certified payroll reports and compliance statements from the prime contractor and sub-contractors for every week of contract work and keep them on file for at least three years after project completion. Prime contractors are responsible for preparing and submitting payroll reports for its own employees and submitting

payroll reports for all sub-contractor employees. Per 29 CFR 5.5(a)(3)(ii), payroll reports do **not** include full social security numbers and home addresses. The optional Payroll Form WH-347 (see instructions) may be used to collect and report all of the necessary information.

A weekly payroll statement must provide the following information:

- Name of contractor or sub-contractor (indicate which)
- Project and location
- Project or contract number
- Name of employee
- Employee identification number (e.g., last four digits of social security number – Do not use full SSN)
- Work/Job classification
- Hourly rate of pay (straight and overtime)
- Daily and weekly number of hours worked
- Deductions made
- Actual wages paid

Along with each payroll report, the contractor (or payment supervisor) must submit to the municipality a signed statement of Davis-Bacon compliance, such as the one on the back of Payroll Form WH-347.

Review Payroll Reports

To verify that contractors and sub-contractors are paying appropriate wage rates and fringe benefits, municipalities must spot-check a representative sample of weekly payroll reports for accuracy at least twice for each contract and subcontract during the project—a minimum of once within 2 weeks of initial payroll and once within 2 weeks of final payroll.

Note: The check boxes on page 1 of the Request for Disbursement Form 8700-215 replaced the DBRA Payroll Certification page. The check boxes serve the purpose of assurance from the municipality to DNR certifying that Davis-Bacon has been satisfied for each week employees are paid.

Interview Employees

Municipalities should periodically conduct confidential, onsite interviews with a sampling of the contractor and sub-contractors' employees to determine whether laborers, mechanics, apprentices, and trainees are being paid in accordance with Davis-Bacon requirements—a minimum of once within 2 weeks of initial payroll and once within 2 weeks of final payroll is suggested. The Labor Standards Interview Standard Form 1445 must be completed with every interview and kept on file for at least three years after project completion.

Verify Apprentice and Trainee Registrations

While municipalities (or their designated representatives) are onsite conducting Davis-Bacon interviews, they should take the opportunity to review the apprentice and trainee registrations and certifications that the contractor should be able to easily provide upon request. Municipalities can use the relevant documents to confirm that the number of apprentices does not exceed the ratio to journeymen allowed by the apprenticeship program plan.

Report Violations

Additional interviews may be completed at the municipality's discretion and are required in the case of questionable payroll reports or employee complaints. Report alleged violations to the EPA Davis-Bacon Coordinator listed in the assistance agreement and to the DOL WHD District Office.

Violations include:

- Misclassification of laborers and mechanics.
- Failure to pay full prevailing wage, including fringe benefits, for all hours worked (including overtime hours).

- Inadequate recordkeeping, such as not counting all hours worked by an individual in two or more classifications during a day.
- Failure to maintain a copy of bona fide apprenticeship program and individual registration documents for apprentices.
- Failure to submit certified weekly payrolls.
- Failure to post the Davis-Bacon poster and applicable wage determination.

Final Loan Closeout

When the SRF loan has reached 95% disbursement of the loan amount, DNR will send a final closeout letter to the municipality, including a Wage Rate Compliance Certification. The municipality must prepare the certification on municipal letterhead and submit it to DNR prior to receiving the final loan disbursement.

EPA Davis-Bacon Applicability

Site of work

Davis-Bacon applies only to laborers and mechanics employed "directly upon the site of the work." The site of work is the physical place or places where the construction is called for in the contract or will remain after work has been completed, and any other site where a significant portion of the building or work is construction, provided that such site is established specifically for the contract. It may also include job headquarters, tool yards, batch plants, borrow pits, etc., provided the properties are located adjacent or virtually adjacent to the "site of work" and dedicated exclusively or nearly so to the performance of the contract or project.

Laborers and mechanics

Laborers and mechanics are employees who work with their hands, have manual or physical duties, or are in specific trades. They include carpenters, plumbers, sheet metal workers, etc., including apprentices and trainees. **The DOL focuses on the actual work being performed by the person, not necessarily their title**. As a general rule, an employee who spends the majority of time in a supervisory position onsite and who spends less than 20% of the work week engaged in skilled labor, is exempt from Davis-Bacon requirements for the percentage of time spent in that skilled time. Clerical staff (timekeepers), professionals (architects, engineers, inspectors), and certain utility installers are also exempt.

Force account employees

Davis-Bacon does not apply to "force account" work in which the municipality performs the construction in-house with its own "force account" employees rather than contracting out the construction work. Furthermore, the DOL does not consider a state or local government to be a contractor, even if it enters into a contract to perform construction work (see 29 CFR 5.2(h)).

Business owners

Davis-Bacon requirements do **not** apply to the owner of a construction company. However, to be exempt, the owner must be a "business owner" as defined under 29 CFR § 541.101 and be actively engaged in the management of their business. Davis-Bacon would **apply** if the owner were not engaged in management but predominantly performs manual or physical duties of construction work.

Truck drivers

Davis-Bacon does **not** apply to truck drivers employed by the contractor who come on the job site to deliver construction materials because they are not employed "directly upon the site of the work." Davis-Bacon **does** apply to truck drivers employed by the contractor to move materials on the site of work or from a property located adjacent or virtually adjacent to it. Davis-Bacon does **not** apply to truck drivers employed by the contractor to move materials at any location that existed prior to bid opening (e.g., contractor's headquarters).

EMPLOYEE RIGHTS

UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

PREVAILING WAGES

You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.

OVERTIME

You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.

ENFORCEMENT

Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.

APPRENTICES

Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.

PROPER PAY

If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

Community Development Specialists at: (800) 362-4505

or contact the U.S. Department of Labor's Wage and Hour Division.

WAGE AND HOUR DIVISION
UNITED STATES DEPARTMENT OF LABOR

1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd

WH1321 REV 10/17

DERECHOS DEL EMPLEADO
BAJO LA LEY DAVIS-BACON

PARA OBREROS Y MECÁNICOS EMPLEADOS EN PROYECTOS DE CONSTRUCCIÓN FEDERAL O CON ASISTENCIA FEDERAL

SALARIOS PREVALECIENTES

No se le puede pagar menos de la tasa de pago indicada en la Decisión de Salarios Davis-Bacon fijada con este Aviso para el trabajo que Ud. desempeña.

SOBRETIEMPO

Se le ha de pagar no menos de tiempo y medio de su tasa básica de pago por todas las horas trabajadas en exceso de 40 en una semana laboral. Existen pocas excepciones.

CUMPLIMIENTO

Se pueden retener pagos por contratos para asegurarse que los obreros reciban los salarios y el pago de sobretiempo debidos, y se podría aplicar daños y perjuicios si no se cumple con las exigencias del pago de sobretiempo. Las cláusulas contractuales de Davis-Bacon permiten la terminación y exclusión de contratistas para efectuar futuros contratos federales hasta tres años. El contratista que falsifique los registros certificados de las nóminas de pago o induzca devoluciones de salarios puede ser sujeto a procesamiento civil o criminal, multas y/o encarcelamiento.

APRENDICES

Las tasas de aprendices sólo se aplican a aprendices correctamente inscritos bajo programas federales o estatales aprobados.

PAGO APROPIADO

Si Ud. no recibe el pago apropiado, o precisa de información adicional sobre los salarios aplicables, póngase en contacto con el Contratista Oficial que aparece abajo:

Community Development Specialists at: (800) 362-4505

o póngase en contacto con la División de Horas y Salarios del Departamento de Trabajo de los EE.UU.

DIVISIÓN DE HORAS Y SALARIOS
DEPARTAMENTO DE TRABAJO DE LOS EE.UU.

1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd

WH1321 SPA REV 10/17

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern Work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The work under this project includes, but is not limited to, all specification sections within this Project Manual, and construction drawings bearing the title 2025 WWTF Upgrade, Wisconsin Dells – Lake Delton Sewerage Commission, Columbia County, Wisconsin as prepared by MSA Professional Services, Inc, including standard details, appendices, and addenda.

B. The work included in this project shall be performed under a single Contract between Owner and General Contractor for the construction of improvements at the Wisconsin Dells – Lake Delton Sewerage Commission Wastewater Treatment Facility (WWTF).

C. Payment for all items of work, within the exception of allowance items and bid alternates, shall be included in the lump sum price bid for the work indicated above and listed on the Bid Schedule.

D. The existing WWTF must remain operational until the new facilities are complete and operational, except as specified herein.

E. The work under this contract includes, but is not limited to, the furnishing of all labor, materials, tools, equipment, transportation, permits, certificates, and temporary protection necessary for, or incidental to, the execution of construction activities related to the following modifications to existing structures as indicated on the contract drawings and specified herein:

1. STR 05 Control Building: The existing 2-inch EIFS exterior system on the building will be fully removed and replaced with a masonry finish installed around the entire perimeter. The new masonry will extend down to the building's footing to provide a durable and long-lasting exterior surface. Regarding the masonry installation, the roof structure will be extended outward by approximately 8 inches at the existing pitch to align with the increased wall thickness resulting from the new masonry exterior. The roofing system for the entire structure will be removed and replaced. As part of the exterior improvements, three existing exterior doors will be removed and replaced with new units to match current operational and security requirements. Additionally, select process equipment will be removed, and any remaining openings left from the removed equipment will be infilled. Associated electrical and HVAC upgrades will occur at the time of building modifications
2. STR 30 Chemical Building: The existing south exterior wall will be removed in its entirety, along with select portions of parrel wall and the adjacent retaining wall. The building footprint will be extended to accommodate the installation of a new chemical tank. The new south wall will consist of a 1'-4" thick masonry construction designed to closely match the existing wall appearance and detailing with the use of EIFS. The wall will also incorporate a knock-out panel appropriately sized to facilitate the installation of a new chemical tank. Additionally, the new tank will require a new housekeeping pad. The remaining EIFS surfaces on the building will be painted to visually coordinate with the new masonry exterior for a cohesive overall appearance. In addition, the existing roofing system will be completely removed and replaced to match the building addition.
3. STR 85 De-chlorination Building: The existing, obsolete de-chlorination building will be demolished to grade, along with associated foundation, bollards, sidewalk, and parking area. The area will be re-graded to promote drainage away from Bowman Road, and any disturbed area must be restored and re-vegetated.

F. The work under this contract includes, but is not limited to, the furnishing of all labor, materials, tools, equipment, transportation, permits, certificates, and temporary protection necessary for, or incidental to,

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the execution of purchase and installation of the following major new equipment and associated infrastructure as indicated on the contract drawings and specified herein:

1. STR 30 Chemical Building: Chemical dosing pumps, chemical storage tanks, emergency eyewash and shower, chemical splash curtain, piping, valves, and fittings
2. STR 50 UV Disinfection Channel: UV disinfection system, power distribution center, hydraulic system center, system control center, structural modifications to channel, slide gates
3. STR 60 Digester Building: Rotary lobe sludge feed pumps, full acceptance bladder tank, piping, valves, and fittings
4. STR 70 Sludge Dewatering Building: Rotary lobe sludge feed pump, piping, valves, and fittings
5. STR 75 Sludge Dryer Building: Pelletizer system (tote discharger, screener, feeder, conditioner, pellet mill), sludge conveyance infrastructure (bucket elevator, Chainvey conveyors, screw conveyor), pelletizer cooling system (counterflow cooler, cyclone separator, main fan), piping, valves, and fittings
6. All other associated appurtenances

G. The work under this contract includes, but is not limited to, the furnishing of all labor, materials, tools, equipment, transportation, permits, certificates, and temporary protection necessary for, or incidental to, the execution of various process piping, manhole modifications, bollards, valves, and grating/plates, as indicated on the contract drawings and specified herein.

H. The work under this contract includes, but is not limited to, the furnishing of all labor, materials, tools, equipment, transportation, permits, certificates, and temporary protection necessary for, or incidental to, the furnishing and installation of various plumbing and heating, ventilating, and air conditioning systems as indicated on the contract drawings and specified herein.

I. The work under this contract includes, but is not limited to, the furnishing or all labor, materials, tools, equipment, transportation, permits, certificates, and temporary protection necessary for, or incidental to, the execution and completion of the following major electrical work and allied systems as indicated on the contract drawings and specified herein:

1. Power distribution equipment and circuitry for normal power supply
2. Indoor and exterior lighting equipment and circuitry
3. Heating and ventilating systems
4. Replacing existing Variable Frequency Drives
5. Motor Control Centers and Motor Controllers
6. Panelboards
7. Lighting transformers
8. Local Control Panels
9. Control Stations
10. Process Instrumentation and Control

J. The work under this contract includes, but is not limited to, the furnishing or all labor, materials, tools, equipment, transportation, permits, certificates, and temporary protection necessary for, or incidental to, the execution and completion of the major site work as indicated on the contract drawings and specified herein:

1. Erosion control
2. Site grading
3. Excavation, trenching, and backfill
4. Utility piping, valves, and utilities
5. Seeding and site restoration
6. Removal and/or installation of utilities
7. Structural excavation

K. The Contractor shall be responsible for scheduling and coordinating the work of all trades (other contractors and sub-contractors) under this contract.

It is the intent of these specifications that the Owner be provided complete systems, functioning as required and meeting the requisites of all Federal, State, or local codes and regulations. The Contractor shall be responsible for compliance with the intent of the contract drawings and specifications.

END OF SECTION

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SECTION 01 14 00
WORK RESTRICTIONS AND PROVISIONS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, current edition.
   2. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK (N/A)

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (N/A)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (N/A)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 EXAMINATIONS

A. Contractor shall obtain complete data at the site and inspect surfaces that are to receive the work before proceeding with assembling, fitting or erecting their work under this contract. The Contractor shall notify the Engineer in writing in the case of discrepancies between existing work and drawings, and of any defects in surfaces that are to receive the Contractor's work. The Engineer will direct the remedy of applicable surfaces.

B. Information pertaining to existing conditions that appear on the drawings is based on available records. While such data has been collected with reasonable care, there is no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing or that unexpected developments may not occur. All data included was provided to assist the Contractor in the investigation of conditions. The Contractor is responsible for the interpretation of the data provided.

C. The Contractor shall become acquainted with the location of underground service, utilities, structures, etc., which may be encountered or be affected by the Contractor's work, and shall be responsible for any damage caused by neglect to provide proper precautions or protection.

D. Utility Locations. Contractor shall be responsible for locating and verifying all utilities on the project and also all relocations where necessary. Typically the utilities require the request for locate be made a minimum of three working days before the Contractor begins work in the area. The utilities shown on the contract drawings are approximate in location, depth, number, and type.

E. Contractor shall verify grades, lines, levels, locations, and dimensions as shown on drawings and report any errors or inconsistencies to the Engineer before commencing work. Starting of work by the Contractor shall imply acceptance of existing conditions.

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3.02 STORAGE AND HANDLING

A. Contractor or the Contractor's authorized representative must be present to accept delivery of all equipment and material shipments. The Owner's employees will not knowingly accept, unload, or store anything delivered to the site for the Contractor's use. Inadvertent acceptance of delivered items by any representative of the Owner shall not constitute acceptance or responsibility to assume all liability for any equipment or material delivered to the job site.

B. Any material or equipment removed from the present construction shall be the property of the Owner and disposition shall be as directed by the Owner or stockpiled at locations shown on the contract drawings. All salvaged materials shall be removed in a workmanlike manner and carefully transported to Owner's storage area. The Contractor shall coordinate the salvaging of items with the Owner.

C. Contractor shall confine all operations, equipment, apparatus, and storage of materials to the immediate area of work to the greatest possible extent. Contractor shall ascertain, observe, and comply with all rules and regulations in effect on the project site, including, but not limited to parking and traffic regulations, use of walks, security restrictions and hours of allowable ingress and egress.

D. The storage of materials on the grounds shall be in strict accordance with the instructions of the Owner.
   1. All materials affected by moisture shall be stored on platforms and protected from the weather in accordance with manufacturer recommendations.
   2. Should it be necessary at any time to move material storage platforms, the Contractors shall move same at the Contractor's expense, when directed by the Owner.
   3. Areas used for storage of materials shall be repaired and restored by the Contractor.

E. The Owner assumes no responsibility for materials stored on the site. The Contractor shall assume full responsibility for damage due to the storage of materials.

F. During the construction of this project, materials, storage areas, and earth stockpiles shall be located so as not to interfere with the installation of the utilities nor cause damage to existing structures or utilities.

3.03 WORK RESTRICTIONS AND PROVISIONS

A. Notification. The Contractor shall notify the Owner and the Engineer 72 hours in advance of beginning work. Notice must also be given to the Owner and the Engineer for each subsequent day the Contractor will be working.

B. Operation During Construction. The existing facilities shall remain completely operational during construction. The Contractor shall be responsible to see that the facilities are operating as they should. Sequence of operations or place of commencement may be determined by the Engineer as deemed to best serve the needs and convenience of the Owner, or as necessity of occasion requires.

C. Starting of work implies acceptance of the work of others. Removal and replacement of work applied to defective surfaces, in order to correct defects, shall be done at the expense of the Contractor who applied work to defective surfaces.

D. Access to Work. Representatives of the State and Federal Regulatory Agencies and Owner shall have access to the work and on-site records at all times.

E. Project Log. A project log shall be maintained showing daily progress of work. Engineer and Owner shall have access to this logbook and the project schedule at all times.

F. Existing pipes, electrical work, and all other utilities encountered, which may interfere with new work, shall be rerouted, capped, cut off, or replaced by the Contractor.

G. Dust and Noise. Contractor shall make an effort to keep dust and noise to a minimum during construction. The dispersion of dust from construction related activities shall, until acceptance of work, be minimized by

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the application of water or other acceptable materials or covers. Noise from any construction activities shall only be allowed during approved working hours. This includes preparation, organizational and clean-up work. Work hours are limited to weekdays between 6 a.m. and 7 p.m. unless specifically stated elsewhere in these specifications or approved during construction by the Owner and Engineer in writing. Only maintenance of traffic and/or erosion control activities are allowed outside of these times.

H. Contractor shall confine equipment, apparatus, storage of materials and operations to limits by specific direction of the Owner or Engineer and shall not bring material onto the site until they are needed for the progress of the work.

I. Cleaning. Contractor shall be responsible for all cleaning required within the technical sections of the specifications governing work under the Contractor's jurisdiction as well as for keeping all work areas, passageways, and all other areas of the premises free of rubbish, debris and scrap which may be caused by the Contractor's operations or that of the Subcontractors.

1. Remove rubbish, debris, and scrap promptly upon its accumulation and in no event later than the end of each week.
2. Combustible waste shall be removed immediately or stored in fire resistive containers until disposed of in an approved manner.
3. Spillage of oil, grease, or other liquids which could cause a slippery or otherwise hazardous situation or stain a finished surface, shall be cleaned up immediately.
4. Dust, dirt, and other foreign matter shall be removed completely from all internal surfaces of all mechanical and electrical units, cabinets, ducts, pipes, etc.
5. Dirt, soil, fingerprints, stains and the like, shall be completely removed from all exposed finished surfaces.
6. If rubbish and debris is not removed, or surfaces cleaned as specified above, the Owner reserves the right to have said work done by others and the related cost(s) will be deducted from monies due the Contractor.

J. Disposal of Demolished Materials. Remove from the site all debris, rubbish, and other materials resulting from demolition operations. Storage of removed materials will not be permitted on the site. If burning is allowed, the Contractor shall obtain all required permits.

K. Mail Service.

1. Temporary relocation of mailboxes. If the Postal Carrier cannot deliver mail to the properties affected by the construction of utilities or roadway, the Contractor shall provide temporary mailboxes or shall relocate existing mailboxes to an accessible site. Contractor shall relocate mailboxes to their new location and set to proper height, as directed by an authorized representative of the US Postal Service. Mailboxes shall be reset as close to original location as possible, unless otherwise noted, while maintaining proper height and location requirements of the US Postal Service, upon restoration of regular postal service. If mailboxes, bases or posts are damaged during removal, it shall be the Contractor's responsibility to replace the damaged part prior to reinstallation. Contractor shall not be responsible for correction of existing deficient mailboxes, bases, or posts. Owner and Engineer shall be notified of such instances immediately.
2. Final relocation of mailboxes. If the Postal Carrier can deliver mail to affected properties during construction, Contractor shall maintain reasonable access to said mailboxes. Upon completion of the project, Contractor shall relocate mailboxes to a location and height that meets the US Postal Service requirements along affected roadways.

L. Street Signs. The Contractor shall salvage and reinstall all signs affected by construction. All signs to be removed shall be done in a workmanlike manner and carefully transported to Owner's storage area. If signs, sign bases or posts are damaged during removal, it shall be the Contractor's responsibility to replace said sign, base or post prior to reinstallation.

M. Garbage Collection. Garbage and/or recycling collection will continue throughout the project. Contractor shall provide temporary access to garbage vehicles throughout the project area or assist with garbage collection in areas inaccessible to vehicular traffic during the project.

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3.04 OPERATION AND PROTECTION

A. Contractor shall schedule their work as to minimize the inconvenience to the Owner and residents adjacent to the project.

B. Traffic Control. The Contractor shall meet the requirements for traffic control in accordance with the Manual on Uniform Traffic Control Devices. All structures and equipment shall be constructed, installed, and operated with guards, controls, and other devices in place.

C. The Contractor shall provide protection as follows:

1. Protection. The Contractor shall provide and maintain proper barricades, fences, signal lights, or watchmen to properly protect the work, persons, animal and property against injury. The cost of protection shall be incidental to the contract and no extra payment will be allowed therefore.
2. Provide, erect, and maintain all required barricades, guard rails, temporary walkways, etc., of sufficient size and strength necessary for protection of stored material and equipment; adjacent to or within project area; adjoining property and the building(s) as well as to prevent accidents to the public and the workmen at the job site.
3. Provide and maintain proper shoring and bracing for existing underground utilities encountered during excavation work, to protect them from collapse or other type of damage until such time as they are to be removed, incorporated into the new work, or can be properly backfilled upon completion of new work.
4. Provide protection against rain, snow, wind, ice, storms or heat so as to maintain all work, materials, apparatus, and fixtures, incorporated in the work or stored on the site, free from injury or damage. At the end of the day's work, cover all new work likely to be damaged. Remove snow and ice as necessary for safety and proper execution of the work.
5. Protect the building and foundations from damage at all times from rain and groundwater. Provide all equipment and enclosures as necessary to provide this protection.
6. Damaged property shall be repaired or replaced in order to return it to preconstruction conditions.
7. Protect materials, work, and equipment, not normally covered by above protection, until construction proceeds to a point where the general building protection of the area where located, dispenses with the necessity therefore. Protect work outside of the building lines such as trenches and open excavations, as specified above.
8. Take any and all necessary precautions to protect Owner's property as well as adjacent property, including trees, shrubs, buildings, sanitary sewers, water piping, gas piping, electric conduit or cable, etc., from any and all damage which may result due to work on this project.
9. Repair work outside of property line in accordance with the requirements of the authority having jurisdiction.
10. Repair any work damaged by failure to provide proper and adequate protection to its original state to the satisfaction of the Owner or remove and replace with new work at the Contractor's expense.
11. Tree Protection. Trees shall be protected from damage and scarring. Do not injure trunks, branches, or roots of trees that are to remain. No trees shall be removed without the approval of the Owner. Tree branches in the way of construction operations shall be carefully pruned prior to construction. Do cutting and trimming only as approved and as directed by the Owner. Do not operate equipment or vehicles within the drip line of a tree to be preserved. Any roots exposed during construction shall be cut clean. Ripping of the roots with excavation equipment shall not be allowed.
12. All survey monuments, property stakes, etc., which are encountered during the construction are to be preserved and undisturbed. The Engineer shall be notified of all such items immediately upon discovery. Failure to preserve such monuments will not be allowed and replacement shall be at the Contractor's expense.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. To provide adequate budget and bonding to cover items not precisely determined prior to bidding, include in the Contract Price the costs or quantities described in this Section.

B. Adjustment of Cost:
1. If cost or quantity is more or less than the specified allowance, Contract Price will be adjusted by Change Order, unless stated otherwise herein.
2. Submit documentation for engineer review for the actual costs or quantities after completion of Work. Documentation shall include actual invoices or billing statements and evidence of payment.

C. Designate in schedule of values costs and quantities required under each allowance.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 SPECIFIC ALLOWANCES

A. Pelletizer Equipment Access Stairs and/or Ladders
1. For bidding purposes, the Contractor shall include $10,000 in their bid for portable stairs and/or ladders for access to the pelletizer system equipment. Style, quantity, and location of access stair and/or ladder units shall be selected by the Owner.

B. Motor Branch-Circuit Conductor Replacement
1. For bidding purposes, the Contractor shall include $20,000 in their bid for replacing and installing motor branch-circuit conductors that fail Megger Testing. Motor branch-circuit conductors that require Megger Testing are as indicated on the drawings. Conductors shall be replaced like in kind.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 1 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Provide a detailed breakdown of the Contract Price showing amounts and quantities allocated to each of the various parts of the Work, as specified herein and as required by General Conditions.

B. Upon request of Engineer, support amounts and quantities with data substantiating their correctness.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Schedule shall be typed on 8-1/2-inch by 11-inch white paper. Contractor's standard forms and automated printout will be considered for approval by Engineer upon request. Include following:
1. Project title.
2. Project location.
3. Owner.
4. Engineer.
5. Engineer's project number.
6. Name and address of Contractor.
7. Contract designation.
8. Date.

B. Identify installed value of Work in sufficient detail to serve as basis for computing values for progress payments during construction.

C. Provide a separate listing of general items, such as bonds, insurance, mobilization, field supervision, construction facilities, allowances, and record documents.

D. Follow Project Manual table of contents as format for listing component items. At a minimum, listing shall include material cost and total installed cost for each Specification Section for each structure as listed in this Section.
1. Identify each line item with number and title of respective Specification Division and Section.
2. Include directly proportional amount of Contractor's overhead and profit.
3. For items on which progress payments will be requested for stored materials, break down value into:
   a. Cost of materials, delivered and unloaded.
   b. Total installed value.

E. If requested, Contractor shall be compensated for stored materials on the following schedule:
1. 10% of item value upon shop drawing Submittal

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2. 25% of item value upon approved storage of item

F. Provide listing of items for each specification section of sitework and for each specification section of structure related construction, each specifications section of piping work, each specification section of process equipment, each specifications section of electrical and instrumentation work. Each item of work shall breakdown costs for materials, labor, and installation. General project cost items shall include breakdown of testing, mobilization/demobilization, bonds, insurance, and Contractor's project administration.

G. Sum of values listed shall equal total Contract Price.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 31 13
PROJECT COORDINATION

GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The General Contractor or their appointed representative shall act as the project coordinator. They shall generally be charged with all duties of a project coordinator including, but not limited to, being responsible for conditions of the contract, administrative requirements, subcontractor's scheduling and cooperation, compliance with specifications and drawings, and all other work related requirements.

B. Contractor shall coordinate the work with adjacent work and shall cooperate with all other Contractors so as to facilitate the general progress of the work. Each Contractor shall afford all other Contractors every reasonable opportunity for the installation of their work and for the storage of their material. In no case will any Contractor be permitted to exclude from the premises or work, any other Contractor or employees thereof, or interfere with any Contractor in the executing or installation of the work.

C. Each Contractor shall perform its work in proper sequence in relation to that of other Contractors and as approved by the Engineer. Any cost caused by defective or ill-timed work shall be borne by the Contractors responsible therefore.

D. Contractor shall arrange the work and dispose of materials so as not to interfere with the work or storage of materials of others and each shall join their work to that of others in accordance with the intent of the drawings and specifications.

E. All Contractors shall work in cooperation with each other and fit their work into the structure as job conditions may demand. All final decisions as to right-of-way and run of pipes and ducts, etc., shall be made by the Engineer or the Owner.

F. It shall be the responsibility of the Contractor to keep constant check on the progress of the work so that each particular trade can insure proper preparation for installation of that Contractor's work and not cause delay in the progress of the work. It shall further be the responsibility of the Contractor to periodically make inspections of work in progress and to notify the Engineer when work is complete in compliance with specifications and drawings.

G. A project log shall be maintained showing daily progress of work. The Engineer and Owner shall have access to this log book and the project schedule at all times.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

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PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 31 19
PROJECT MEETINGS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Preconstruction Meeting. A Preconstruction Meeting will be scheduled and conducted by the Engineer and shall be attended by representatives of the Owner, Contractor and all subcontractors as deemed required by the Engineer. The purpose of the meeting will be to identify all project participants, review project requirements and specifications, establish the method of making pay requests and other matters that may be deemed necessary to be discussed. At this meeting, the Contractor shall submit the proposed construction schedule for review, consensus by the parties and approval. The Contractor shall also submit a schedule of values for the work to be used as the accounting format for all progress payments.

1. Submit a pdf copy of the American Iron and Steel (AIS) checklist a minimum of one week prior to the pre-construction meeting. The AIS checklist shall provide a list of all products and materials to be furnished to complete the project. ENGINEER may review and request the CONTRACTOR to provide additional statements/certifications for any products and materials provided on the project.

B. Monthly Construction Progress Meetings. Brief monthly meetings, as deemed necessary by the Engineer, will be held and shall be attended by all Contractors. The purpose of the meeting will be to coordinate work schedules, review the project progress and other matters that may be deemed necessary to be discussed.

1. A construction progress meeting agenda shall be prepared as deemed necessary to the Engineer.
2. All construction progress meeting attendees shall be fully prepared prior to the meeting and shall be ready to discuss issues raised as they relate to their work. This shall include, but not be limited to, providing revised schedules, milestone activities, specific requirements for subordinate construction and any proposed or completed changes required for their work.

C. Bi-Weekly Field Progress Meetings. Bi-weekly field meetings shall be held and attended by the Site Superintendent of the General Contractor, Resident Project Representative (RPR), and Owner. The purpose of the meeting will be to review weekly work schedules, review updated 4-week look ahead schedules, coordinate temporary shutdowns, coordinate construction phasing and demolition matters, and discuss other project matters.

1. Contractors shall attend as deemed necessary by the Engineer and/or RPR.
2. Contractor shall maintain meeting minutes of each field progress meeting and distribute to Engineer, RPR, and Owner.

D. Electrical Meetings. To facilitate the modifications and additions to the existing SCADA system at the facility, conference meetings shall be held:

1. Refer to Section 26 90 00.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Schedule of Values – Division 01

C. Construction Progress Schedule – Division 01

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1.05 SUBMITTALS

A. Contractor shall submit the following prior to the preconstruction meeting:
   1. Construction schedule
   2. Schedule of values

B. Contractor shall submit the following on a monthly basis:
   1. All meeting agendas and minutes

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Submit preliminary Construction Progress Schedule in accordance with General Conditions prior to pre-construction conference.

B. The Contractor shall comply with and the Work shall be completed in accordance with the following construction schedule:
   1. Award Contract (January 30, 2026 – Tentative)
   2. Notice to Proceed (February 27, 2026 – Tentative)
   3. Substantial Completion. Substantial Completion shall be completed by August 27, 2027. Substantial Completion shall include all work on Wisconsin Dells-Lake Delton WWTF and associated infrastructure as shown on the Contract Drawings and detailed in these specifications, including the following:
      a. Complete systems are operating and Owner is receiving all critical alarms through SCADA.
      b. Installation and successful start-up testing of all equipment and appurtenances.
      c. Submittal of all required final shop drawings, start-up reports, and Operation & Maintenance manuals.
      d. Notification to the Engineer and Owner that the project is substantially complete and the Work is ready for final field inspection and measurement.
      e. Warranty Documents. Upon Substantial Completion of the project, Contractor shall submit such written warranties to the Engineer for presentation to the Owner.
      f. Substantial Completion may exclude items deemed non-essential by the Engineer.
   4. Final Completion. The project shall be completed by October 27, 2027. Final Completion shall include all work as shown on the Contract Drawings and detailed in these specifications, including:
      a. Completing all items addressed in punchlist(s).
      b. Restoring the work site to an equal or better condition than which existed prior to starting the work.
      c. Disposing of all unused, salvaged, or unusable materials.
      d. Record drawings submitted.
   5. Within 30 days of final completion, submit final project closeout documentation inclusive of lien waivers, affidavit of compliance with prevailing wage rate determination, and final pay request.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS

A. Contractor shall provide a preliminary construction schedule prior to the Preconstruction Meeting.

B. Contractor shall provide an updated construction schedule prior to all monthly Construction Meetings.

C. Furnish an electronic copy (printable on 11x17 paper) and hardcopies of the construction schedule to all meeting attendees, and subsequent revisions thereof, seven (7) days before each Monthly Construction Progress Meeting.

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D. Within seven (7) days after the Monthly Construction Progress Meetings, furnish an electronic copy (printable on 11x17 paper) of revised schedule to Engineer. Furnish revised schedule to subcontractors as appropriate.

E. Failure to submit schedules on a timely basis shall be considered cause for withholding progress payments.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 FORM OF SCHEDULE

A. Prepare schedule in form of horizontal bar chart.
1. Provide separate horizontal bar for each trade, activity or operation.
2. Provide continuous vertical line to identify first working day of each week.
3. Scale and space to allow for notations and future revisions.

3.02 CONTENT OF SCHEDULE

A. Show complete sequence of construction by activity or operation.

B. Show dates for beginning and completion of each major element of construction and installation dates for major equipment items. Include:
1. Each individual task of construction.
2. Procurement of equipment and systems including Shop Drawing submittals, Engineer's review of submittals, shop tests, and delivery dates.
3. Identification of Work that will affect existing plant operations.
4. Services of manufactures' representatives.
5. Startup dates for major equipment.
6. Field tests.
7. Dates of Substantial and Final completion.
8. Subcontractor Work items.
9. MBE, WBE, and SBE activities.
10. O&M data activities
11. Contractor-provided training.

C. Show projected percentage of completion for each activity as of first day of each month.

3.03 REVISIONS TO SCHEDULE

A. Each month Contractor shall receive update information from Subcontractors and Suppliers that shall be included in current schedule. Revised schedule shall indicate changes such as:
1. Major changes in scope.
2. Activities modified since previous submittal.
3. Revised projections of progress and completion.
4. Other identifiable changes.

B. Provide narrative report to define following:
1. Problem area and anticipated delays and their impact on schedule.
2. Corrective action recommended and its effect.

3.04 MONTHLY PROGRESS MEETINGS

A. Once each month Construction Progress Schedule will be reviewed. Progress will be reviewed:
1. To identify those activities started and completed during previous period.
2. For remaining duration required to complete each activity started, but not completed.

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3. For durations of selected activities not yet started.
4. For effect of Change Orders and proposed sequencing.

B. Update schedule accordingly and issue to the Engineer and RPR.

3.05 DELAYS AND RECOVERY

A. If, at any time during the Project, Contractor fails to complete activity by its latest scheduled completion date, Contractor shall, within five (5) working days, submit to Engineer written statement as to how and when work force will be reorganized to return to current construction schedule.

B. If, during schedule review meetings, it becomes apparent that milestone completion dates or Contract completion dates will not be met, Contractor shall take some or all of the following actions:
1. Increase construction staffing in such quantities and crafts as shall eliminate backlog of Work.
2. Increase number of working hours per shift, shifts per day, Work days per week, amount of construction equipment or combination of foregoing sufficient to substantially eliminate backlog of Work.
3. Reschedule Work actives to achieve concurrency of accomplishment

C. Under no circumstances will addition of equipment or construction forces, increasing working hours or other method, manner or procedure to return to current Construction Progress Schedule be considered justification for Contract modification or treated as acceleration.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 33 00
SUBMITTALS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing submittal information as required by the contract drawings, other specification sections and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Schedule of Values – Section 01 29 73

C. Project Meetings – Section 01 31 19

D. Construction Progress Schedule – Section 01 32 16

E. Submittal Log - Section 01 33 23

F. Special Procedures – Section 01 35 00

G. Permits – Section 01 41 26

H. Execution – Section 01 73 00

I. Electrical – Division 26 (All Sections)

J. Equipment – Division 40 and 44 (All Sections)

1.05 SUBMITTALS

A. As soon as possible after Notice to Proceed, Contractor to create a schedule of submittals stating approximate date of submittal, specification section, and contents.

B. As soon as possible after Notice to Proceed, submit brochures of catalog cuts and specifications for all new equipment. Submittal of product data shall comply with the requirements for Submittals.

C. Contractor shall plan for the long lead times for delivery of mechanical equipment, piping, valves, electrical equipment, control panels, instrumentation, and other devices and materials. Delivery lead times for equipment, piping, materials, and valve deliveries shall not be a cause for delay and extra costs.

D. Prior to fabrication of installation, provide Submittals for review.

E. An electronic web based submittal management software, such as Procore, eComm, or Submittal Exchange, shall be utilized during the Submittal review process. Contractor to acquire a license to the selected electronic submittal system and provide Engineer with access at no charge.

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F. Each submittal shall be submitted electronically in PDF format through the electronic submittal system website, as specified herein.
   1. Final approved submittals shall be submitted in PDF format and provided in hardcopy. Provide two hard copies of final submittals to the Owner.

G. Submittals shall include layout details, schedules, setting instructions, and manufacturer's literature. Concrete reinforcing steel Submittals shall include a concrete pouring sequence for structures with vertical construction joints.
   1. Submittals shall be identified with the name of the project, appropriate specification section number, and alphabetical letter indicating the submission or resubmission of the same submittal, i.e. "A = 1st submission, B = 2nd submission (1st resubmission), C = 3rd submission, etc. An example submittal number would be 40 23 36-B indicating the second submittal (1st resubmittal) for Specification Section 40 23 36. Submittals without appropriate naming convention will be returned to the Contractor.
   2. Contractor shall supply standard naming convention for files. File naming convention at minimum shall include project number, item description, item number, and date (Year.Month.Day). For example, RFI 3 could be named 00090019 WDLD WWTF RFI 3 2026.05.01.
   3. Submittals shall bear the stamp of review of the Contractor as evidence that all drawings have been checked by the Contractor for accuracy and compatibility with contract requirements. Drawings not so checked and noted will be returned without being examined.
   4. Partial submittals will not be considered and will be returned without review, unless authorized by Engineer prior to submittal. A single submittal package shall include all items included in that specification number the package represents.
   5. Submittals for all Division 22, 23, 26, 33, 40, 41, and 44 specifications shall include the Equipment Data Form as included at the end of this section. The Equipment Data Form is to include key information and design criteria for the submitted products and is intended for reviewer use.
   6. Submittals shall be accompanied by a Request for Submittal Approval coversheet as included at the end of this section. Contractor shall notify Engineer of any submittal items that may not be in conformance with the Contract Document requirements, but nevertheless asks approval thereof. Contractor shall include brief, specific descriptions of each potential nonconformity.

H. Contractor shall clearly identify all project specific items in Submittal. Clearly mark pertinent products or models to be installed and cross out all extraneous information provided with the literature.

I. Electronic submittals shall be a text searchable and bookmarked PDF document. Electronic submittal document shall be created with OCR (Optical Character Recognition) to allow for full alphanumeric recognition of printed characters.

J. If information on previously submitted Submittals is altered, in addition to the notations made by the Engineer, the Contractor shall bring all changes to the attention of the Engineer. Contractor shall resubmit previously submitted Submittal in its entirety and additional or modified information as requested by Engineer in previous Submittal review. Corrections or changes indicated on reviewed Submittals shall not be considered an order for extra work.

K. Submittals will not be considered reviewed unless they bear the stamp of review and signature of the Engineer. Drawings will be reviewed for general design only. Dimensions and fit of units of various parts shall be the Contractor's responsibility.

L. Prior to work at the site, submit samples allowing reasonable time for review and testing. Submit samples in sufficient quantity (minimum of five), of adequate size showing quality, type, color range, finish and texture. Label each sample stating material, description, applicable specification sections, intended use, project name, and Contractor's name.

M. Order no materials subject to sample review until receipt of written shop drawing review. Materials installed shall match reviewed samples. No review of samples shall be taken in itself to change or modify contract requirements beyond the expressed stipulations of the review letter.

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N. All Submittals for major equipment must be reviewed and delivery dates scheduled prior to performing any work at the site. A revised work schedule shall be submitted weekly showing corrected delivery dates.

1.06 OPERATION & MAINTENANCE (O&M) MANUALS AND INSTRUCTIONS

A. Three weeks prior to startup of the equipment, the Contractor shall provide the Engineer and Owner with O&M manuals in electronic PDF format through the document management website.
   1. Engineer and Owner to review and approve electronic version of O&M manuals prior to start-up. Contractor to revise manuals per Engineer and Owner comments prior to distribution at startup and training.
   2. The Contractor shall make two hard copies of the approved O&M manuals for distribution at startup and training.
   3. Following training, Contractor shall update final operation and maintenance manuals (hard copies and electronic copies) for the project to include start-up and testing information.
   4. Contractor shall provide the Owner with two (2) hard copies and two (2) flash drives of the final O&M manuals for the project.

B. Each O&M manual shall include the following:
   1. Electronic O&M manuals shall be a text searchable and bookmarked PDF document. Electronic O&M documents shall be created with OCR (Optical Character Recognition) to allow for full alphanumeric recognition of printed characters.
   2. Supplier and manufacturer's name, address, telephone number, and local representative's name, address and telephone number. Sources of service and parts and a list of local repair services, supply houses, and potential sources for the types of repairs and equipment parts.
   3. Complete and accurate set of record drawings including drawing dimensions, schematics of hydraulics, wiring, and piping.
   4. Warranties and bonds shall be included in manual.
   5. Catalog literature complete with test data and performance data and ratings.
   6. Clearly mark pertinent products or models installed and cross out all extraneous information provided with the literature. For example, the correct model number shall be designated where the literature covers more than one model.
   7. Specify equipment function, normal operating, and limiting conditions.
   8. Assembly, installation, alignment, adjusting, and checking instructions.
   9. Operating instructions for start-up, shutdown, routine and normal operation.
   10. Emergency operating instructions indicating range and flexibility during emergencies.
   11. Detailed service information including schedule of recommended maintenance.
   12. Spare parts and supplies required for maintenance and repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead time to obtain.
   13. Troubleshooting, common operating problems, problems that might occur in unit/process. List probable causes and discuss control/prevention.
   14. Detailed safety section covering the operation and maintenance of unit. Contractor shall supply a complete list of equipment service numbers, model numbers, electrical requirements, manufacturer's names, etc.
   15. O&M manuals for all Division 22, 23, 26, 33, 40, 41, and 44 specifications shall include the Equipment Data Form as included at the end of this section. The Equipment Data Form is to include key information and design criteria for the installed equipment and is intended for Owner use.
   16. For items assembled by the Contractor, the Contractor shall write and provide duplicate operation and maintenance instructions.
   17. Hardcopies of the O&M shall be folded to 8-1/2 inch x 11 inch size and placed into three D-ring binders with durable plastic cover. Prepare binder cover with printed title "Operation and Maintenance Instructions", title of project, subject matter of binder, and binder number when multiple binders are required for a single specification section. Material shall be grouped according to specifications section and filed behind individual filing tab pages on which the following is to be typed: Item, Manufacturer, Contractor's Order Number, Supplier's Order Number, Manufacturer's Order Number.

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18. All manuals shall be delivered to the Engineer prior to 90% completion as determined by Contractor's monthly payment application. If manual submittal process is not completed prior to 90% completion, Owner may elect to withhold payment until all manuals are submitted.

1.07 PERMITS AND APPROVALS

A. Obtain and submit copies of all permits, code inspections, and approval documents, as specified.

B. See Section 01 41 26 – Permits.

1.08 CONSTRUCTION SCHEDULE

A. Submit a schedule of operation as indicated in Section 01 32 16 – Construction Progress Schedule.

B. The construction schedule shall be supplemented by a list of Submittals, dates they will be submitted for approval and a reasonable time allowance for review. Submittal schedule shall reflect completion dates in accordance with these specifications.

1.09 SEQUENCE OF CONSTRUCTION

A. Submit a sequence of construction and daily schedule where the work impacts the operation of existing facilities as indicated in 01 73 00 – Execution.

1.10 START-UP REPORTS

A. Where equipment startup by a factory-trained representative is required, a minimum of three copies of the start-up report shall be submitted which describe the representatives activities and installation approval.
   1. Start-up report shall be a typewritten document containing descriptive information specifically identifying the piece by equipment, all tests conducted, and the results of the tests.
   2. Start-up role log, with the dated signatures of those conducting and accepting all start-up instructions and tests shall be provided as part of the report.
   3. Copies of equipment start-up reports to be placed in the appropriate final O&M manuals.

B. Substantial completion will not be issued until all start-up reports have been submitted.

1.11 RECORD DRAWINGS

A. The Engineer will provide the Contractor with a suitable set of contract drawings on which daily records of changes and deviations from contract shall be recorded. All buried or concealed piping, conduit, or similar items shall be located by dimensions and elevations on the record drawings.
   1. Record drawings shall be kept at the site and available for review by Engineer and RPR.
   2. Record information concurrent with construction progress, not less than weekly. Record drawings will be reviewed by RPR for verification of current status of documents, prior to acceptance of Contractor's request for payment.
   3. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.
   4. At completion of the project, the Contractor shall submit the marked-up record drawings to the Owner.

B. Maintain onsite one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Review shop drawings, product data, and samples.
   6. Manufacturer's instructions for assembly, installation, and adjusting.

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C. Ensure entries are complete and accurate, enabling future reference by Owner.

D. Store record documents in construction trailer separate from documents used for construction.

E. Specifications: Legibly mark and record at each product section description of the actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings (and Shop Drawings): Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, reference to visible and accessible features of the work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract Drawings.

G. Submit complete set of record documents to Engineer prior to claim for final Application for Payment.

1.12 SUBMITTAL LOG

A. A submittal log is included as Section 01 33 23 of this Project Manual, which lists the minimum required Submittals, product data, samples, and operation and maintenance manuals. Additional submittals not listed on the log may be required by the Engineer during the course of construction. All submittals to the Engineer shall include the submittal number shown on the log. The minimum number of copies to be submitted is shown on the submittal log. Any additional copies required by the Contractor may be submitted in addition to the number shown on the log.

B. Submit a minimum of five (5) copies of the American Iron and Steel (AIS) checklist a minimum of one week prior to the pre-construction meeting. The AIS checklist shall provide a list of all products and materials to be furnished to complete the project. ENGINEER may review and request the CONTRACTOR to provide additional statements/certifications for any products and materials provided on the project.

C. Revised and updated AIS Checklist shall be provided with all pay requests. Certification or statements of AIS compliance shall be provided with payment requests for all AIS products and materials.

1.13 ELECTRONIC WEB BASED SUBMITTAL MANAGEMENT SOFTWARE

A. The Contractor shall supply electronic web based submittal management software such as eCommunication, Submittal Exchange, or approved equal for Submittal storage, notification, and transfer.
   1. Minimum electronic submittal system features:
      a. Defined work flow directed submission, review, and approval process for various types of contract related documents. Work flow process shall be specified to type of document. Include specific work flow process for:
         1) Requests for substitutes
         2) Shop drawings and product data
         3) Test results
         4) Operation and Maintenance data
         5) Request for Proposals
         6) Request for Information
         7) Change Orders
         8) Work Directive Changes
         9) Pay requests (draft and final)
         10) Guarantees, Warranties, Maintenance Agreements, and Workmanship Bonds
         11) Survey Data

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12) Certifications
13) Closeout Submittals
14) Miscellaneous project related documents including:
    a) Contract Documents – plans, specifications, and addenda
    b) Project schedule
    c) Schedule of Values
    d) Permits
    e) Project forms for document transmittal
    f) Construction photographs and video
    g) Inspection reports
    h) Project meeting minutes
    i) Contact information for each team member
15) Any additional categories as required by project-specific needs at no additional cost to the Owner

b. Defined work flow roles, responsibilities, and capabilities for defined teams including:
    1) Owner
    2) Engineer
    3) Contractor
    4) Subcontractors
c. Activities listed below shall be available based on team membership and agreed to team-based roles, and agreed to work flow process for a given category of activity:
    1) View items
    2) Submit new item
    3) Add files
    4) Sign and annotate files
    5) Process item
    6) Send item back to previous step
    7) Forward the item
    8) Share the item
d. Include tools to allow basic mark-up and annotation of files.
e. Provide email notification that submittal, RFI, or other item needs the attention of a team member.
f. Active item list of items requiring attention based on team member.
g. Ability of team members to add signature (PNG) or action stamp to files, based on assigned user rights.
h. Document library listing all closed documents posted on site, with ability of team members to view, print, or save items based on assigned user rights.
i. Ability to create and generate logs and reports.
j. Ability to view and download stored documents.

2. Provide system set up with input from Owner and Engineer
    a. Obtain and input email addresses of all project members intended to receive notification of submittal availability. Obtain and configure passwords to limit access to site. Include up to 20 persons for distribution and access.
    b. Modify system configuration as required for project specific requirements throughout the duration of the Project.
3. Provide training for all team members on use of the system
    a. Initial training sessions shall consist of a minimum of two (2) one (1) hour sessions. Each session shall be repeated once to accommodate team member availability.
    b. Coordination training dates and times at least one week in advance of proposed training dates.
    c. Have training manuals available at least one day prior to training session.
    d. Training shall occur in a mutually agreed location or may be offered via web based interactive session.
4. Security
    a. Cloud hosted in off-site Tier-1 environment.
    b. Include daily back-ups and redundant disk arrays (RAID 6).
    c. Enterprise level firewall, monitored for intrusion, spam and virus, and physical security.

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d. Capability for encrypted data transmission.

5. Project Closeout, File Retention, and Document Delivery:
   a. Within 4 weeks of final closeout of the Project, all project files present on the Document Management Website shall be archived for long term storage.
   b. Archived files shall be linked within a menu driven file structure accessible using Adobe Acrobat. Files shall be archived using the same file names and within the same file structure used on the website interface.
   c. All archived files shall be delivered on flash drive. Two (2) flash drives shall be provided.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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Project Name:			
Equipment Descrip:			
Spec Section:		Installation Date:	
Tag Number (s):			
Installation Location:			
Manufacturer:			
Address:			
Contact:		Phone:	
Vendor:			
Address:			
Contact:		Phone:	
Maintenance Requirements			
Frequency	Requirement		
Lubricants			
Recommended:		Alternative:	
Notes:			
Spare Parts			
Mechanical Nameplate Data			
Equipment			
Make			
Serial No.		ID No.	
Model No.		Frame No.	
HP	RPM	Capacity	Size
TDH	Imp Size	Belt No.	CFM
PSI			
Misc.			
Electrical Nameplate Data			
Equipment			
Make			
Serial No.		ID No.	
Model No.		Frame No.	
HP	Volts	Amp	Hz
Phase	RPM	SF	Duty
Code	Insul Class	Designation	Type
NEMA Designation		Temp Rise	
Rating			
Misc.			
Note: some items to be completed after shipment			

Motor Nameplate		
Manufacturer		
Frame	HP	Service Factor
Volts	Phase	Temp. Rating
Full Load Amps	Frequency	Locked Rotor Amps
RPM	Insul Class	
Design Letter	Code Letter	Time Rating
Efficiency		
Minimum Efficiency	Nominal Efficiency	
Motor Enclosure Type		
Open Drip Proof	TEFC	Explosion Proof (CL 1, Div 1)
Notes		
Motor Features		
Inverter Duty (Y / N)	Winding Overtemp Protection (Y / N)	Cast Iron Frame (Y / N)
NEMA Mounting Config	Bearing Life, hours:	
Motor Starter		
☐ FVNR	☐ FVR	☐ RVSS ☐ VFD

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

PROJECT: 2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION

MSA PROJECT NO: 00090019

CONTRACTOR:

						Referred			Action					# copies to			
Spec Section #	Spec Section Title/Product	Date Rec'd	Min. # Req'd	# Submitted	Submittal/Revision #	To	Date Sent	Date Reviewed	Reviewed with no Comments	Reviewed with Comments as Amend and Resubmit	Rejected		Date Ret'd	Contractor	Owner	Field	File
01 32 16	Construction Progress Schedule		6														
01 33 00	Submittals		6														
01 55 26	Traffic Control		6														
01 77 00	Closeout Procedures		6														
02 41 16	Structure Demolition		6														
02 41 19	Selective Structure Demolition		6														
03 15 00	Concrete Accessories		6														
03 20 00	Concrete Reinforcing		6														
03 30 00	Cast-In-Place Concrete		6														
03 62 00	Non-Shrink Grouting		6														
03 64 23	Epoxy/Grout Injection Crack Repair		6														
04 20 00	Unit Masonry System		6														
05 50 00	Metal Fabrications		6														
06 10 00	Rough Carpentry		6														

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

PROJECT: 2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION

MSA PROJECT NO: 00090019

CONTRACTOR:

Spec Section #	Spec Section Title/Product	Date Rec'd	Min. # Req'd	# Submitted	Submittal/Revision #	Referred			Action					# copies to			
						To	Date Sent	Date Reviewed	Reviewed with no Comments	Reviewed with Comments as Amend and Resubmit	Rejected		Date Ret'd	Contractor	Owner	Field	File
06 16 43	Exterior Gypsum Sheathing Board		6														
06 17 53	Shop-Fabricated Wood Trusses		6														
07 01 90	Joint Sealant Restoration		6														
07 11 13	Bituminous Dampproofing		6														
07 21 13	Board Insulation		6														
07 21 16	Blanket Insulation		6														
07 21 26	Blown Fiberglass Insulation		6														
07 24 00	Exterior Insulation and Finish Systems		6														
07 27 13	Sheet Membrane Air/Vapor Retarder		6														
07 27 26	Fluid-Applied Membrane Air/Vapor Retarder		6														
07 50 00	Preparation for Re-roofing		6														
07 62 00	Sheet Metal Flashing and Trim		6														
07 71 24	Seamless Gutters and Downspouts		6														
07 92 00	Joint Sealants		6														

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

PROJECT: 2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION

MSA PROJECT NO: 00090019

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Spec Section #	Spec Section Title/Product	Date Rec'd	Min. # Req'd	# Submitted	Submittal/Revision #	Referred			Action					# copies to			
						To	Date Sent	Date Reviewed	Reviewed with no Comments	Reviewed with Comments as Amend and Resubmit	Rejected		Date Ret'd	Contractor	Owner	Field	File
08 16 00	Fiberglass Reinforced Polyester Door and Frame		6														
08 71 00	Door Hardware		6														
08 81 00	Glass Glazing		6														
09 77 50	Fiberglass Reinforced Plastic Surfaced Laminated Panels		6														
09 96 00	High Performance Coatings		6														
10 14 00	Signage		6														
10 14 69	Warning Signs		6														
10 44 16	Fire Extinguishers		6														
13 34 00	Fabricated Engineered Structures		6														
22 00 00	Plumbing		6														
23 00 00	Heating, Ventilating and Air Conditioning (HVAC)		6														
26 05 19	Low-Voltage Electrical power Conductors and Cables (600V		6														
26 05 26	Grounding and Bonding for Electrical Systems		6														
26 05 29	Hangers and Supports for Electrical Systems		6														

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

PROJECT: 2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION

MSA PROJECT NO: 00090019

CONTRACTOR:

Spec Section #	Spec Section Title/Product	Date Rec'd	Min. # Req'd	# Submitted	Submittal/Revision #	Referred			Action					# copies to			
						To	Date Sent	Date Reviewed	Reviewed with no Comments	Reviewed with Comments as Amend and Resubmit	Rejected		Date Ret'd	Contractor	Owner	Field	File
26 05 34	Conduit		6														
26 05 35	Surface Raceways		6														
26 05 53	Identification for Electrical Systems		6														
26 24 16	Panelboards		6														
26 24 19	Motor-Control Centers		6														
26 29 13	Enclosed Controllers		6														
26 29 23	Variable-Frequency Motor Controllers		6														
26 90 00	Process Instrumentation and Control		6														
26 90 10	Control Panel Construction		6														
26 90 11	Control Panel Components		6														
26 90 20	Instrumentation Devices		6														
26 90 60	Ethernet Networking Equipment		6														
32 13 10	Concrete Sidewalk, Steps and Driveways		6														
32 91 19.13	Topsoil Placement Grading		6														

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

PROJECT: 2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION

MSA PROJECT NO: 00090019

CONTRACTOR:

Spec Section #	Spec Section Title/Product	Date Rec'd	Min. # Req'd	# Submitted	Submittal/Revision #	Referred To	Referred Date Sent	Date Reviewed	Action: Reviewed with no Comments	Action: Reviewed with Comments as Amend and Resubmit	Action: Rejected	Date Ret'd	# copies to: Contractor	# copies to: Owner	# copies to: Field	# copies to: File
32 92 19	Seeding		6													
40 23 36	Wastewater Process Piping System		6													
44 42 00.11	Non-Potable Water System		6													
44 42 73.10	Chemical Storage Tank		6													
44 42 76.10	Wastewater Process Valves and Specialties		6													
44 42 76.30	Mechanical Lift Slide Gate		6													
44 44 73.11	Ultraviolet Disinfection Equipment		6													

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SECTION 01 41 26
PERMITS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.
   1.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The Contractor shall comply in all ways with the requirements of the following permits:
   1. All required City of Wisconsin Dells and building permits
   2. Wisconsin DNR Construction Approval

B. The Contractor shall comply in all ways with the requirements of the following permits:
   1. All state building permits.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS

A. Contractor shall provide a copy of each permit to the Engineer for record.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 45 00
QUALITY CONTROL

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Provide quality control for all work performed under this contract as described in this section.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Material and Equipment - Division 01

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 QUALITY ASSURANCE

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.08 TOLERANCES

A. Monitor tolerance control of installed products to produce acceptable work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.09 REFERENCES

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A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. The contractual relationship, duties, and responsibilities of the parties in Contract nor those of the Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.10 MOCK-UP

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups are representative of the quality required for the work.

D. Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.11 INSPECTING AND TESTING LABORATORY SERVICES

A. Contractor shall be responsible for concrete testing as outlined in Division 01 (Concrete Quality Control) of these specifications. For other testing, Owner will appoint, contract, and pay for the services of an independent firm to perform inspecting and testing.

B. The independent firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Engineer or the Owner.

C. Inspecting, testing, and source quality control may occur on or off the project site. Perform off-site inspecting or testing as required by the Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Engineer indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
   1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
   2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing or inspecting does not relieve Contractor from the responsibility to perform Work to contract requirements.

G. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting inspecting or testing charges from the Contract Sum/Price.

1.12 MANUFACTURERS' FIELD SERVICES AND REPORTS

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A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, and test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report within 30 days of observation to Engineer for information.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 45 16.11
CONCRETE QUALITY CONTROL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover sampling and testing of concrete to determine the materials conformance and work conformance to the requirements specified for cast-in-place concrete.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Accessories - Division 03

C. Cast-in-Place Concrete - Division 03

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Concrete Institute (ACI), Annual Book of ACI Standards:
      a. ACI 117/177R - Specification for Tolerances for Concrete Construction and Materials and Commentary, Current Edition.
      b. ACI 209.1R - Report on Factors Affecting Shrinkage and Creep of Hardened Concrete, Current Edition.
      c. ACI 301 - Specifications for Structural Concrete, Current Edition.
      d. ACI 302.1R - Guide for Concrete Floor and Slab Construction, Current Edition.
      e. ACI 305R - Hot Weather Concreting, Current Edition.
      f. ACI 306.1 (R2002) - Standard Specification for Cold Weather Concreting, Current Edition.
      g. ACI 311.4R - Guide for Concrete Inspection, Current Edition.
      h. ACI 318/318R - Building Code Requirements for Structural Concrete and Commentary, Current Edition.
      i. ACI 530/530.1/530R/530.1R - Building Code Requirements and Specification for Masonry Structures and Related Commentaries, Current Edition.
      j. ACI ASCC-1(05) - The Contractor's Guide to Quality Concrete Construction, Third Edition.
      k. ACI CP-10/PACK - Craftsman Study Package for ACI Certification of Concrete Flatwork Finisher, Current Edition.
      l. ACI MCP06 - ACI Manual of Concrete Practice, Parts 1 through 6, and Index, 2006 Edition.
      m. ACI SCM-24 - Concrete Repair Basics, Current Edition.
      n. ACI SP-4 - Formwork for Concrete, Current Edition.
      o. ACI SP-15 - Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with Selected ACI Reference, Current Edition.
      p. ACI SP-71 - ASTM Standards in 318, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field, Current Edition.
      b. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens, Current Edition.
      c. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete, Current Edition.

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d. ASTM C78 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading), Current Edition.
e. ASTM C114 - Standard Test Methods for Chemical Analysis of Hydraulic Cement, Current Edition.
f. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete, Current Edition.
g. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete, Current Edition.
h. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method, Current Edition.
i. ASTM C183 - Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement, Current Edition.
j. ASTM C186 - Standard Test Method for Heat of Hydration of Hydraulic Cement, Current Edition.
k. ASTM C187 - Standard Test Method for Normal Consistency of Hydraulic Cement, Current Edition.
l. ASTM C188 - Standard Test Method for Density of Hydraulic Cement, Current Edition.
m. ASTM C192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory, Current Edition.
n. ASTM C219 - Standard Terminology Relating to Hydraulic Cement, Current Edition.
o. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method, Current Edition.
p. ASTM C470 - Standard Specification for Molds for Forming Concrete Test Cylinders Vertically, Current Edition.
q. ASTM C823 - Standard Practice for Examination and Sampling of Hardened Concrete in Constructions, Current Edition.
r. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing, Current Edition.

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 TESTING FOR ACCEPTANCE

A. Samples of concrete shall be delivered to a location on the site where material conformance tests can be performed.
1. Samples of concrete shall be obtained in accordance with ASTM C172.
2. Test specimens shall be stored without being disturbed for the first 24 hours.
3. Contractor's Sampling and Testing. The Contractor, or independent testing laboratory engaged and paid for by the Contractor, as approved by the Engineer, shall conduct tests on the proposed concrete mixture to determine the slump, entrained air content, compressive strength, or other appropriate tests to determine conformance with these specifications. The Contractor shall supply the standard equipment and molds necessary, and the Contractor shall transport the test specimens to the testing laboratory.
4. Owner's Sampling and Testing. The Owner may conduct tests on the proposed concrete mixture to determine the slump, entrained air content, compressive strength, or other appropriate tests to determine conformance with these specifications, as deemed necessary by the Engineer.

B. Slump and Air Content Tests
1. Slump tests shall be made in accordance with ASTM C143. Air content tests shall be made in accordance with ASTM C173 or ASTM C231. Slump tests and air tests shall always be performed from the same batch from which strength tests are performed.

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2. If the measured slump or air content falls outside the limits specified, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed to meet the requirements of the specifications and shall not be used in the work.

C. Strength Tests (Contractor's Sampling and Testing for Acceptance). Results from tests conducted by the Contractor shall be considered evidence of compliance of Contractor's materials used in the work, when strength is used as the basis for acceptance.

1. Cylinders for strength tests shall be made in accordance with ASTM C31. During the first 24 hours all test specimens shall be covered and kept at air temperatures between 60 Degrees Fahrenheit and 80 Degrees Fahrenheit in facilities provided on the job site by the Contractor. At the end of 24 hours, specimens will be carefully transported by the Contractor to the testing laboratory, where molds shall be removed, and cylinders shall be cured in a moist condition at 73.4 Degrees Fahrenheit ±3.0 Degrees Fahrenheit until time of test.
2. A strength test for any class of concrete shall consist of four standard cylinders made from a composite sample secured from a single load of concrete in accordance with ASTM C172, with one cylinder tested at 7 days, two at 28 days, and the fourth used as a spare. The test results at 28 days shall be the average of the strength of two specimens determined in accordance with ASTM C39, except that if one specimen in a test shows manifest evidence of improper sampling, molding or testing, it shall be disregarded and the spare cylinder shall be tested.

D. Strength Test (For Early Formwork or Shoring Removal). If the Contractor wishes to remove formwork or shoring prior to the minimum time as specified in Structural Cast-In-Place Concrete Forming - Division 03, they shall, at their expense, prepare test cylinders as evidence of concrete strength as follows:

1. Cylinders shall be made in accordance with ASTM C31. During the period of time from completion of the pour to removal of protective cover and stripping of forms, all test specimens shall be kept with the pour and be subjected to ambient conditions resulting from the curing and protection facilities provided on the job site by the Contractor. At the end of this period, specimens will be carefully transported by the Contractor to the testing laboratory, where molds shall be removed and cylinders shall be stored in outdoor ambient conditions to simulate on job site conditions until time of test.
2. A minimum of two cylinders made from a composite sample secured from a single load of concrete in accordance with ASTM C172. The test results shall be the average of the strength of two specimens determined in accordance with ASTM C39, except that if one specimen in a test shows manifest evidence of improper sampling, molding or testing, it shall be disregarded.

3.02 SELECTION OF TESTING LABORATORY

A. An independent testing laboratory to perform Concrete Quality Control shall meet the requirements of ASTM E329. The laboratory shall be selected by the Contractor as approved by the Engineer.

3.03 TEST REPORTS

A. Test reports will be directly distributed by the laboratory as follows: The original to the Contractor; two copies to the Engineer; one copy to the Owner.

3.04 TESTING REQUIREMENTS

A. The Contractor shall be required to perform one test for each 25 cubic yards of concrete poured, or fraction thereof, for each class of concrete used. Each test shall consist of four (4) cylinders; one (1) to be tested at seven (7) days, two (2) to be tested at twenty-eight (28) days, and one (1) to be a spare.

B. Compliance testing shall be performed on every single load, or portion thereof, where water addition to the single load, or portion thereof, takes place on site.

C. A minimum of one (1) test shall be performed per day for each class of concrete placed.

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3.05 CONDITIONS OF COMPLIANCE AND NON-COMPLIANCE

A. Compliance of Contractor's Materials Used in the Work.

1. To conform to the requirements of this specification, every 28-day test representing each mix must be equal to or greater than the specified minimum strength without exception. If a specimen shows manifest evidence of improper sampling, molding, or testing, it will be disregarded. Note, however, that the anticipated strength for all mixes is appreciably above the specified minimum strength due to quality required by the water-cement ratio specified.

B. Non-Compliance of Contractor's Materials Used in the Work

1. When strength is used as the basis for acceptance, should individual tests of the Contractor's specimens produce strengths less than 90% of the specified strength (f'c), tests of cores drilled from the area in question may be required in accordance with ASTM C42. Three cores shall be taken for each cylinder test less than 90% of the specified strength (f'c). If the concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60 to 80°F, relative humidity less than 60 percent) for seven (7) days before test and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet.
2. Concrete represented by the core tests will be considered structurally adequate and meet the requirements of this specification if the average of the three cores is equal to at least 95 percent of the specified strength (f'c) and if no single core is less than 90 percent of f'c. To check testing accuracy, locations represented by erratic core strengths may be retested. If these strength acceptance criteria are not met by the core tests, the Engineer shall order appropriate action at no additional cost to the Owner.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover all materials, equipment, tools, labor and supervision necessary to execute the temporary facilities and controls required for the work.

B. Contractor shall be responsible to obtain from authorities of each respective utility the necessary service for water, electricity, telephone, etc., or make arrangements with the Owner for some or all of these services as specified below.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (NONE)

PART 3 EXECUTION (N/A)

3.01 TEMPORARY ELECTRIC

A. The Contractor shall be responsible for coordinating the installation of primary electric service to the site. Contractor shall be responsible for all work associated with obtaining temporary electric service. Meter for temporary electric service shall be in Contractor's name, and Contractor shall be responsible for all electric power bills for the temporary service until Substantial Completion has been granted by Owner.

3.02 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels.

C. Maintain lighting and provide routine repairs.

D. Permanent building lighting may be utilized during construction.

3.03 TEMPORARY HEATING

A. Heat enclosed areas to achieve curing of materials, to dissipate humidity, and to in general provide with environmental conditions required for construction operations.
   1. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

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2. Enclose building prior to activating temporary heat in accordance with Enclosures article in this section.
3. Operation of new permanent equipment for temporary heating purposes is not allowed.
4. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelope. Combustion gas shall not be allowed in any temporary enclosure and building envelope.

3.04 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
1. Provide and pay for ventilation devices and as needed to maintain specified conditions for construction operations. Provide separate metering and reimburse Owner for cost of energy used.
2. Operation of new permanent equipment for temporary ventilating purposes is not allowed.

3.05 TEMPORARY WATER

A. Contractors may obtain water from the on-site water system at no cost, however, usage shall be metered and a record provided to Owner at the end of the project. Approval from owner is required prior to obtaining water.

3.06 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

3.07 TEMPORARY FIELD OFFICES AND SHEDS

A. Do not use existing facilities for field offices or for storage.

B. Do not use permanent facilities for field offices or for storage.

C. Provide space and facilities for Project as required.

D. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

3.08 VEHICULAR ACCESS

A. Provide unimpeded access for emergency vehicles. Maintain 20 foot wide driveways with turning space between and around combustible materials.

B. Provide and maintain access to fire hydrants and control valves free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Use designated existing on-site roads for construction traffic.

3.09 TEMPORARY PARKING

A. Arrange for temporary parking areas to accommodate construction personnel. Use of designated areas of existing parking facilities used by construction personnel is permitted. Locate as approved by Owner. Coordinate specific requirements with Owner.

B. When site space is not adequate, provide additional off-site parking.

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C. Use of existing on-site streets and driveways used for construction traffic is permitted. Tracked vehicles not allowed on paved areas.

D. Do not allow heavy vehicles or construction equipment in parking areas.

E. Do not allow heavy vehicle parking on existing pavement.

F. Permanent Pavements and Parking Facilities:
1. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.
2. Use of permanent parking structures is not permitted.

G. Maintenance:
1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
2. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

H. Removal, Repair:
1. Remove temporary materials and construction when permanent paving is usable.
2. Remove underground work and compacted materials to depth of 2 foot fill and grade site as specified.
3. Repair existing facilities damaged by use, to original or better than condition.

I. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

3.10 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

3.11 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for access to existing buildings.

C. Provide protection for facilities designated to remain. Replace damaged facilities.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

3.12 TEMPORARY ENCLOSURES

A. Exterior Enclosures:

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1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

B. Interior Enclosures:
1. Provide temporary partitions and ceilings as indicated on contract drawings to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.
2. Construction: Framing and plywood sheet materials with closed joints and sealed edges at intersections with existing surface.

3.13 TEMPORARY SECURITY

A. Security Program:
1. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
2. Initiate program in coordination with Owner's existing security system at project mobilization.
3. Maintain program throughout construction period until Owner acceptance precludes need for Contractor security.

B. Entry Control:
1. Owner will control entrance of persons and vehicles related to Owner's operations.
2. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

3.14 TEMPORARY WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

3.15 TEMPORARY DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

3.16 TEMPORARY EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

3.17 NOISE CONTROL (N/A)

3.18 PEST CONTROL (N/A)

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3.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials, prior to Substantial Completion inspection.

B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on contract drawings.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 55 26
TRAFFIC CONTROL

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, current edition.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall include installing and maintaining traffic control devices to safely and efficiently direct traffic through or around the construction site.

B. The work also includes removing temporary traffic control devices at the completion of the project.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Work Restrictions and Provisions – Division 01

C. Submittals – Division 01

1.05 SUBMITTALS

A. If a detailed traffic control plan is not included in the Contract Drawings, the Contractor shall submit a traffic control plan. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (N/A)

PART 2 PRODUCTS AND MATERIALS

2.01 GENERAL

A. Traffic control devices and materials shall conform to the MUTCD and Wisconsin Department of Transportation specifications.

PART 3 EXECUTION

3.01 TRAFFIC CONTROL

A. All Contractors shall provide adequate traffic control, as required. It shall be the Contractor's responsibility to notify the City of Wisconsin Dells prior to any construction activities within a public right-of-way and coordinate the installation and removal of said traffic control.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 60 00
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK (NONE)

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Quality Control - Division 01

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 REQUIREMENTS

A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

1.08 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.09 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions, with seals and labels intact and legible.

B. Store sensitive Products in weathertight, climate controlled enclosures.

C. For exterior storage of fabricated Products, place on sloped supports, above ground.

D. Provide insured off-site storage and protection when site does not permit on-site storage or protection.

E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Product.

F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

G. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

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H. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.10 OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.11 SUBSTITUTIONS

A. Engineer will consider requests for Substitutions only within 30 days after date established in Notice to Proceed. Approval or disapproval of a substitution after bidding is entirely at the Engineer's discretion.

B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:
1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
2. Will provide the same warranty for the Substitution as for the specified Product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
1. Submit one copy of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Submittals, Product Data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
3. The Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 73 00
EXECUTION

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The Work includes work at the wastewater treatment facility as described in Section 01 11 00 Summary of Work.

B. The Contractor shall be responsible for performing the work according to a sequence of construction that will not adversely affect the continued operation, performance, or reliability of the wastewater treatment facilities and related systems during construction.

C. The Contractor shall provide temporary facilities, including bypass pumping equipment and bypass piping, as necessary to ensure that the existing treatment facility continues to operate satisfactorily during the construction of the new facilities.
   1. If interruption of wastewater treatment systems (including but not limited to screening, aeration, pumping, storage, and any biological, physical, and chemical processes) or power outage is proposed, the Contractor shall provide temporary facilities to replace the disrupted operations.
   2. The Contractor will be responsible to provide and operate all temporary pumps, automatic controls, equipment, and temporary piping to maintain operation of the existing wastewater treatment facility during construction and implement phased construction in the recommended sequence.

D. The Work includes selective demolition and the replacement of various equipment and piping at the wastewater treatment facility, along with the modifications to existing structures, and the construction of new structures, equipment and piping that will impact the operation of the existing facilities.

E. Contractor shall provide manpower, labor, and equipment as needed to implement the start-up of newly constructed and modified facilities and implement the shutdown of existing facilities one-at-a-time prior to construction modifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Project Meetings – 01 31 19

C. All sections of this Project Manual

1.05 SUBMITTALS

A. Where the work impacts the operation of the existing facilities and new construction, the Contractor shall submit a detailed sequence of construction and daily schedule that demonstrates the ability to maintain the necessary reliability and performance of the treatment facility. Where temporary facilities are required, the Contractor shall detail the equipment and materials that will be provided to ensure the reliability and performance of the treatment facility. See Section 01 33 00 - Submittals.

B. Temporary Bypass Pumping Plan
   1. Temporary Bypass Pumping Plans designated by type and location.
   2. System test results and operation logs.

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3. Obtain Engineer and Owner approval of submittals prior to mobilization of equipment included in the plans.
4. Temporary Bypass Pumping Plan – For Daily System Shutdowns
    a. Outline provisions and precautions to be taken to convey and maintain existing wastewater flows during construction.
    b. Ensure proper protection of existing facilities, the project area, and surrounding properties from damage due to the discharge of flows.
    c. Provide adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be located at the mainline flow bypassing locations, ready for use in the event of primary pump failure. In this event, promptly repair or replace the failed equipment.
    d. Include the following as a minimum:
        1) Manufacturer's product data for bypass pumps including sizes, capacities, power requirements, and number of each size to be on site including primary, secondary, and spare pumps.
        2) Manufacturer's product data for bypass piping including make, material, material properties, diameter, thickness, pressure rating, and number to be on site.
        3) Calculations to demonstrate sufficient pump capacity for potential flows.
        4) Method of noise control for pumps, motors, and generators.
        5) Location and method of connection to the existing sewer on each side of the bypass if not provided in the Contract Documents.
        6) Number, size, material, and method of installation of suction and discharge piping, valves (isolation and air release), fittings, and other components for connection to the existing sewer system.
        7) Sewer isolation or plugging method and types of plugs or valves and fittings.
        8) Emergency plan for adverse weather and flooding for various phases of the work.
        9) Incidental items required to ensure proper protection of the facilities.
        10) Traffic Control Plan where roads are impacted.
        11) Plan to divert pedestrian access where sidewalks are impacted.
5. Temporary Bypass Pumping Plan – For Overnight System Shutdowns or for Periods Greater Than One Day.
    a. Prepare and submit a project- and site-specific detailed temporary bypass pumping plan that provides detailed descriptions and layout drawings of the proposed temporary bypass pumping system(s). Outline provisions and precautions to be taken by the Contractor to convey and maintain existing wastewater flows during construction.
    b. Ensure proper protection of existing facilities, the project area, and surrounding properties from damage due to the discharge of flows.
    c. Include the following as a minimum:
        1) Size of pipeline or conveyance system to be bypassed.
        2) Staging areas for pumps.
        3) Manufacturer's product data for temporary bypass pump sizes, capacities, power requirements, and number of each size to be on site including primary, secondary, and spare pumps. Provide method of operation and control, and redundancy sufficient to prevent SSOs.
        4) Provisions for standby power including generator size and location.
        5) Provisions for stand-by lighting.
        6) Method of noise control for pumps, motors, or generators.
        7) Location and method of connection to the existing sewer on each side of the bypass if not provided in the Contract Documents.
        8) Size and location of manholes or access points for suction and discharge hose or piping.
        9) Provide level detection equipment, alarms, drives, controls, fittings, valves, air release valves, fuel tanks, auxiliary fuel tanks, and other components for a reliable stand-alone system. Provide sufficient components for a redundant system.
        10) Plan indicating location of temporary bypass pumping pipe locations.
        11) Number, size, material, location, and method of installation of suction and discharge piping, valves (isolation and air release), fittings, and connections to the existing sewer system.

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12) Thrust and restraint block sizes and locations.
13) Sewer isolation or plugging method and types of plugs or valves and fittings.
14) Discharge plan including method of protecting discharge manholes or structures from erosion and other damage.
15) Access plans to temporary bypass pumping locations indicated on the drawings.
16) Temporary pipe supports and anchoring.
17) Calculations of static lift, friction losses, flow velocity (pump curves showing pump operating range shall be submitted), and bypass pipe size verification.
18) Schedule for installation, operation, maintenance, and removal of the temporary bypass pumping system(s).
19) Emergency plan for adverse weather and flooding for various phases of the work.
20) Contractor's plan for providing continuous (24-hour) monitoring of the temporary bypass pumping operation as well as the monitoring persons' qualifications.
21) Plan for refueling pump sets on demand.
22) Demonstration of compliance with the requirements and permit conditions specified in the Contract Documents.
23) Incidental items necessary to insure proper protection of the facilities.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. O&M manuals, that include, but not limited to, ratings for equipment (such as flow rates for pumps and blowers, screening capacities, filter removal rates, etc.) and intended layouts with piping, valves, equipment, etc. for all temporary facilities and equipment, shall be located onsite and readily available to the Contractor, Owner, and Engineer.

1.07 CRITICAL DELIVERY OF EQUIPMENT AND MATERIALS

A. No extra time or additional costs will be allowed by the Owner for any cause for delay in the delivery of products, materials, and equipment required in this Project.

B. Critical delivery of equipment and materials shall be included in the Contractor provided construction schedule submittal.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 CONSTRUCTION METHODS

3.01 SEQUENCE OF CONSTRUCTION

A. Contractor shall host Scheduling Meetings that reflect the sequence of construction and construction schedule as described in 01 31 19 Project Meetings.
   1. Submittals of long lead time equipment and materials should be high priority so purchase orders can be submitted to manufacturers.
   2. Contractor shall continuously update the project schedule to include equipment and material lead times to determine possible schedule delays well in advance of substantial completion.

B. The Contractor is responsible for the sequence of construction and construction schedule. The Contractor's sequence of construction is to ensure the continued performance and reliability of the existing wastewater collection system and the treatment facilities during construction and to ensure the successful start-up of all new facilities.

C. The Contractor shall clearly define their intended sequence of construction in the submitted construction schedule. The sequence of construction shall be identified by the Contractor at the Pre-Construction Meeting for discussion and approval by Owner and Engineer.
   1. Equipment lead times shall be included in all submittals.

3.02 TEMPORARY TREATMENT AND BYPASS PUMPING

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A. The Contractor is responsible for all related temporary treatment and bypass pumping costs.

B. All temporary and modified systems shall be freeze protected.

C. Temporary treatment may be required during the following work:
   1. Chemical storage tank and feed pump removal and replacement in STR 30

D. Temporary bypass pumping may be required during the following work:
   1. Structural and UV system modifications in STR 50

E. Temporary systems may be required during the following work:
   1. Architectural modifications to STR 05
   2. Removal and replacement of potable water pressure tank in STR 60

3.03 POTABLE WATER SYSTEM

A. Contractor shall keep the potable water system running at all times.

B. Contractor is responsible to coordinate any short-term shutdowns to accommodate potable water system modifications in STR 60 with the Owner and Engineer.

C. If short-term shutdowns are necessary, temporary plumbing is required to ensure facility operation during short-term shutdowns. Contractor must coordinate temporary plumbing with the Owner and Engineer.

3.04 BYPASS PUMPING

A. Temporary pumping shall be provided for daily, overnight, and extended shutdowns of the sewer and wastewater treatment systems.
   1. Contractor shall provide bypass pumping plan as a submittal to the Engineer and Owner.
   2. Firm Capacity shall be provided: The pumping capacity of a temporary bypass pumping system with the largest pump out of service.
      a. Historical WWTF flow rates during non-disinfection season
         1) Average day flow = 1.5 MGD
         2) Maximum day flow = 4.2 MGD
         3) Minimum day flow = 0.5 MGD
   3. Coordination
      a. Coordinate temporary bypass pumping system testing with Engineer and Owner Provide 72-hour notice prior to system testing. Engineer or Owner representative must observe testing for it to be accepted.
      b. Coordinate system shutdowns with Engineer and Owner.
      c. Single day bypassing events shall be coordinated with the weather forecast and shall be done during dry weather. For bypassing events >1 day, Contractor shall provide bypass pumping capacity for peak hour capacity.
      d. It will be the Contractor's responsibility to obtain and pay for any permits required.

3.05 EQUIPMENT STARTUP

A. Contractor shall provide startup and commission of all existing and new equipment. This includes, but not limited to, all work that is incorporated into the existing and new SCADA system.

3.06 CONSTRUCTION CONSTRAINTS

A. All equipment shutdowns, bypasses, and temporary treatment systems shall be coordinated with the Owner.

B. Control Building – STR 05
   1. The building will remain in use during the duration of construction and is of primary use by all the Owner's staff. Access to the building shall be always maintained with the exception of special occurrences that are pre-approved and scheduled with the Owner in advance.

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2. The general contractor has discretion to coordinate and implement the needed work at this building to accommodate owner usage/access and facilitate effective construction process. Acquisition of almost all associated materials in advance and an efficient sequence of work is recommended to shorten the construction duration to the extent possible.
3. Roofing replacement and alterations includes the proposed roof overhang extensions. It is perceived that the roof overhang extensions may likely take place before the work below to best direct the roof water away from the work below. The sequence is at the contractor's discretion.
4. Coordinate walk door replacements to maintain a walk route into and out of the building.
5. Foundation improvements will impact garage access with excavation and masonry work and backfill. Work must be phased to maintain garage door access for either the entire North side or the entire South side with the exception of pre-approved periods of time no greater than 1-week with advanced notice and Owner approval.
6. Masonry installation and site restoration to be coordinated to maintain building and garage access as described above.

C. Chemical Building – STR 30
1. Chemical addition for phosphorus removal is required to be maintained throughout construction. Contractor is to use discretion in timing of construction of STR 30 as WWTF uses Alum for chemical addition. If temperatures are encroaching on freezing, Contractor is responsible for maintaining temperatures required in STR 30 building and prevention of freezing of temporary Alum feed.

D. UV Disinfection – STR 50
1. Disinfection is only required May 1st through September 30th. The disinfection system may be bypassed for work on UV system in STR 50 outside of these dates. UV system shall be tested and started up 14 days prior to the beginning of disinfection on May 1.

E. Sludge Feed Pump and Dewatering Press Feed Pumps – STR 60 and STR 70
1. Demolition and installation sequencing shall be coordinated with Owner's digester transfer and dewatering press feed schedule. Contractor shall coordinate with Owner for Owner to remove waste from sludge storage tank as feasible.
2. Sludge feed pumps in STR 60 shall be replaced one at a time, keeping one sludge feed pump online at all times.
3. During the replacement of the dewatering press feed pump in STR 70, the sludge pumps in STR 60 shall be utilized to feed the dewatering press while the dewatering press feed pump is offline. STR 70 and STR 60 pumps are not to be out of service concurrently.

F. Pelletizer System – STR 75
1. Installation of the pelletizer system equipment may take place during periods while the sludge drying equipment is completing a drying cycle. Contractor to coordinate with Owner and not impede WWTF operations for completion of biosolids drying.
2. Contractor shall complete tie-ins to existing system during periods when a drying cycle is not occurring.
3. Startup of the pelletizer system equipment shall be coordinated with the Owner's sludge drying schedule.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 75 16
EQUIPMENT START-UP

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Process Mechanical treatment equipment shall be started up as complete process systems. A system includes all of the various components and equipment that function together to make the system work including accessory equipment such as HVAC, process instrumentation and control and electrical equipment.
   1. Work covers all equipment in Divisions 13, 22, 23, 26, 33, 40, 41, and 44.

B. The Contractor will designate a Start-up Coordinator in writing.
   1. The Coordinator will be responsible for scheduling the various parties involved in each system for equipment checkout and training.
   2. The Coordinator will provide the Engineer with a detailed schedule for equipment checkout, training, and system demonstration for each complete process system.
   3. The Coordinator will be responsible for expediting repairs and interface problems that arise during equipment checkout.
   4. The Coordinator will serve as the liaison between the equipment suppliers and technicians and the Engineer and Owner.

C. Equipment start-up will consist of four phases.
   1. Phase One: Adjustment and Check Out. Each equipment item will be inspected by a factory certified technician so that it is ready to be placed into service.
      a. This will be done for all of the various equipment items in the process system.
      b. The technician will provide the Engineer and Owner with a detailed report describing the adjustments, alignments, calibrations, and settings that he made and listing any damaged parts that were repaired or replaced and certifying that the equipment is properly installed. The report will contain a certification that the equipment has been completely checked out and is 100% ready to go into service.
      c. The Contractor shall provide enough oil and grease to get the equipment operational and to maintain it for a period of one year after the systems demonstration has been completed, including seasonal oil changes.
      d. Programming and software installation will be completed during phase one of the start-up.
      e. As part of his adjustment, the Systems Integrator shall physically demonstrate that all alarms and control sequences are operational in the presence of the Engineer and Owner. The Systems Integrator will prepare a written checklist of the alarms and controls with appropriate boxes for the Engineer and Owner to initial their approval of those various items and another column for comments. This demonstration will also serve the purpose of allowing the Owner and Engineer to review the alarms and control sequences and to make any desired changes prior to training.
   2. Phase Two: Operator Training.
      a. O&M manuals must be submitted a minimum of three weeks prior to training.
      b. Equipment adjustment and check out is to be 100% complete for all of the various items in the process system so that the system is completely functional as a whole prior to training of any individual items.
      c. Training must be conducted by a factory-approved instructor who is familiar with the theory of the equipment operation, all the facets of the physical operation and repair of the equipment item.
      d. The instructor will refer to the O&M manual during training.
      e. Use charts and illustrations where possible to enhance the explanation of the equipment operation.

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f. Provide a “Certificate of Instructional Services” to be signed by both the Owner and the instructor verifying that training was provided to the satisfaction of all parties.

g. Training will consist of two parts. These will be applicable to all equipment in the process system including accessory items such as HVAC, controls, and electrical.

1) The first part will be classroom instruction to give an overview of the theory of the equipment operation, the mechanical equipment operation and maintenance and the various functions the equipment is to perform.

2) The second part will consist of field training where plant personnel can observe the operation of the equipment and further instruction can take place by directly pointing out items on the machine.

h. Training will include specific information on lubricant type, viscosity, and volumes necessary for the particular model of equipment.

i. It is intended that structures and buildings will be basically complete and have been cleaned when training occurs.

j. The Owner may videotape the training if he desires.

3. Phase Three: Consecutive Seven-Day System Demonstration. During this phase, the equipment will be allowed to run in automatic mode for seven consecutive days.

a. If all items in the system function perfectly for seven days the system will be considered substantially complete and will be accepted by the Owner. If at anytime during the demonstration there are any problems, malfunctions, or the Engineer feels that the system is not operating correctly, the problem will be corrected and the test will then be rerun starting at day one.

b. The Contractor will keep a daily log describing how the system worked during the seven-day test and will note any problems or repairs that were made. This log will continue on as a retest if necessary.

c. The Contractor will be responsible for all maintenance on the system until a successful system’s demonstration has been completed.

d. The Contractor will provide any temporary facilities and services necessary to complete the systems testing.

4. Phase Four: Post Start-up Training. The Contractor will include a cost in his bid to provide a one day post start up training session approximately three months after the equipment has been placed into service, or as requested by the Owner. Travel time is additional to the one-day instructional time.

a. The instructor will check out the equipment to see that it is still operating properly.

b. The instructor will review the training for the equipment given previously and answer questions.

c. The instructor will provide a “Certificate of Post Start-up Services” for the Owner to sign.

1.04 RELATED WORK ELSEWHERE

A. All sections of this Project Manual

1.05 SUBMITTALS

A. Submit coordinated startup schedules for all pieces of equipment at least 30 days prior to startup and training activities.

B. Equipment Commissioning Reports for all equipment.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. O&M manuals shall be provided at least three weeks prior to commissioning, startup, and training of the applicable piece of equipment.

PART 2 PRODUCTS AND MATERIALS (NONE)

PART 3 EXECUTION

3.01 START-UP

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A. Schedule start-up and training with the engineer at least fourteen days in advance.

B. Classroom training will take place at a location designated by the Owner.

C. Process systems will not be considered substantially complete until the systems testing for that process has been successfully completed.

D. Contractor and subcontractors, including but not limited to, general, mechanical, electrical, and integrator, whose scope of work is necessary for equipment function shall be present at startup.

E. Contractor shall plan for no more than one equipment start-up per day. If more than two equipment start-ups are planned per week, Owner and Engineer shall approve dates and times before scheduling. This is not applicable to pieces of equipment that are required to be started up together to create an entire operable system.

3.02 FAILED AND CANCELLED START-UP

A. Contractor is responsible for the coordination, scheduling, and completion of all start-up work. Failed or cancelled start-up efforts will result in extra costs for the Owner and Engineer. Cancelled start-ups will be accommodated at no charge if more than 48-hour notice is provided.

B. Contractor shall recognize that time is of the essence and that Owner will suffer financial loss if start-up work is not completed as scheduled. The Contractor shall also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the Owner if the Work is not completed as scheduled. Accordingly, instead of required any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner $2,500.00 for each failed or cancelled start-up that results in additional start-up work.

PART 4 MEASUREMENT AND PAYMENT (NONE)

END OF SECTION

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1702 Pankratz Street
Madison, WI 53704

P (608) 242-7779
TF (800) 446-0679
F (608) 242-5664

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Submittal Number	Rev.	Copies	Spec Section	Description

Submitted for:		Action Taken:			
	Your approval		Approved as Submitted		Resubmit
	For Your use		Approved as Noted		Submit
	As requested		Review and Comments		Returned
	Return by:				Returned for Corrections

Remarks:
INSTALLATION AND INSTRUCTIONAL SERVICES ENCLOSED.

Transmitted by: _____ Reviewed by: _____
Name
Ph: F:
Email:

Review of this document and approval or approval as noted shall not relieve the material supplier or subcontractor from the responsibility for any errors therein or for furnishing the materials and equipment of proper dimension, size, quantity, quality and al performance characteristics to meet the requirements and intent of the contract documents.

Copies: __ File
__ Field
__

MANUFACTURER/SUPPLIER CERTIFICATE OF
PROPER INSTALLATION/START-UP/OPERATOR TRAINING

Project Name and/or Location:	
Owner:	
Engineer:	
Specification No.:	
Equipment:	
Manufacturer/Serial No:	

As a result of this inspection, operation and testing, we hereby certify the following: (please check or mark n/a where appropriate)

	Start-up has been completed. Start-up requirements of specific specification divisions have been met?
	Phase 1 has been completed. Certification and report have been provided to Engineer and Owner.
	Phase 2 has been completed. Operator has been trained to operate and maintain equipment. O&M manuals have been provided. "Certificate of Instructional Services" have been signed and provided to Owner.
	Phase 3 has been completed. Consecutive 7-day system demonstration has been completed.
	Phase 4 has been scheduled. Dates for the post start-up training has been coordinated with Engineer and Owner. "Certificate of Post Start-up Services" will be provided.
	Process instrumentation and control systems, including all I/O points, have been demonstrated and accepted by the Engineer and Owner.
	Specified spare parts have been furnished.
	Lubricants have been provided for 1 year of service
	Equipment conforms to the requirements of the contract documents.
	Equipment is ready for permanent operation by others.
	That nothing in the installation will render the manufacturer's warranty null and void.
	Manufacturer's Rep to provide a copy of their business card.
	Installation deficiencies have been corrected?
Observations/Recommendations/Comments:	

Manufacturer's Rep:	Signature: Cell/Phone Number:	Date:
Owner Rep:	Signature:	Date:
MSA Rep:	Signature:	Date:

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover: starting of systems; demonstration and instructions; testing, adjusting and balancing; operation and maintenance data; protecting installed and completed construction; final cleaning; manuals for materials and finishes; manual for equipment and systems; spare parts and maintenance products; product warranties, guarantees and bonds; project closeout procedures; and maintenance service.

B. The Contractor shall assume the responsibility for the protection of all finished construction until accepted by the Owner. The Contractor shall repair and restore any and all damage to finished work to the satisfaction of the Engineer.

C. The Contractor shall require each trade to clean the premises of accumulations of surplus materials and rubbish caused by their activities. Burning of rubbish on site will not be permitted.

1.04 RELATED WORK ELSEWHERE

A. All sections of this Project Manual

1.05 SUBMITTALS

A. The Contactor shall provide to the Engineer a completed list of Disadvantaged Business Enterprise subcontractors used on the Project, including the subcontractor's estimated contract amounts at time of bidding, and the actual dollar amounts paid. DNR Form 8700-294a MBE/WBE Contacts Worksheet is provided in Division 00 for Contractor's use. In addition, EPA Form 6100-4 (DBE Subcontractor Utilization Form) is provided in Division 00 for Contractor's use and must be filed prior to final payment.

B. Davis/Bacon Federal Wage Rates apply. The minimum wages to be paid on the project shall in accordance with the wage scale established by the Federal wage determination. Weekly wage reports must be filed with the Owner or its designated agent, and the Contractor's employees shall be interviewed periodically to verify data. The Owner may withhold payment(s) until wages and fringe benefits are in conformance with prevailing wage requirements.

C. Submittals shall be in conformance with the requirements stated in Division 01 Section 01 33 00 – Submittals.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Preparation of the O&M manuals shall be in conformance with the requirements stated in Division 01 Section 01 33 00 – Submittals.

1.07 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances.

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C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

D. Clean filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.08 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Engineer and Owner seven days prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Submittals-Division 01 that equipment or system has been properly installed and is functioning correctly.

1.09 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at schedule time, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

F. Required instruction time for each item of equipment and system is specified in individual sections.

1.10 TESTING, ADJUSTING AND BALANCING

A. The completed Work in accordance with requirements of the contract documents when ready in all respects for use by the Owner shall be subjected to a performance test at operating conditions.

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B. Submit reports to Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents. Make all adjustments necessary to fulfill requirements and to comply with the instructions and recommendations of manufacturers, and to comply with all codes and regulations.

1.11 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.12 PROJECT RECORD DOCUMENTS

A. Maintain and submit Record Documents in accordance with Section 01 33 00 – Submittals.

1.13 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes in final form within 10 days after final inspection.

E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom manufactured products.

F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

H. Additional Requirements: As specified in individual product specification sections.

I. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.14 MANUAL FOR EQUIPMENT AND SYSTEMS

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A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes in final form with 10 days after final inspection.

E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

F. Panelboard Circuit Directories: Provide electrical service characteristics, control, and communications typed.

G. Include color-coded wiring diagrams as installed.

H. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.

I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

J. Include servicing and lubrication schedule, and list of lubricants required.

K. Include manufacturer's printed operation and maintenance instructions.

L. Include sequence of operation by controls manufacturer.

M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

N. Include control diagrams by controls manufacturer as installed.

O. Include Contractor's coordination drawings, with color-coded piping diagrams as installed.

P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

R. Include test and balancing reports as specified in Quality Control – Division 01.

S. Additional Requirements: As specified in individual product specification sections.

T. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.15 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.

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B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.16 PRODUCT WARRANTIES, GUARANTEES AND BONDS

A. Obtain warranties, guarantees and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include Table of Contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.17 LOOSE AND DETACHABLE PARTS

A. The Contractor shall retain all loose and small detachable parts of apparatus and equipment furnished under this contract, until completion of the work and shall turn them over to the Owner.

1.18 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.

B. Provide submittals to Engineer for presentation to Owner required by authorities having jurisdiction.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Owner will occupy all portions of building as specified in Summary of Work – Division 01.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 02 41 19
SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor, Part 1926 Regulations:
      a. Subpart N - Cranes Derricks, Hoists, Elevators and Conveyors, Current Edition.
      b. Subpart P - Excavations, Current Edition.
      c. Subpart T - Demolition, Current Edition.
      d. Subpart U - Blasting and Use of Explosives, Current Edition.
   2. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall consist of the removal of existing treatment facilities as shown on the contract drawings. The existing treatment facilities must remain in operation until the new facility is capable of treating the raw sewage.

B. No bypassing will be allowed for construction by the Contractor without prior State approval. It will be the Contractor's responsibility to obtain and pay for any permits required.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Grading - Division 31

C. Subgrade Preparation - Division 31

1.05 SUBMITTALS

A. Provide a detailed sequence of operation for demolition and removal work in accordance with Submittals - Division 01 of these specifications to ensure the uninterrupted progress of the Owner's operations.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 EXISTING CONDITIONS

A. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. Owner shall have the right to salvage any existing equipment and furnishings. The Owner assumes no responsibility for the actual conditions of structures to be demolished.

PART 2 PRODUCTS AND MATERIALS

2.01 EXPLOSIVES

A. The use of explosives will not be permitted.

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PART 3 EXECUTION

3.01 ABANDONMENT

A. After satisfactory startup of the new treatment facilities and after the influent force main to the lagoon system has been cut and capped, the contents of the stabilization lagoon shall be disposed of by discharging either into the existing outfall or to the treatment facility.

B. Discharges to the outfall shall be in accordance with the facility's WPDES discharge permit. Sampling and analysis of the lagoon contents shall be performed prior to discharge to confirm that the BOD of the discharge will be less than 30 mg/l.

C. Discharge to the new treatment facilities shall not cause the total influent flow rate to exceed the average daily design flow, nor shall they cause upset of the treatment process or cause violation of the facility's WPDES discharge permit.

D. Lagoon bottom sludge shall not be discharged to the outfall or treatment system. When water has been removed from the stabilization lagoon to expose sludge, the Contractor shall notify the Engineer to approve the commencement of sludge removal.

E. Sludge shall be removed and disposed of by a DNR licensed waste hauler. Lagoon bottom sludge shall be disposed of in accordance with the provisions of 40 CFR Part 503 and with Wisconsin Administrative Code Chapter NR 204 in effect at the time of disposal.

F. Sites for land disposal, if applicable, shall be properly obtained by the Contractor and approved by the DNR.

G. Owner will be responsible for the analytical testing of the sludge to determine the disposal requirements.

H. Mixtures of bottom material and sludge that cannot be pumped after all liquid sludge has been removed shall be combined with excess earth from the removal of the berms and shall be wasted on site in the former borrow area. Such mixtures shall be thin spread in lifts not greater than 6 inches.

I. Contractor shall notify Engineer when all sludge removal is complete and prior to the start of final grading activities. Engineer shall determine if the site has been properly abandoned.

J. After approval by Engineer, Contractor shall remove berms surrounding former lagoon and seepage cells as indicated on the contract drawings.

3.02 PROTECTION OF UTILITIES

A. Before commencing demolition work, preserve in operating condition active utilities traversing the project site; protect property, including but not limited to mains, manholes, catch basins, valve boxes, poles, guys and other appurtenances.

3.03 DEMOLITION, GENERAL

A. Proceed with demolition in accordance with approved sequence of operations. Provide controls as practicable to confine dust and dirt in the immediate area of demolition. See contract drawings for specific areas of demolition.

3.04 BELOW GRADE DEMOLITION

A. Demolish all abandoned structures to a depth of not less than 24 inches below the existing ground surface or 24 inches below proposed finish grade, whichever is lower. In addition, demolish and remove all below grade wood and metal construction, and floor construction except concrete slabs on ground. Break up concrete slabs on ground to allow water seepage.

3.05 FILLING OF VOIDS

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A. Completely fill below grade areas and voids resulting from the demolition of structures. Use satisfactory soil materials consisting of stone, gravel, and sand, free from debris, trash, frozen materials, roots and other organic matter, and stones larger than 6 inches in any dimension. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash and debris. Place fill materials in horizontal layers not exceeding 6 inches in loose depth. Compact each layer at optimum moisture content of the fill material to a density equal to the original adjacent ground. After fill placement and compaction, grade the surface to meet adjacent contours and to provide flow to surface drainage structures.

3.06 PARTIAL REMOVAL

A. Items of salvageable value to the Contractor, not desired by the Owner, must be transported from the site as they are removed. Storage or sale of removed items on the site will not be permitted.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from the site all debris, rubbish, and other materials resulting from demolition operations. Storage of removed materials will not be permitted on the site. Coordinate with Owner all salvaged items to be removed by Contractor. Burning of debris will be allowed in areas designated and under the regulations enforced by the Owner.

3.08 DAMAGES

A. Promptly repair damages caused to adjacent facilities by demolition operations, as directed by the Engineer and at no cost to the Owner.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Selective structure demolition shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 SELECTIVE STRUCTURE DEMOLITION

A. Selective Structure Demolition, Unit Price. The items of selective structure demolition, as the case may be, will be measured as a unit for each specific item designated in the bid schedule and completely removed in accordance with the contract, provided however, that the removal of that portion of any structure which is within the space occupied by the new structure and which is actually removed shall be classified as utility excavation or structural excavation and paid for as such. This item, measured as provided above, will be paid for at the contract unit price each for selective structure demolition, which price shall be payment in full for removing, salvaging when required, storing and disposing of all materials as set forth above, and for furnishing all labor, tools, equipment and incidentals necessary to complete this work.

B. Selective Structure Demolition, Lump Sum. When so provided, payment for selective structure demolition shall be made at the contract lump sum price bid.

END OF SECTION

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SECTION 03 11 13
STRUCTURAL CAST-IN-PLACE CONCRETE FORMING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all materials, equipment and labor required to furnish all formwork for cast-in-place concrete as shown on the contract drawings and specified herein.

B. The work shall include formwork, shoring for cast-in-place concrete, and installation into formwork of items by other such as anchor bolts, setting plates, anchorages, inserts, frames, and other items to be embedded in concrete.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Accessories - Division 03

C. Concrete Reinforcing - Division 03

D. Cast-in-Place Concrete - Division 03

E. Joint Sealers – Division 07

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Concrete Institute (ACI) Annual Book of ACI Standards:
      a. ACI 117/177R - Specifications for Tolerances for Concrete Construction and Materials and Commentary, Current Edition.
      b. ACI 301 - Specifications for Structural Concrete, Current Edition.
      c. ACI 302.1R - Guide for Concrete Floor and Slab Construction, Current Edition.
      d. ACI 311.4R - Guide for Concrete Inspection, Current Edition.
      e. ACI 318 - Building Code Requirements for Structural Concrete, Current Edition.
      f. ACI 347 - Guide to Formwork for Concrete, Current Edition.
      g. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures, Current Edition.
      h. ACI ASCC-1(05) - The Contractor's Guide to Quality Concrete Construction, Third Edition.
      i. ACI SCM-24 - Concrete Repair Basics, Current Edition.
      j. ACI SP-4 - Formwork for Concrete, Current Edition.
      k. ACI SP15 – Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with Selected ACI Reference, Current Edition.
      l. ACI SP-71 - ASTM Standards in ACI 318, Current Edition.
   2. American Plywood Association (APA) Specifications and Standards:
      a. APA PS1 - Plywood Design Specification, Current Edition.

1.05 DEFINITIONS

A. Bug Holes: Surface voids that do not exceed size as listed for Rough Form or Smooth Form Finish. These voids shall be considered surface effects, not defects. Quantity of bug holes is not limited.

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1.06 SUBMITTALS

A. Submit such product literature and catalog cuts of materials to be used for the formation of control / construction joint material in the formwork. Information shall be in conformance with requirements of Submittals – Division 01 of these specifications.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 DESIGN

A. The design and engineering of the formwork and its accessories shall be the responsibility of the Contractor. Formwork shall be designed, erected, supported, braced and maintained so as to safely support all vertical and lateral loads until such loads can be supported by the concrete structure.

B. Determination of loads and design shall be in accordance with ACI 301 and ACI 347.

2.02 FORMS

A. Forms may be wood, plywood, concrete-form-grade hardboard, metal or other acceptable material which will produce smooth, true surfaces.
   1. Provide lumber dressed on at least two edges and one side for tight fit.
   2. Metal forms shall have smooth surfaces free from any pattern, irregularities, dents, bends and sags.

2.03 SHORING

A. All shoring members shall be of such design and material to safely support all dead and working loads throughout the placing and curing period. Shoring shall be placed to prevent sagging and settlement.

2.04 FORM TIES AND ACCESSORIES

A. Form ties shall be factory-fabricated, adjustable-length, removable or snap-off metal, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

B. For exposed concrete surfaces, provide ties so that the portion remaining with the concrete after removal is 1 inch to 1-1/2 inches inside the finished face of the concrete.

C. Unless otherwise indicated, provide form ties which will not leave holes larger than 1 inch in diameter in concrete surfaces.

2.05 FORM COATING COMPOUND

A. Form coating compound shall be a commercial formulation that will not bond with, stain, nor adversely affect concrete surfaces and not impede the wetting of surfaces to be cured with water or curing compounds. Forms for concrete surfaces requiring subsequent treatment shall receive a type of coating that will not impair bond or adhesion.

B. Form coating compound for steel forms shall conform with all requirements stated above and shall be of rust-preventative type.

2.06 CONTROL / CONSTRUCTION JOINT MATERIALS

A. Provide material to be used for the formation of wall control joints and construction joints as indicated on the contract drawings and in this specification. Submit product literature and catalog cuts of materials to be used for forming joints.

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PART 3 EXECUTION

3.01 GENERAL

A. Responsibility. The design and construction of formwork shall be the sole responsibility of the Contractor.

B. Earth forms are not acceptable or permitted.

C. Construct forms to the exact sizes, shapes, lines and dimensions shown, as required to obtain accurate alignment, location, grades, level and plumb in finished construction and to maintain tolerances in accordance with ACI 301. Provide for openings, offsets, keyways, recesses, moldings, rustications, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Chamfer all corners of concrete exposed to view using chamfer strips. Use selected materials to obtain required finishes.

D. Forms shall be sufficiently tight to prevent leakage of concrete. Temporary openings shall be provided in the inside form of all wall forms and in column forms to facilitate cleaning and inspection immediately before placing concrete.

E. Assemble forms so their removal will not damage concrete and adjacent materials.

3.02 FORMWORK

A. Forms shall conform in general to shape, line, grade and dimensions of members as shown on contract drawings and shall have the strength and stability to ensure finished concrete within the tolerances specified in ACI 347.
   1. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from those other trades.
   2. Exterior edges of all exposed concrete, unless otherwise specified, shall have a chamfer strip placed in form to provide bevel of sharp edges. Chamfer strips shall be 3/4-inch by 3/4-inch by 45º wood, plastic, or rubber.
   3. Accurately place and secure in position, prior to placing concrete, all anchors, bolts, inserts and other items furnished under other sections of the specifications and for other contractors on the project.

B. Formwork shall be mortar-tight and sufficiently rigid to prevent displacement or sagging between supports.

C. Formwork shall be properly braced or tied together so as to maintain position and shape and ensure safety to workman and passersby.

D. Temporary openings may be provided on all wall and column forms to limit the free fall of the concrete to less than 4 feet and should be so located as to facilitate the placing and consolidation of the concrete. The ports shall be spaced no more than 6 feet apart to limit the horizontal flow of concrete.

E. All forms shall be cleaned and rubbed smooth prior to placing to ensure true forming surfaces for all concrete surfaces.

F. All surfaces that will be exposed to view shall be provided with a smooth-form finish.
   1. Form-facing materials with raised grain, torn surfaces, worn edges, dents, or other defects that would impair the texture of the concrete are not allowed.
   2. Facing materials shall be set in an orderly and symmetrical arrangement and seams shall be kept to a practical minimum.

3.03 FORM TIES AND ACCESSORIES

A. Internal wall ties shall contain positive stops at the required wall thickness. The exterior clamp portions of the pipe shall be adjustable to permit tightening of forms. Ties shall provide a positive disconnection 1 inch to l-1/2 inches inside the finished face of the concrete. Cutting ties back from face of wall or use of wire ties will not be permitted. All tie and plug holes shall be filled with non-shrink grout after forms are removed.

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B. All concrete tie locations shall be watertight. Wall ties shall be fitted with tapered rubber plugs at all water retaining structures.

C. Accessories shall be used only for the purpose intended and shall in no way interfere with the placing of concrete. Removal of accessories shall in no way impair or disturb finish concrete surfaces. Accessories shall be compatible with formwork and ties and shall maintain the watertight integrity of the formwork system.

D. Design of all form ties and accessories shall be adequate for all concrete placement, horizontal and vertical, to prevent failures and blowouts.

3.04 FORM COATINGS

A. Coat form contact surfaces with form bond breaker compound before reinforcement is placed. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

B. Coat steel forms with form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

C. Clean reinforcing steel that has become contaminated with form coating to the satisfaction of the Engineer prior to placing concrete.

3.05 EMBEDDED ITEMS

A. Items embedded in concrete shall be properly cleaned to be free from oil or foreign matter that would weaken the bond of the concrete to these items.

B. Install in the formwork requisite inserts, anchors, sleeves and other items specified under other sections of these specifications; close end conduits, piping and sleeves embedded in concrete with caps or plugs.

C. Conduits or pipes embedded in slabs of larger outside diameter than 1-1/2 inches, or when pipes and conduits come closer than 1 inch from either the upper or lower surface of the slab, provide expanded metal or wire mesh laid and extended beyond conduit or piping at least 8 inches on all sides; space conduits or pipes closer than 3 diameters on centers, place to avoid changing locations of reinforcement for indicated locations.

3.06 CONSTRUCTION JOINTS

A. Make construction joints where indicated on the contract drawings; additional construction joints are subject to prior approval of the Engineer; locate additional construction joints to least impair the strength of the structure.

B. Form keyways and joints as indicated on the contract drawings.

C. Continue reinforcing steel and wire fabric across construction joints, unless noted otherwise.

3.07 EXPANSION JOINTS

A. Expansion joints shall be placed where indicated on the contract drawings; reinforcement, corner protection angles or other fixed metal items embedded in or binded to continuously shall not extend through expansion joints; finish concrete slab edges along expansion joints neatly with slightly rounded edging tool; leave joints in the completed work carefully tooled and free of mortar and concrete.

B. Joints between slabs on earth and vertical surfaces, including columns, piers, walls, machinery foundation and other fixed structures shall have expansion joint material placed on abutting vertical surfaces.

C. Joints to receive joint compound shall have premolded expansion filler strips at proper level placed below finished floor with slightly tapered, dressed, oiled wood strip secured temporarily to top thereof; install wood

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strip of depth to form groove at least 1 inch deep; after concrete has set, remove strip; fill groove with light colored joint compound for poured application; fill joint grooves flush, to be slightly concave, after drying as specified in Joint Sealers - Division 07.

3.08 CONTROL JOINTS

A. Install vertical control joints as indicated on the contract drawings, locate specifically as follows:
   1. At each control joint, extend only alternate horizontal reinforcement bars through the joint; seal control joints with concrete colored joint compound.

B. Install control (contraction) joints in slabs as indicated on the contract drawings, and where not indicated locate specifically as follows:
   1. Space at a minimum of 25 feet on center; at each joint, cut reinforcing mesh so only alternate wires extend through joint.
   2. Resulting panels shall be approximately square; elongated and L-shaped panels shall not be acceptable.
   3. Provide 1/4-inch wide saw - cut control joints to a depth equivalent to 1/3 the slab thickness; cut as soon as the slab will support the weight of the saw and operator and not damage the surface and not more than 8 hours after completion of concrete placement.

C. Apply joint compound to all control and construction joints after concrete has sufficiently cured; clean joint slot; fill joint with light colored compound for poured application; fill joint grooves flush, to be slightly concave after drying, as specified in Joint Sealers - Division 07.

3.09 WATERSTOPS

A. Install waterstops of the sizes and shapes indicated on the contract drawings; support and protect that portion of the waterstop which extends beyond the bulkhead during placing of concrete and subsequent removal of forms.
   1. Continuous at construction and expansion joints.
   2. Material, size and shape as indicated on the contract drawings and in Concrete Accessories - Division 03.

B. Make field splices by heat - sealing, maintaining the continuity of the ribs and bulbs, and allow the splice to cool before stressing; field splice must be watertight; repair damaged waterstops.

3.10 FORM/SHORING REMOVAL

A. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

B. Removal of forms shall be accomplished in such a manner as will prevent injury to concrete and ensure complete safety of structure. Removal times listed below are minimum and may be increased by the Engineer as job conditions warrant.
   1. Where structure as a whole is supported on shores, vertical forms such as beam and girder sides, columns, and similar vertical forms may be removed 24 hours after completion of pour, providing concrete has hardened sufficiently to sustain its own weight and to prevent injury.
   2. Wall forms shall not be removed in less than 24 hours after pouring, unless otherwise required for curing.
   3. Supporting forms and shoring must remain in place until concrete can carry any loads to be imposed upon it and in no case shall be removed in less than seven (7) days.
   4. Forms ties, requiring any operation in removal of forms which would tend to destroy bond between tie and concrete in order to remove form, shall not be disturbed for seven (7) days after completion of pour.
   5. The time periods stipulated above may be reduced if strength results of concrete so indicate adequate conditions.

C. Notify the Engineer before the forms are removed in order that an examination of the newly-stripped surfaces may be made prior to patching.

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3.11 REPAIR TIE HOLES

A. After removal of form tie, the holes shall be filled as follows:
   1. Thoroughly clean and dampen.
   2. Fill solid with patching mortar.

B. Make repairs uniform in color and finish with surrounding concrete.

3.12 FORM FACE MATERIALS

A. Unless otherwise specified, or permitted, form face materials in contact with concrete shall be lumber, plywood, tempered concrete-form-grade hardboard, metal, plastic, or paper that creates specified appearance and texture of concrete surface.

3.13 AS-CAST SURFACE FINISHES

A. See Section 03 30 00 for finish required at each location. See Section 03 30 00 for rubbed finishes and required locations.

B. Surface Finish-1.0 (SF-1.0) per ACI 301; except tie holes shall be repaired.
   1. No formwork facing material.
   2. Patch voids larger than 1-1/2 inch wide or 1/2-inch deep.
   3. Remove projections larger than 1-inch.
   4. Surface tolerance Class D as specified in ACI 117.
      a. At surfaces exposed to view, provide surface tolerance Class C as specified in ACI 117.
   5. Mock-up not required.

C. Surface Finish-2.0 (SF-2.0) per ACI 301.
   1. Use a form facing material that will produce a smooth, hard, uniform texture on the concrete.
   2. Keep seams to a practical minimum.
   3. Patch voids larger than 3/4-inch wide or 1/2-inch deep.
   4. Remove projections larger than 1/4-inch.
   5. Patch tie holes.
   6. Surface tolerance Class B as specified in ACI 117.
   7. Mock-up not required; however, first pour will be reviewed by Engineer for acceptance.

D. Surface Finish-3.0 (SF-3.0) per ACI 301.
   1. Use a form facing material that will provide a smooth, hard, uniform texture on the concrete.
   2. Keep seams to a practical minimum.
   3. Patch voids, or bug holes, larger than 3/4-inch wide or 1/2-inch deep.
   4. Remove projections larger than 1/8-inch.
   5. Patch tie holes.
   6. Surface tolerance Class A as specified in ACI 117.
   7. Mock-up required, mock-up may be part of the first pour if approved by Engineer. Mock-up will be reviewed by Engineer for acceptance.

3.14 EXPOSED SURFACES

A. Exposed surfaces: remove fins; fill pores, stone pickets, honeycombs, etc., with non-shrink grout or concrete repair compound as follows:
   1. Repair immediately after form removal and inspection by the Engineer.
   2. Remove concrete surrounding defect to sound concrete, then wet affected area.
   3. Brush on bonding agent, mixed and applied in accordance with manufacturer's recommendations.
   4. Consolidate patch grout and strike off to leave the patch slightly higher than the surrounding surface.
   5. Finish the repaired area flush with the surrounding area after the patch has been in place for one hour, or as prescribed by the manufacturer.

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B. Perform patching before curing compound is applied; cure patched areas in the same manner as adjacent concrete; make repairs uniform in color and finish with surrounding concrete.

C. Exposed surfaces shall be protected from excessive sun, wind and rain, and kept wet until curing compound is applied. When ambient temperature falls below 40ºF heat aggregate and mixing water; clear all forms, reinforcement and subgrade of snow and ice; cover all freshly placed concrete with tarpaulins, and provide heat to maintain a temperature of 70ºF for at least three days or 50ºF for five days; rate of cooling after end of protection period shall be accomplished in a manner approved by the Engineer.

3.15 REUSE OF FORMS

A. Clean and repair surfaces of forms to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for the new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

C. Do not use “patched” forms for concrete surfaces exposed to view.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Structural cast-in-place concrete forming shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 STRUCTURAL CAST-IN-PLACE CONCRETE FORMING

A. Structural Cast-in-Place Concrete Forming, Inclusive. When no quantity is provided, structural cast-in-place concrete forming shall be considered inclusive to payment for work associated with cast-in-place concrete.

END OF SECTION

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SECTION 03 15 00
CONCRETE ACCESSORIES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing concrete accessories as shown on the contract drawings and specified herein.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Structural Cast-In-Place Concrete Forming - Division 03

C. Cast-in-Place Concrete - Division 03

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Concrete Institute (ACI), Annual Book of ACI Standards:
      a. ACI 308R – Guide to Curing Concrete, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete, Current Edition.
      b. ASTM C272 - Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions, Current Edition.
      c. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete, Current Edition.
      d. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation, Current Edition.
      e. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete, Current Edition.
      f. ASTM C882 - Standard Test Method for Bond Strength for Epoxy-Resin Systems Used with Concrete by Slant Shear, Current Edition.
      g. ASTM C884 - Standard Test Method for Thermal Compatibility Between Concrete and an Epoxy-Resin Overlay, Current Edition.
      h. ASTM D6 – Standard Test Method for Loss on Heating of Oil and Asphaltic Compounds, Current Edition.
      i. ASTM D297 – Standard Test Methods for Rubber Products - Chemical Analysis, Current Edition.
      j. ASTM D994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type), Current Edition.
      k. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types), Current Edition.
      l. ASTM D1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction, Current Edition.
      m. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover, Current Edition.
      n. ASTM E1643-98 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

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o. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

3. Canadian General Standards Board (CGSB) Standards:
   a. CGSB 41-GP-35M - Performance Standards for Poly Vinyl Chloride (PVC) Waterstops, Types I and III, Current Edition.
4. Federal Specification TTS 227 and TTS 230, Current Edition.
5. U.S. Army Corps of Engineers (USACOE), Specifications and Standards:
   a. USACOE CRD-C572 - Specification for Poly Vinyl Chloride (PVC) Waterstop, Current Edition.

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to the rate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 WATERSTOP

A. Polyvinyl Chloride PVC Waterstop.
   1. Ribbed Centerbulb, for non-moving joints: 4-inch long, minimum 3/16-inch thick with 1/8-inch ribs, 3/8-inch outside diameter centerbulb and shall comply with U.S. Corps of Engineers Specification CRD-C572.
      a. Greenstreak 701 by Sika Corporation
      b. Or equal
   2. Split Flange Type: 6-inch long, minimum 3/8-inch thick with 3/16-inch thick split ends, 5/8-inch outside diameter centerbulb,
      a. Greenstreak 724 by Sika Corporation
      b. Or equal
   3. Retrofit Waterstop: L-shaped PVC waterstop with 3-inch long legs, ribbed on one leg. Stainless batten bar with steel epoxy anchor bolt.
      a. Greenstreak 655 with epoxy 7300 by Sika Corporation
      b. Or equal

B. Gasket Waterstop: Strip-applied non-swelling mastic waterstop for non-moving joints, 3/4-inch by 1-inch wide unless noted otherwise.
   1. Lockstop with Lockstop Primer by Sika Corporation

C. Additional Waterstop at Tanks with Waterproofing Admixture: Use at all joints in water-retaining structures with waterproofing admixture (see Section 03 30 00).
   1. General: Crystalline, cementitious, non-toxic chemical treatment for the waterproofing and protection of concrete.
   2. Product: Use same product provided as admixture in concrete mix – see Section 03 30 00.
   3. Concentration: Concentrated slurry coat, concentration as recommended by manufacturer.

2.02 EXPANSION AND CONTRACTION JOINT FILLER

A. Preformed Bituminous. Bituminous expansion and contraction joint filler shall be preformed bituminous strips which complies with ASTM D994.

B. Preformed Sponge Rubber. Sponge rubber expansion and contraction joint filler shall be preformed which complies with ASTM D1752.

C. Preformed Cork. Cork expansion and contraction joint filler shall be preformed which complies with ASTM D1752.

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D. Thermal Isolation Joint Material (Rigid/Board Insulation). Thickness shall be 0.5 inch, unless noted otherwise. Contractor to choose from one of the following:
   1. Polystyrene insulation: ASTM C578, Type X, extruded cellular type, 5-year aged R-value of 5.0 minimum at 75°F, water absorption in accordance with ASTM C272 of 0.3 percent by volume maximum, minimum 15 psi compressive strength, square edges.
      a. Owens Corning Foamular Insulating Sheathing for 0.5-inch thickness.
      b. Or equal
   2. Polyisocyanurate insulation: ASTM C1289 Type 1, closed-cell polyisocyanurate foam core bonded to foil facing on each side, R-value of 6 per inch, 0.05 perm water vapor permeable, water vapor absorption of 0.1%; less than 25 flame spread index, less than 450 smoke developed index, 16 psi compressive strength, 40 psi flexural strength.
      a. Dow Thermax Sheathing
      b. Johns Mansville AP Foil Faced Polyiso Board
      c. Sika Rmax Pro Select Polyiso Insulation Board
      d. Or equal.
   3. EPDM Rubber insulation: ASTM C534 Type I and II, ASTM D1056, flexible, closed-cell EPDM-rubber based elastomeric, tube and sheet, UV resistant, indoor/outdoor, mold and fungal growth resistant. k Value: 0.245 at 75 degrees F (ASTM C518/C117). Water Absorption (weight %): 0.2% (ASTM C209). Water Vapor Permeability: 0.03 perm (ASTM E96). Flame Spread/Smoke Developed Ratings: 25/50.
      a. Aerocel by Aeroflex
      b. Or equal.

E. Removable Plastic Expansion Joint Cap: Plastic joint cap, board width by 1/2-inch deep.
   1. Snap-Cap by W.R. Meadows.
   2. Geenstreak Expansion Board Cap by Sika Corporation.

2.03 BOND BREAKER

A. Cast-in-Place Concrete Flatwork. Asphalt impregnated felts, 15-pound.

B. Cast-in-Place Concrete Formwork. Non-staining liquid product which imparts a waterproof film to prevent adhesion of concrete and will not leave a paint-impeding coating on the face of the concrete.

2.04 VAPOR BARRIER

A. Under Slab Vapor Barrier: 15 mil reinforced high-density multi-layer laminated polyethylene film for under slab application.
   1. Must meet the following minimum properties:
      a. Barrier shall meet or exceed all requirements of ASTM E1745 Classes A, B and C.
      b. Water Vapor Permeance (ASTM F1249): 0.038 perms
   2. Products:
      a. Stego Wrap Vapor Barrier (15-mil) by Stego Industries
      b. Griffolyn Type-65 by Reef Industries
      c. Or equal

B. Seam Tape: High density polyethylene tape with pressure sensitive adhesive, minimum 4 inches wide. Tape or Mastic by vapor barrier manufacturer.

C. Pipe Boots: Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

2.05 WATERPROOF SHEET MATERIAL FOR CURING

A. Provide one of the following, complying with ASTM C171: waterproof paper, polyethylene film or polyethylene-coated burlap.

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B. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:
   1. Polyethylene sheet not less than 6 mils thick; or
   2. Water resistant barrier paper consisting of heavy papers laminated together with glass fiber reinforcement and overcoated with black polyethylene on each side.

2.06 CONCRETE REPAIR COMPOUND

A. Concrete repair compound shall be as required for the installation.

B. As manufactured by Master Builders Solutions or equal.

2.07 PIPE SLEEVES, ANCHOR BOLTS AND CAST IRON GROOVES

A. Shall be furnished, installed, and anchored solid in their final location.

2.08 CURING AND SEALING COMPOUND

A. Interior:
   1. Membrane-forming curing compound shall meet the moisture retention requirements of ASTM C309, Type 1.
      a. MasterKure CC 200WB by Master Builders Solutions.
      b. Sealtight CS-309-25 Curing and Sealing Compound by W.R. Meadows, Inc.
      c. Eucocure VOX by Euclid Chemical Co.
      d. Or equal.
   2. Products shall be compatible with surface finish. Where flooring manufacturer allows, use water-based dissipating type.

B. Exterior:
   1. Curing compound for use on standard exterior concrete shall comply with ASTM C309, Type 2; resin, white pigmented.

2.09 DAMPPROOFING MEMBRANE

A. For use at tie-holes and form times only. See Section 07 11 13 for full coating of below grade foundations.

B. Acceptable Products:
   1. Sealmastic Asphalt Emulsion Dampproofing by W.R. Meadows, Inc.
   2. MasterSeal 614 by Master Builder Solutions by BASF
   3. Substitutions: per Section 01 60 00.

2.10 PIPE BOLLARD CAPS

A. Pipe bollard caps: Precast concrete pipe bollard caps, 5000 psi fiber reinforced concrete with a cast in place anchor, diameter to match the steel pipe diameter: Top Gard concrete bollard caps by TopGard LLC 1125 Brookside Ave, Indianapolis, IN, www.topgardcap.com.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories where shown on contract drawings and as specified herein.

B. Place bond breaker at junctures of slabs-on-grade with vertical walls.

C. Expansion and Contraction Joint Filler:
   1. Install at locations noted on the drawings calling for expansion / contraction joint materials.

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2. Thermal Isolation Joint Material (Rigid/Board Insulation): Install at the inside perimeter of the exterior wall foundation between the foundation wall and the concrete slab on grade. Place the snap cap on top of the insulation.

D. Seal all exposed surfaces of expansion and contraction joints with joint sealer (3/4-inch deep and hold 1/8-inch below surface of concrete) under Section 07 92 00.

E. Waterstops:
1. All splices on PVC waterstops shall be field welded using an indirect heating element. Concrete shall be thoroughly vibrated around the waterstop to avoid honeycombs and to ensure complete embedment of the ribbed flanges.
2. Apply concentrated slurry coat to surface of joints in water-retaining structures with water-proofing admixture. Clean joint as required by manufacturer. Apply slurry coat full width of second pour intersection. Apply per manufacturer's instructions for areas not subject to hydrostatic pressure.
3. Gasket waterstop shall be applied to locations shown on Drawings to a concrete surface that is smooth, dry, and cured for a minimum of 24-hours. Brush apply a minimum 2-inch wide continuous coat of primer adhesive along the joint and allow to dry for at least 2-hours before applying waterstop. Press gasket waterstop firmly and continuously in place, achieving about a 25% spread of the materials width. Gasket can be mechanically fastened in place with fastener spacing of approximately 12-inch on center in addition to use of primer. Splice gasket by lapping approximately 1-inch of the material side-by-side, press together so there is no separation of air pockets. Do not remove separation paper from gasket until just prior to the second concrete pour. Install to provide minimum cover as required by manufacturer.

F. Vapor Barrier: Install under-slab vapor barrier at locations shown on Drawings in accordance with manufacturer's instructions and ASTM E1643-98.
1. Unroll vapor barrier with the longest dimension parallel with the direction of the pour.
2. Seal vapor barrier to foundation walls behind perimeter expansion joint, unless shown otherwise on Drawings.
3. Vapor barrier shall be continuous inside building foundation, unless noted otherwise.
4. Overlap joints 6-inches and seal with manufacturer's tape. Seal all penetrations (including pipes) with manufacturer's pipe boot. No penetrations of the vapor barrier are allowed except for reinforcing and permanent utilities.
5. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6-inches and taping all four sides with tape.

G. Concrete Structural Repair Compound: Apply first coat of repair mortar with a stiff bristle brush to apply a scrub coat working the mortar into the honeycomb areas, then use a trowel to completely fill the honeycomb areas and trowel smooth the mortar to flush it out with the face of the concrete.

H. Dampproofing:
1. Do not apply dampproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to dampproofing manufacturer.
2. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
3. Prime surfaces in accordance with manufacturer's instructions.
4. Apply mastic to seal penetrations form tie bar penetrations in substrate in accordance with manufacturer's instructions. Extend mastic in minimum 3-inch diameter around penetration. Apply two (2) coats, continuous and uniform. Do not apply where finished surface will be exposed.
5. Not required where plug type form holes have been filled with non-shrink grout.
6. Protect membrane from damage.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Concrete accessories shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 CONCRETE ACCESSORIES

A. Concrete Accessories, Inclusive. When no quantity is provided, concrete accessories shall be considered inclusive to payment for work associated with cast-in-place concrete.

END OF SECTION

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SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing concrete reinforcing as shown on the contract drawings and as specified herein.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Accessories - Division 03

C. Cast-in-Place Concrete - Division 03

D. Masonry – Division 04

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. American Concrete Institute (ACI) Specifications and Standards:
    a. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures, Current Edition.
    b. ACI 318 - Building Code Requirements for Structural Concrete and Commentary, Current Edition.
    c. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary, Current Edition
2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
    a. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement, Current Edition.
    b. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement, Current Edition.
    c. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, Current Edition.
    d. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plan and Deformed, for Concrete, Current Edition.
3. American Welding Society (AWS), Specifications and Standards:
    a. AWS D12.1 - Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction, Current Edition.
4. American Association of State Highway Transportation Officials (AASHTO), Specifications and Standards:
    a. AASHTO M182 - Specification for Burlap Cloth Made from Jute or Kenaf, Current Edition
5. Concrete Reinforcing Steel Institute (CRSI) Specifications and Standards:
    a. CRSI - Manual of Standard Practice, Current Edition.
    b. CRSI - Recommended Practice for Placing Reinforcing Bars, Current Edition.
    c. CRSI - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature, Current Edition.
    d. CRSI - Recommended Practice for Reinforcing Bar Splices, Current Edition.

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1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specification. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.
   1. Submit detailed reinforcing drawings prepared in accordance with ACI 315, including bar schedule with bar marks and bends indicated.
   2. Comply with CRSI Manual of Standard Practice showing bar schedules, stirrup spacing, diagrams of bent bars and arrangements of concrete reinforcement. Include special reinforcement required at openings through concrete.
   3. Verify dimensions and make proper allowance for fitting together work of other trades.

B. Submit a certification attesting that reinforcing steel meets the requirements of ASTM A615, including Supplementary Requirements S1, and that welded steel wire fabric meets the requirements of ASTM A185.
   1. Submit certified copies of mill reports, tensile and bend tests for reinforcing steel on projects where the quantity of reinforcing exceeds 15 tons.
   2. For information only, submit manufacturer's data and instruction for proprietary items, including reinforcement and accessories.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 REINFORCEMENT

A. Steel Bar Reinforcement. Main reinforcing and stirrups; ASTM A615, Grade 60.

B. Welded Wire Fabric. Welded wire fabric, flat sheets, ASTM A1064, 6x6-W2.9xW2.9, unless otherwise specified or indicated on the contract drawings.

C. Steel Tie Wire. Steel tie wire, ASTM A82, plain, cold-drawn, 16 gauge or heavier.

D. Supports For Reinforcement. Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place complying with CRSI Manual of Standard Practice. For slabs on grade where base material will not support chairs, use supports with sand plates or horizontal runners to locate mesh properly in slab. Provide hot-dipped galvanized or plastic-coated accessories in contact with forms for sight exposed concrete.

PART 3 EXECUTION

3.01 FABRICATION

A. Fabricate and place to shapes and dimensions indicated or required to carry out intent of contract drawings and these specifications.

B. Bends for stirrups and ties shall be made around a pin having a diameter not less than four times the diameter of reinforcing bar. Bends for other bars shall be made around a pin having a diameter not less than six times diameter of bar, except that for bars larger than 1 inch, pin shall be not less than eight times diameter of bar.
   1. Perform cutting and bending in the shop; bend and cut steel cold. Heating of reinforcement will not be permitted. Do not bend or straighten bars in a manner that will injure the material.
   2. Field bending of bars shall not be allowed without the Engineer's approval.

C. Tagging shall be with metal, linen, or rope fiber tags filled in with machine or waterproof ink. Paper tags shall not be allowed.

D. Reinforcing bars shall conform accurately to the dimensions shown on the contract drawings.

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3.02 PRODUCT DELIVERY, STORAGE AND HANDLING

A. For reinforcing steel fabricated on-site, shop from the mill in bundles, limited to one size and length, tagged with a waterproof tag showing the name of the mill, heat number, grade and size of the bars and identifying number.

B. For reinforcing steel fabricated off-site, deliver in bundles identified as to structure and shop drawing number. Identify each individual bar with a waterproof tag showing the grade, size and bar mark from the approved bar schedule.

C. Protect reinforcing steel and wire fabric from damage and from dirt, oil grease, other foreign matter, and rust-causing condition. Do not store reinforcement in direct contact with the ground.

3.03 CLEANING

A. Before placing and before pouring concrete, all reinforcement shall be thoroughly cleaned of all oil, dirt, loose mill scale, loose rust, or foreign matter that will destroy or reduce bond.

3.04 PLACING REINFORCEMENT

A. Placement. Metal reinforcement shall be accurately placed in accordance with approved Submittals and adequately secured in position by concrete or metal chairs or spacers. Nails shall not be driven into forms to support reinforcement nor shall wire ties come in contact with forms.

B. Splicing. Lap at splices shall be sufficient to transfer stress between bars by bond and shear.
1. Furnish reinforcing bars in full lengths as indicated on the contract drawings and approved Submittals.
2. Do not splice bars unless indicated on the contract drawings or approved by the Engineer in writing. When authorized, make splices in accordance with ACI 318; perform welding in accordance with AWS D12.1.
3. Splices generally shall be avoided at points of maximum stress. Minimum splice lap for stressed bars shall be forty times bar diameter.

C. Offsets in longitudinal bars at change of cross section shall be placed in region of lateral support. Slope of inclined portion of offset shall not be more than one in six and, in tied columns, ties shall be spaced not over 3 inches on centers for a distance of 1 foot below actual point of offset.

D. Embedded Items. The Contractor shall provide for the installation of all items embedded in the concrete, such as coil rod inserts, anchor bolts, dowels, etc., as shown on the contract drawings or as provided for in other Divisions of these specifications.
1. All dowel bars shall be tied securely in place before pouring concrete.
2. Provide for clearances with appurtenant materials and devices.

E. Drilled and Grouted or Epoxy Dowel Installation. Existing concrete which will be incorporated into new work and requiring integration with new concrete will be doweled as indicated on the contract drawings and as follows:
1. Drill hole in existing concrete of size that is 3/4 inch larger in diameter than diameter of dowel bar. Incline the hole in the concrete such that the non-shrink grouting or epoxy will be retained in the hole.
2. Fill hole with non-shrink grouting or epoxy.
3. Immediately place dowel bar into hole.
4. Allow grout or epoxy to take initial set before disturbing dowel bar.

F. Steel Reinforcing Fabric. Reinforce as detailed on the contract drawings; and where not indicated, reinforce with wire fabric, place 2 inches from the top of the slab.
1. Flat sheets shall be used whenever available. Wire fabric shall lap 6 inches on side joints and 12 inches on end joints. Properly secure with annealed wire. Fabric shall be raised and secured in

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the correct location using permanent supports. Raising the fabric by hook during placement of concrete shall NOT be permitted.

2. Alternately, in tight quarters and around appurtenances and openings, lap mesh reinforcement not less than one mesh space plus 2 inches, and tie.

G. Concrete Cover. The minimum cover of concrete for all reinforcement shall conform to the dimensions indicated on the contract drawings, which indicate the clear distance from the edge and end of the reinforcement to the face of the concrete surface. Provide clearance and spacing indicated on the contract drawings and approved Submittals, where so indicated.

1. Where no clearances are indicated, the thickness of the concrete cover over reinforcement shall be as follows:
   a. Concrete cast against and permanently exposed to earth – 3-inch;
   b. Formed concrete exposed to earth or weather – 2-inch;
   c. Formed concrete not exposed to earth or weather - 1-1/2-inch;
   d. Slabs not exposed to earth or weather – 1-inch.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Concrete reinforcing shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 CONCRETE REINFORCING

A. Concrete Reinforcing, Inclusive. When no quantity is provided, concrete reinforcing shall be considered inclusive to payment for work associated with cast-in-place concrete.

END OF SECTION

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered under this section shall cover furnishing all materials, equipment and labor required to construct all cast-in-place concrete as shown on the contract drawings and as specified.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Concrete Quality Control - Division 01

D. Structural Cast-in-Place Concrete Forming - Division 03

E. Concrete Accessories - Division 03

F. Concrete Reinforcing - Division 03

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. American Concrete Institute (ACI), Annual Book of ACI Standards:
    a. ACI 117/177R - Standard Specification for Tolerances for Concrete Construction and Materials and Commentary, Current Edition.
    b. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete, Current Edition.
    c. ACI 209.1R - Report on Factors Affecting Shrinkage and Creep of Hardened Concrete, Current Edition.
    d. ACI 301 - Specification for Structural Concrete, Current Edition.
    e. ACI 302.1R - Guide for Concrete Floor and Slab Construction, Current Edition.
    f. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete, Current Edition.
    g. ACI 305R - Hot Weather Concreting, Current Edition.
    h. ACI 306 - Standard Specification for Cold Weather Concreting, Current Edition.
    i. ACI 308R - Guide to Curing Concrete, Current Edition.
    j. ACI 309R - Guide for Consolidation of Concrete, Current Edition.
    k. ACI 311.4R - Guide for Concrete Inspection, Current Edition.
    l. ACI 318/318R - Building Code Requirements for Structural Concrete and Commentary, Current Edition.
    m. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures, Current Edition.
    n. ACI 530/530.1/530R/530.1R - Building Code Requirements for Commentary for Masonry Structures and Specification for Masonry Structures and Related Commentaries, Current Edition.
    o. ACI ASCC MNL-5 - The Contractor’s Guide to Quality Concrete Construction, Current Edition.

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p. ACI CP-10/PACK - Craftsman Study Package for ACI Certification of Concrete Flatwork Technician/Finisher, Current Edition.
q. ACI MCP - ACI Manual of Concrete Practice, Parts 1 through 7, and Index, Current Edition.
r. ACI SCM-24 - Concrete Repair Basics, Current Edition.
s. ACI SP15 - Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with Selected ACI Reference, Current Edition.
t. ACI SP-71 - ASTM Standards in ACI 318, Current Edition.

2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
   a. ASTM C33 - Standard Specification for Concrete Aggregates, Current Edition.
   b. ASTM C70 - Standard Test Method for Surface Moisture in Fine Aggregate, Current Edition.
   c. ASTM C94 - Standard Specification for Ready-Mixed Concrete, Current Edition.
   d. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch or [50 mm] Cube Specimens), Current Edition.
   e. ASTM C125 - Standard Terminology Relating to Concrete and Concrete Aggregates, Current Edition.
   f. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate, Current Edition.
   g. ASTM C128 - Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Fine Aggregate, Current Edition.
   h. ASTM C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine, Current Edition.
   i. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete, Current Edition.
   j. ASTM C150 - Standard Specification for Portland Cement, Current Edition.
   k. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete, Current Edition.
   l. ASTM C191 - Standard Test Methods for Time Setting of Hydraulic Cement by Vicat Needle, Current Edition.
   m. ASTM C219 - Standard Terminology Relating to Hydraulic Cement, Current Edition.
   n. ASTM C226 - Standard Specification for Air-Entraining Additions for Use in the Manufacture of Air-Entraining Hydraulic Cement, Current Edition.
   o. ASTM C233 - Standard Test Method for Air-Entraining Admixtures in Concrete, Current Edition.
   p. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete, Current Edition.
   q. ASTM C311 - Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for use as a Mineral Admixture in Portland-Cement Concrete, Current Edition.
   r. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete, Current Edition.
   s. ASTM C535 - Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine, Current Edition.
   t. ASTM C566 - Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying, Current Edition.
   u. ASTM C595 - Standard Specification for Blended Hydraulic Cement, Current Edition.
   v. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzlan for Use in Concrete, Current Edition.
   w. ASTM C688 - Standard Specification for Functional Additions for Use in Hydraulic Cements, Current Edition.
   x. ASTM C989 - Standard Specification for Slag Cement for Use in Cement and Mortars, current edition.

3. Portland Cement Association (PCA) Standards and Specifications:
   a. PCA - Design and Control of Concrete Mixtures, Current Edition.

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1.05 DEFINITIONS

A. Exposed or Exposed to View: Portion of the structure that can be observed by the “public” during normal operation.
   1. Normal Operation: For tanks, this means when the tank is filled with liquid to the projected design average operating liquid level.

B. Public: Persons allowed on-site and within buildings by the Owner.

C. Liquid-Retaining Structure: A structure intended to hold and contain liquid in various stages of treatment. These structures are designed to be watertight to prevent leakage. Examples include, but are not limited to, storage tanks, clarifiers, aeration tanks, digesters, chemical containment.

D. Severe Exposure: Conditions where concrete is subjected to aggressive environments that can significantly impact its durability, such as chemical attacks from substances like acids, alkalis, or other corrosive chemicals.

1.06 SUBMITTALS

A. Submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specification. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Concrete Design Mix
   1. Prior to the start of placing of concrete, submit the design mix for each class of concrete, indicating that the concrete constituents and proportions will result in a concrete mix meeting the physical requirements for each class of concrete specified.
   2. Submit with the design mix, laboratory strength test reports and manufacturer’s certificates attesting the conformance of constituents with these specifications.
   3. Do not vary the proportions of the constituents or source of material of the approved mix without submitting corresponding test result documentation to the Engineer for review and approval.
   4. Design mix shall indicate proportions of cement, aggregate and water, and names and proportions of admixtures and air-entraining agents.
   5. Laboratory strength test reports shall contain strength data for the required number of tests as specified in ACI 318 (for non-water retaining concrete) or ACI 350 (for water-retaining concrete) design specifications. If existing data for the required number of tests is not available, then ACI 318/350 allows for alternate data or trial mixture results to be submitted for approval. Provide certification that the design mix complies with all ACI and ASTM requirements.

C. Concrete Installation Submittals
   1. Submit proposed plans and methods for cold/hot weather concrete placement procedures.
   2. Submit proposed curing and concrete jointing plans that indicate locations of construction joints and control joints for concrete walls and slabs.

1.07 MEETINGS

A. Prior to submitting design mixtures and rebar shop drawings, contractor shall hold a meeting to review detailed requirements for preparing final concrete design mixes and expectations regarding shop drawing quality, to establish procedures for placing, finishing, curing, and protecting concrete to meet required quality under anticipated conditions, to review construction drawing details, and to review proposed construction and control joint locations and layouts. Representatives of each entity directly involved with the cast-in-place concrete shall attend, including the following:
   1. Contractor's superintendent
   2. Architect of Record or representative
   3. Structural Engineer of Record or representative
   4. MSA's Resident Project Representative (RPR)
   5. Testing laboratory responsible for field quality control

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6. Ready-mix concrete supplier
7. Concrete subcontractor
8. Special concrete finish subcontractor

B. Pre-installation concrete meetings shall be held seasonally:
1. Pre-Installation Concrete Meeting – Fall
a. Review of cold weather concrete placement procedures, curing methods, and protocols.
2. Pre-Installation Concrete Meeting – Spring
a. Review of hot weather concrete placement procedures, curing methods, and protocols.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 CEMENTITIOUS MATERIALS

A. Cement
1. Cement shall be Portland Cement ASTM C150 Type I or IA or ASTM C595 Class IL, except as otherwise noted or approved.
a. Type III cement shall only be used for Class L concrete, or when approved by the Engineer.
b. ASTM C150 Type I or IA, Type II, and Type III, and ASTM C595 blended cement types IL, IP, and IS shall be used for exterior flatwork as approved by the Engineer.
2. A singular brand and manufacturer of cement shall be used for the entire work.

B. Cement Substitutions:
1. Contractor may use fly ash or ground granulated blast furnace slag (GGBFS) as a substitute for a portion of Portland cement in the structural concrete. The maximum allowable substitution rates shall be as follows:
a. Interior or Structural Concrete:
1) Fly Ash: 20%
2) GGBFS: 30%
3) Total Mineral Admixture: 30%
b. Exterior concrete flatwork (sidewalks and driveways):
1) Fly Ash: 15%
2) GGBFS: 15%
3) Total Mineral Admixture: 15%
2. Fly Ash and Slag:
a. Fly Ash:
1) Fly ash shall conform to ASTM C618 Class C.
2) A singular source of fly ash shall be used for the entire work.
b. Slag:
1) Slag shall be ground granulated blast furnace slag (GGBFS) conforming to ASTM C989.

2.02 AGGREGATE

A. Aggregate shall consist of clean, hard durable sand, gravel, crushed gravel or crushed rock.

B. Aggregate shall conform to the requirements of ASTM C33. Fine and coarse aggregate shall meet ASTM C33 grading requirements. Coarse aggregates shall be graded in accordance with ASTM gradations as follows:
1. 3/4-inch maximum coarse aggregate - ASTM No. 67
2. 1-1/2-inch maximum coarse aggregate - ASTM No. 467

C. Maximum aggregate size shall be as defined in the Concrete Schedule, or where not defined in the Concrete Schedule, as defined by dimensional constraints for cast-in-place concrete as follows.
1. Not larger than one-fifth of the narrowest dimension between sides of the forms;

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2. Not larger than one-third the thickness of the slab;
3. Not larger than three-fourths of the minimum clear spacing between individual reinforcing bars or wire, bundles of bars, or prestressing tendons or ducts.

2.03 MIXING WATER

A. Mixing water shall be natural or treated water, clean and free from injurious amount of oil, acid, alkali, chlorides and sulfates, other common salts, organic matter or other deleterious substances.

B. Mixing water shall yield cement paste complying with the requirements ASTM C109 and ASTM C191.

2.04 ADMIXTURES

A. All admixtures are subject to the written approval of the Engineer and shall be used in strict accordance with the manufacturer's recommendations.
1. Air-Entraining Admixture
   a. All concrete exposed to weather and freeze-thaw cycles shall be air-entrained, unless otherwise specified.
   b. Air-Entraining admixture shall conform to ASTM C260.
   c. Air-Entrainment shall be as indicated for each class as in the Concrete Schedule.
2. Water-Reducing, Set-Controlling Admixtures
   a. Water-Reducing, Set-Controlling admixtures shall conform to ASTM C494, Type A for water-reducing, Type C for accelerating, Type D for water-reducing and retarding, and Type E for water-reducing and accelerating. Type F for water reducing, high range, and Type G for water reducing, high range and retarding.

B. Crystalline Water-Proofing Admixture
1. Where: Water-proofing admixture is typically required in concrete mix for all concrete walls, floor slabs, and top slabs in water retaining structures. See Table 2 Concrete Schedule Uses and Properties.
2. General: Admixture shall be crystalline, cementitious, non-toxic chemical treatment for the water-proofing and protection of concrete.
3. Product:
   a. Xypex Admix C-500, C-1000 or C-2000 as manufactured by Xypex Chemical Corporation, 13731 Mayfield Place, Richmond, BC, Canada, V6V 2G9; 800-961-4477 or 604-273-5264; fax 604-270-0451; enquiry@xypex.com; www.xypex.com
   b. MasterLife 300D as manufactured by Master Builders Solutions Admixtures, LLC, 23700 Chagrin Boulevard, Beachwood, OH 44122; 800-628-9990; master-builders-solutions.com.
   c. Penetron Admix SB as manufactured by Penetron USA, Inc., 45 Research Way, Suite 203, East Setauket, NY 11733; 631-941-9700; info@penetron.com; www.penetron.com
   d. Substitutions: None.
4. Dosing:
   a. Rate as required by manufacturer.
   b. Admixture must be added in accordance with the manufacturer's recommendations. Thorough blending of the admixture throughout the concrete mix is essential for correct performance and care should be taken to ensure a homogeneous mixture is obtained.

C. Admixtures containing calcium chloride or soluble chloride shall not be used.

PART 3 EXECUTION

3.01 COORDINATION

A. Examine the drawings and specifications for work of other sections or other contractors and coordinate such work with the requirements of this Section; make provisions for installation of such items as sleeves, pipes, conduits, inserts and hangers in a manner that will not impair or weaken concrete construction. Verify that preinstallation meetings have occurred per requirements of Part 1.

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3.02 READI-MIX CONCRETE

A. Acceptability and Use. Readi-mix concrete shall be designed on the basis of strength, durability, impermeability, and exposure condition, as required for the intended use of the structure by methods specified in ACI 211.1 and ACI 318. All readi-mix concrete shall comply with the water-cement ratio for each specific class of concrete as specified in the Concrete Schedule. Concrete design mix, complete with sample test results shall be submitted to the Engineer for approval prior to placing any concrete.

1. Failure to Meet Strength Requirements. Failure to meet strength requirements shall be as defined in Concrete Quality Control- Division 01 of these specifications.
2. Watertight Concrete. All concrete exposed to earth or water shall be watertight, shall have a water-cement ratio as specified, and shall be air-entrained as specified in the Concrete Schedule.
    a. Provide damp-proofing membrane as indicated on the contract drawings.
3. Waterproof Concrete. All concrete for water retaining structures shall be waterproof, shall have a water-cement ratio as specified, and shall be air-entrained as specified in the Concrete Schedule.
    a. Install waterstops as indicated on the contract drawings.

B. Mix Proportioning. Mix proportioning shall be the responsibility of the Contractor and shall be submitted for review and approval by the Engineer, in accordance with these specifications.

1. Select proportions for concrete to obtain the quality requirements for the class of concrete as specified in the Concrete Schedule. Contractor, at their expense, shall have an approved independent laboratory prepare design mixes for each specified concrete class.
2. Slump. Slump for class of concrete shall be as specified in the Concrete Schedule. The Contractor shall at their expense, make field slump tests in accordance with ASTM C143 and Concrete Quality Control-Division 01 of these specifications.
3. Adjustment to Concrete Mixes. Design mix adjustments may be requested by the Contractor when characteristics of materials, conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised design mixes and strength results shall be submitted and approved before using in the work. No change in contract price will be allowed for these changes.
4. Addition of Water to the Batch. Addition of water to the batch delivered to the site shall be in strict accordance with ASTM C94. This shall be the Contractor's responsibility and by their direction, following consultation with the Engineer.
    a. Addition of water to the batch shall be one time only. Total gallons of water added to the batch shall be recorded on the load ticket, which shall be supplied to the Engineer prior to that delivery truck leaving the site. If water is permitted to be added to mixed concrete upon arrival at the job, an additional mixing of 30 revolutions of the drum shall be required.
    b. Contractor shall adjust the water-cement ratio of the batch to the corresponding value based on the addition of water to the batch and shall submit this information to the Engineer with adjusted strength data for the final batch proportion.
    c. At no time shall the addition of water cause the water-cement ratio specified in the concrete class schedule to be exceeded.

3.03 GENERAL

A. Unless otherwise specified, conform to ACI 304, 305, and 306 for concrete installation requirements such as preparation, mixing, conveying, depositing, curing, and cold and hot weather requirements; consolidate concrete in accordance with ACI 309.

B. Concrete not placed within 90 minutes or 300 revolutions, whichever occurs first, after the first mixing of the cement and aggregates will be rejected.

C. Contractor shall indicate on record set of Drawings at site, for review prior to installation, a pouring program for concrete work showing unit of operation, method of pouring, installation of construction/control joints, expansion joints and all necessary work.

D. Proper grade marker or stakes shall be used by Contractor to establish grades for ramps, platforms, sidewalks, slopes to drains, inlets, etc.

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E. Trenches, forms, conveying equipment shall be prepared to receive concrete in accordance with ACI 304.

F. Place concrete footings upon undistributed clean surfaces, free from frost, ice, mud and water; when foundation is on dry soil or pervious material, lay waterproof sheathing paper over earth surfaces to receive concrete.

G. Rock surfaces upon which concrete is to be placed, make level, clean, free from all objectionable coatings, water, mud, debris, loose semi-detached or unsound fragments; level surfaces to receive sand cushion placed to minimum thickness of 2 inches.

H. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperature and mechanical injury; maintain with minimum moisture loss and relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete.

I. All freshly cast concrete shall be protected from damaging effects of the elements freezing, rapid drop in temperature and loss of moisture and from future construction operations.

3.04 PREPARATION OF EQUIPMENT AND PLACE OF DEPOSIT

A. Before placement, clean equipment for mixing and transporting the concrete; remove debris and ice from all surfaces upon which concrete is placed; clean reinforcement of dirt, loose rust, and mill scale, or other coatings.

B. Remove water from all areas before depositing concrete; before depositing new concrete on or against concrete that has set, thoroughly roughen; clean existing surfaces of laitance, foreign matter or loose particles; retighten forms; slush existing surfaces with neat cement grout coat; place new concrete before grout has attained initial set; give horizontal construction joints grout brush coat of cement, fine aggregate, in same proportions as concrete to be placed.

C. Thoroughly wet the stone base on which slabs are to be placed where no vapor barrier is indicated.

D. Check compaction of fill and proper grade for slabs-on-grade. Check screeds and exercise care to prevent disturbing screeds during placement. Provide for construction joints in slabs-on-grade at 20 feet maximum in each direction unless shown otherwise on the contract drawings. Place expansion joint material at junctures of slabs-on-grade with vertical walls and as otherwise shown.

E. Remove debris, excess form oil, and water from formwork; avoid washing newly deposited concrete.

3.05 MIXING

A. Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C94 and ACI 304. The production facilities shall comply with the requirements of the National Ready Mixed Concrete Association Certification Plan as regards materials storage and handling, batching equipment, central mixer, truck mixers, agitators, non-agitating units, ticketing system, etc.

B. Do not over-mix; do not use concrete which is retained in mixers so long as to require additional water in excess of design mix water to permit satisfactory placing; retempering of mix is not permitted.

C. Concrete shall be delivered to the site of the work and the mixed concrete discharged completely within 1-1/2 hours after water has been added to cement. In hot weather, or under conditions contributing to quick stiffening of concrete, this time may be reduced by the Engineer.

D. Concrete delivered shall arrive at the site having a temperature not less than 50 Degrees F nor greater than 85 Degrees F, unless otherwise permitted by the Engineer.

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3.06 CONVEYING

A. Convey concrete from the mixer to the final deposit by methods that will prevent segregation or loss of materials.

B. Use of aluminum conveyances is not permitted.

3.07 CONCRETE PLACEMENT

A. Place concrete, including drops greater than 60 inches using recommended practices in accordance with ACI 304 and ACI 318. Once pouring operation commences, it shall be carried out as a continuous operation until a section is completed.

B. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing; do not use vibrators to move concrete horizontally within the forms.

C. Do not use retempered concrete or concrete contaminated by foreign material.

D. Plan and conduct concrete placement to ensure that the concrete is kept plastic and that the concrete is free of cold joints.

E. Where there is a time delay greater than 45-minutes between adjacent concrete placement, a bulkhead construction joint, complete with waterstops where required, must be installed.

F. Do not commence placing when the sun, heat, wind or limitations of facilities provided prevent proper finishing or curing.

G. Discontinue concreting when the descending natural air temperature falls lower than 40 Degrees Fahrenheit unless preparations are made and in place to heat or insulate concrete in accordance with the cold weather concreting requirements of this specification.

H. Concrete for walls shall be deposited in approximately horizontal layers not to exceed 18 inches in height to avoid segregation due to rehandling and flowing.

I. Concrete shall not be placed or poured in water. Water level shall be removed or lowered in a manner approved by Engineer. Excess water shall not be permitted. Powdering a mixture of cement to absorb excess water shall not be permitted.

J. Concrete shall be placed before initial set has occurred. Placing should be carried on in such manner that the concrete in the form is still plastic and can be integrated with fresh concrete.

K. Contractor shall notify Engineer of concrete pouring schedule one day in advance of pour to allow for inspection of reinforcing and forms.

L. Bottom dump buckets may be used for transporting mixed concrete to the desired location. Particular care shall be taken to avoid jarring or bumping as this may cause segregation.

M. Where chutes are used to transport concrete, they shall be of metal or wood with metal lining and should have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal so that the concrete will travel fast enough to keep the chute clean but slow enough to avoid segregation of materials. The end of each chute shall be provided with a baffle to help prevent segregation, or the concrete should be discharged through a tremie or elephant trunk directly into the form.

N. Elephant trunks and/or tremies shall be used in walls and columns to prevent free fall of the concrete and to allow the concrete to be placed through the cage of reinforcing steel.

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O. Pumping equipment shall be of suitable type, without Y-sections, and with adequate pumping capacity. Loss of slump in pumping shall not exceed 1-1/2-inches.

3.08 CONSOLIDATION

A. Each concrete layer placed shall be compacted by mechanical internal vibrating equipment supplemented by hand spading, rodding, or tamping.

B. The period of concrete vibration shall not be less than two seconds nor more than five seconds at any one point.

C. Consolidate concrete thoroughly as it is placed in order to secure a dense mass; work concrete well around the reinforcement and embedded items and into the corners of the forms.

D. Use internal vibrators inserted vertically over the entire area of the placement; form vibrators not permitted; internal vibrators shall maintain a minimum of 5000 impulses when submerged in concrete.

E. Vibrate until voids are eliminated, coarse aggregate is suspended in mortar, and entrapped air bubbles begin to rise to the surface; concrete should move back into the space vacated by the vibrator; vibration duration shall be limited only to the time necessary to produce consolidation without causing segregation.

F. Space vibrator insertions such that the area visibly affected by the vibrator overlaps the adjacent just-vibrated area by a few inches.

G. Penetrate at least 6 inches into previously placed layers in order to bond between layers and avoid cold joints.

H. Take care not to over-vibrate air entrained concrete; place vibrator to eliminate honeycombing but avoid excess vibrating that bleeds all entrapped air from the mix.

I. Do not use vibrators to transport concrete.

3.09 JOINTS

A. Construct expansion, control, and isolation joints only where indicated on the drawings or at additional locations approved by the Engineer (and as shown on the Standard Details).

B. Where the placing of concrete is discontinued, clean off laitance and other objectionable material to a sufficient depth to expose sound concrete as soon as concrete is firm enough to retain its form; smooth the top surface of concrete adjacent to the forms with a trowel to minimize visible joints on exposed faces.

C. Immediately upon completion of the work of placing concrete, remove accumulations splashed upon the reinforcement and the surfaces of the forms; perform this removal before concrete takes its initial set; clean reinforcing steel carefully to prevent damage to the concrete steel bond.

D. Do not halt work within 18 inches of the top of any face.

E. For bonded horizontal joint construction, roughen the surface and expose the aggregate; clean the surface thoroughly by wet sandblasting, by cutting with high-pressure water jet or by other approved methods; perform cleaning after the concrete has hardened to prevent raveling of the surface below the desired depth.

F. Construction and contraction joints shall be constructed with interfaces roughened to 1/4-inch amplitude, cleaned and laitance removed.

G. Before bonding concrete is placed, clean the surface of loose or soft particles or other objectionable materials and keep wet for a minimum period of 12 hours.

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H. Cover the cleaned and saturated surface with a coating of neat cement grout and deposit new concrete before the grout has attained its initial set.

3.10 CURING

A. Concrete shall be wet cured by immersion of moisture-retaining covers in conformance with ACI 308 or shall receive curing compound in accordance with ACI 309.

B. Water curing is the preferred method of protection for curing concrete; cover exposed surfaces with a saturated material (burlap or cotton mats) and keep wet continuously with a soil soaker hose for 7 curing days for all concrete except high early strength concrete; leave covering in place, without wetting, for an additional 3 days.

C. A curing day is defined as 24-hour day when the concrete surfaces are kept moist and the uniform temperature of the concrete mass is between 55 Degrees Fahrenheit and 75 Degrees Fahrenheit.

D. Curing shall start as soon as free surface water disappears after finishing. Where forms are not removed immediately, curing shall be accomplished in a manner acceptable to the Engineer.

E. Curing compounds may not be used on surfaces that are to receive additional concrete, paint or tile, unless approved by the manufacturer for such use.

F. Curing and sealing compound shall not be applied to steel reinforcing anchors, water stops, construction joints, or surfaces to be bonded to other concrete.

G. When using a curing compound, keep surfaces moist after the forms are removed. Preferred sequence: Remove forms in accordance with 03 11 13 Structural Cast-In-Place Concrete Forming of this specification: apply curing compound according to manufacturer's recommendations (if manufacture allows pre-finishing application); repair form tie holes; finish surface. Alternate sequence (if manufacturer does not allow pre-finishing application): Remove forms in accordance with 03 11 13 Structural Cast-In-Place Concrete Forming of this specification; repair form tie holes; finish surface; apply curing compound according to manufacturer's recommendations.

H. Slabs: Immediately following slab finishing, begin water curing before the surface becomes dry or apply liquid membrane-forming curing compound.
   1. For exposed slabs with synthetic fiber reinforcement (fiber mesh), the exposed fibers shall be melted or burned off with a heat source prior to applying the curing compound.

I. Vertical Surfaces: When the forms are removed entirely, spray the surface with water and allow it to reach a uniformly damp appearance with no free water on the surface; apply curing compound or begin water curing.

J. For curing concrete under hot weather conditions, see Hot Weather Requirements in this section.

K. For curing concrete under cold weather conditions, see Cold Weather Requirements in this section.

3.11 CONCRETE WALL FINISHES

A. Complete screeding and darbying of top of walls before excess moisture or bleeding water is present on the surface.

B. Do not begin subsequent finishing operations until surface water has disappeared.

C. Refer to Section 03 11 13 for As-Cast Surface Finishes requirements.

D. All areas of concrete that have holes and pockmarks that exceed the definition for bug hole shall be repaired with a structural repair mortar after forms are removed and prior to any specific surface finishes.

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E. Refer to Concrete Schedule, included in this specification section, for finish type at each location, defined as follows:
   1. Rough Form Finish: (Type W1)
      a. Provide As-Cast Surface Finish-1.0.
   2. Smooth Form Finish: (Type W2)
      a. Provide As-Cast Surface Finish-2.0.
   3. Smooth Rubbed Finish: (Type W3)
      a. Provide As-Cast Surface Finish-2.0.
      b. Wet surface and rub with a Carborundum brick until uniform color and texture are produced.
      c. Perform rubbing no later than 24 hours after forms are removed.
      d. Do not use any cement grout other than the paste drawn from the concrete itself by rubbing.
      e. Thoroughly wash the surface with water.
   4. Smooth Troweled Finish: (Type W4)
      a. Produce a Smooth Rubbed Finish W3.
      b. After wet-rubbing, finish with a steel trowel to increase compaction of fines and to provide maximum density.
   5. Smooth Finish (Grout Cleaned): (Type W5)
      a. Provide As-Cast Surface Finish-3.0.
      b. Use for surfaces exposed to general view, unless noted otherwise. This is not an architectural texture or exposed aggregate finish. This method is to fill bug holes remaining in exposed concrete, not repair defects in concrete work.
      c. Mix 1 part portland cement and 1-1/2 parts fine sand with sufficient water to produce grout having consistency of thick paint; use white portland cement in combination with normal portland cement to achieve uniform surface color after drying.
      d. Wet surface of concrete and uniformly apply grout with brush or spray gun completely filling air bubbles; surface with a wood float scouring wall vigorously.
      e. Allow grout to partially set for one to two hours, depending on weather conditions; in hot dry weather, keep damp, using fine fog spray.
      f. When grout has hardened sufficiently to be scraped from wall with edge of steel trowel without removing grout from small air holes, cut off all grout that can be removed with trowel.
      g. Allow surface to dry thoroughly then rub vigorously with dry burlap to completely remove dried grout; there shall be no visible film or grout remaining after this rubbing.
      h. The entire cleaning operation for any area must be completed the day it is started; no grout shall be left on overnight, and sufficient time shall be allowed for grout to dry after it has been cut with trowel so it can be wiped off clean with burlap.
      i. After entire surface has been grout cleaned, wipe off any slightly dark spots or streaks with fine abrasive hone.

3.12 CONCRETE SLAB FINISHING

A. Complete screeding and darbying slabs before excess moisture or bleeding water is present on the surface.

B. Do not begin subsequent finishing operations until surface water has disappeared and the concrete will sustain foot pressure with only approximately 1/4-inch indentation.

C. Refer to Concrete Schedule, included in this specification section, for finish type at each location, defined as follows:
   1. Smooth Float Finish: (Type S1)
      a. Consolidate concrete with a power-driven disc-type float or a combination floating-troweling machine with metal float shoes attached.
      b. Machines which have a water attachment for wetting the concrete during the finishing operation are prohibited.

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c. Check and level surface plane to a tolerance not exceeding 1/4 inch in 10 feet when tested with a 10-foot straightedge. Cut down high spots and fill low spots; immediately after re-leveling, refloat surface to a uniform, smooth, granular texture.

d. Where slab drainage is indicated, take care to maintain accurate slopes for drainage.

2. Steel Troweled Finish: (Type S2)
   a. Produce a Smooth Float Finish S1.
   b. After float finishing, steel trowel surface as specified in Concrete Schedule to increase the compaction of fines and to provide maximum density and wear resistance.
   c. Steel Troweled Finish: Screed and bull float or darby. Give preliminary float finish, true, even and free from depressions; float surface with hand or machine floats; compact surface with not less than 2 thorough and complete steel troweling operations.
   d. Tolerance on finished steel troweled floors in no instance shall exceed 1/8 inch in 10'-0" on surface; where floor drains occur, slope floors to drains.
   e. Buffing: After concrete floors have been properly cured, buff thoroughly to remove soluble salt incrustation or other foreign substances.
3. Broom Finish: (Type S4)
   a. Produce Smooth Float Finish S1.
   b. Draw stiff broom over surface, to obtain non-slip finish.
      1) At Sidewalks, produce a medium-coarse broom finish.
      2) At all other areas produce a fine broom finish.
   c. For slabs with synthetic fiber (fiber mesh) reinforcement, broom in one direction only, with a consistent sweeping motion to align the fibers with the broom texture.

3.13 CONCRETE SIDEWALKS

A. Concrete sidewalk construction shall be as specified in Concrete Sidewalks, Steps, and Driveways - Division 32 of these specifications.

3.14 CONCRETE SPLASH BLOCKS

A. Reinforced precast concrete splash blocks formed of 4000 psi concrete with air entrained concrete; shall be 2 inches thick x 1'-0" wide x 2'-6" long; front shall be turned up 4 inches for 6 inches overall height; upper corners of turned up lip shall be cut off at 45 Degree angle; wire mesh reinforcing turned up in front lip.

3.15 PERIMETER INSULATION

A. Install perimeter insulation at building foundation wall and under floor slab as shown on the contract drawings.

3.16 HOT WEATHER REQUIREMENTS

A. Comply with ACI 305R unless otherwise specified herein below.

B. Hot weather conditions are deemed to exist when the temperature in the forms is 75 Degrees Fahrenheit or above, or a combination of high air temperature, low relative humidity and wind velocity impair the quality of fresh or hardened concrete; take protective measures for mixing, transporting and placing concrete in accordance with ACI 305R.

C. The temperature of the concrete at the place of discharge may not exceed 85 Degrees Fahrenheit.
   1. If ice is used to lower temperature, place crushed, shaved or chipped ice directly into the mixer as part or all of the mixing water; mix until ice is completely melted.
   2. Record the concrete temperature at the time of discharge.

D. Do not add water that will cause the proportions to exceed the maximum water-cement ratio shown in Table I.
   1. Notify the Engineer before adding any water to the concrete mix.

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2. Record the amount of water added to the concrete at the jobsite.

E. Discharge concrete within 45 minutes or 100 revolutions, whichever occurs first, after the first mixing of cement and aggregates.

F. Placing and Curing:
1. Place concrete promptly upon arrival.
2. Provide at least one standby vibrator for each 3 vibrators in use.
3. Protect concrete from direct sunlight; keep forms covered and moist by means of water sprinkling or the application of continuously wetted burlap or cotton mats for a minimum of 24 hours. Windbreaks and/or sunshades shall be provided as directed by the Engineer.
4. When forms are removed, provide wet cover to the newly exposed surfaces to avoid exposure to hot sun and wind.
5. Continue specified water curing methods for 10 days; leave covering in place 4 additional days; do not permit alternate wetting and drying cycles.
6. For slabs on grade, beam and deck concrete, and other horizontal placements protect the surface between finishing operations using one or more of the following methods:
   a. Careful use of a fog nozzle.
   b. Spreading and removing polyethylene sheeting between finishing operations.
   c. Application of mono-molecular film after the strike-off.

G. During extremes in weather, floor slabs shall not be cast unless the slab is protected by a roof and other suitable protective measures are provided. After curing has been completed, the floor shall be exposed to the air for 48 hours prior to allowing traffic on the floors.

3.17 COLD WEATHER REQUIREMENTS

A. Comply with ACI 306.1 (R2002) unless otherwise specified herein below.

B. Cold weather is defined any time when the daily temperature is 40 Degrees Fahrenheit or lower during placement and the protection period. If at any time during the progress of the work, the temperature drops below 40 Degrees F., the Contractor shall make suitable provisions to protect the concrete by use of insulation materials such as blankets, mats, etc., and equipment for providing artificial heat.

C. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelope. Combustion gases shall not be allowed in any temporary enclosure and building envelope.

D. Protect concrete surfaces from freezing for at least 24 hours after placement.

E. All surfaces in contact with newly-placed concrete including formwork, reinforcement and subgrade must be above 35 Degrees Fahrenheit.

F. Use preparation methods capable of producing concrete with a temperature not more than 85 Degrees Fahrenheit, and not less than 55 Degrees Fahrenheit, at the time of placement.

G. Do not heat concrete ingredients to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, within the specified temperatures. (Do not heat water in excess of 140 Degrees Fahrenheit.)

H. Concrete shall have a temperature of not less than 55 Degrees Fahrenheit when placed; mix concrete at a temperature between:
1. 60 Degrees Fahrenheit and 70 Degrees Fahrenheit when outside air temperature is above 30 Degrees Fahrenheit.
2. 65 Degrees Fahrenheit and 75 Degrees Fahrenheit when outside air temperature is between 0 Degrees Fahrenheit and 30 Degrees Fahrenheit.

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3. 70 Degrees Fahrenheit and 80 Degrees Fahrenheit when outside air temperature is below 0 Degrees Fahrenheit.

I. Follow concrete placement with tarpaulins or other readily movable coverings, so only a few feet of concrete is exposed to the outside air at any time.

J. Maintain the temperature and moisture conditions specified in all parts of the newly placed concrete by covering, insulating, housing or heating; arrange for protection methods in advance of placement.

K. Maintain concrete at a temperature of not less than 55 Degrees Fahrenheit nor more than 70 Degrees Fahrenheit for a period of 3 days after placement.

L. A thermometer accurate to plus or minus 2 Degrees F shall be placed under the curing blanket. Additional insulation shall be supplied as required to maintain the temperature above 55 Degrees F.

M. After the curing period, the temperature of the exposed surface shall not be permitted to drop faster than 30 Degrees F in 24 hours.

N. Do not remove forms during the initial protection period.

O. Protect insulation against wetting that will impair its insulating value using moisture-proof cover material; keep insulation in close contact with concrete.

P. Construct enclosure to withstand wind and snow loads and be reasonably airtight; provide sufficient space between the concrete and enclosure to permit free circulation of heated air.

Q. Use vented heaters; do not permit heaters to heat or dry concrete locally. Unvented salamanders or other heaters which produce carbon dioxide as by-products shall not be permitted within enclosures or inside buildings. If heaters are used, precautions shall be taken to prevent drying of the slab through the use of water jackets or other suitable methods.

R. Maintain relative humidity above 40% within heated enclosures before construction supports are removed.

S. Monitor temperature to ensure concrete is kept within specified limits recording time and concrete temperature every 8 hours.

T. Assure concrete has developed necessary strength before removing forms; provide additional test cylinders with the same protection as the structure they represent to verify concrete strength before construction supports are removed.

U. If water curing is used, terminate at least 12-hours before end of temperature protection period. Permit concrete to dry.

V. After the required protection period gradually reduce the concrete temperature within an enclosure or insulation at a rate not to exceed 20 Degrees Fahrenheit per day until the outside temperature has been reached.

W. Apply membrane forming curing compound to concrete surfaces during the first period of above-freezing temperatures after forms are stripped and before air temperature rises to 50 Degrees Fahrenheit; apply membrane forming curing compound to slabs as soon as finishing operations are completed, except where live steam curing is used.

3.18 DELIVERY TICKETS

A. With each load of concrete delivered to the job there shall be furnished by the ready-mixed concrete producer duplicate delivery tickets, one for the Contractor and one for the Engineer. Delivery tickets shall provide the following information:

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1. Date and serial number of ticket;
2. Name of ready-mixed concrete plant;
3. Job location;
4. Contractor;
5. Type and brand name of cement;
6. Mix number or specified cement content in bags per cubic yard of concrete;
7. Truck number;
8. Time dispatched stamped by a time clock;
9. Amount of concrete in load in cubic yards;
10. Admixtures in concrete, if any;
11. Maximum size of aggregate;
12. Water added at job, if any;
13. Slump of concrete ordered

TABLE 1
CONCRETE CLASS SCHEDULE

Parameter Value	Compressive Strength (PSI) 28-Day	Water-Cement Ratio Maximum	Air Content Range (%) Minimum-Maximum	Slump Range (Inches) Minimum-Maximum	Coarse Aggregate (Inches) Maximum
Class A	4,000	0.5	1 to 2	2 to 4	3/4
Class B	4,000	0.5	1 to 2	2 to 4	1-1/2
Class C	4,000	0.5	5 to 7	2 to 4	3/4
Class D	4,000	0.5	4 to 6	2 to 4	1-1/2
Class E (Interior)	3,000	0.5	1 to 2	2 to 4	3/4
Class F (Exterior)	3,000	0.5	5 to 7	2 to 4	1-1/2
Class G	2,000	0.67	1 to 2	4 to 6	1-1/2
Class H	5,000	0.45	1 to 2	2 to 4	3/4
Class I	5,000	0.45	1 to 2	2 to 4	1-1/2
Class J	5,000	0.45	5 to 7	2 to 4	3/4
Class K (Exterior)	5,000	0.45	4 to 6	2 to 4	1-1/2
Class L	3,000 psi @24 hours	0.40	5 to 7 4 to 6	2 to 4 2 to 4	3/4 1-1/2

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TABLE 2
CONCRETE SCHEDULE
USES AND PROPERTIES

Use	Finish	Class and Considerations
Standard Concrete (not including liquid-retaining or severe exposure structures)		
Foundations, walls, and footings,	W1	Class A
(Buried and non-exposed)	W1	Class B
Foundations and walls	S2 Top, W5 Sides	Class A
(Exterior and exposed)	S2 Top, W5 Sides	Class B
Slabs and floors,	S4 Top, W5 Sides	Class C
(Exterior)	S4 Top, W5 Sides	Class D
Slabs and floors,	S2 Top, W5 Sides	Class A
(Interior)	S2 Top, W5 Sides	Class B
Housekeeping pads	S2 Top, W5 Sides	Class E (Interior)
	S2 Top, W5 Sides	Class F (Exterior)
Equipment pads	S2 Top, W5 Sides	Class A
(Interior)	S2 Top, W5 Sides	Class B
Equipment pads	S4 Top, W5 Sides	Class C
(Exterior)	S4 Top, W5 Sides	Class D
Sidewalks, aprons, driveways	S4 Top, W5 Sides	Class C
	S4 Top, W5 Sides	Class D
Manhole bases and benches	Special Construction	Class E
Pavement base, cradles	Special Construction	Class E
and inlet walls		Class F
Mass and fill	None	Class G
Traffic areas requiring		
early access or use	Special Construction	Class L
Liquid-Retaining Structures (provide with integral crystalline water-proofing admixture)		
Locations: STR 30 Chemical Containment walls and floor; STR 50 UV Disinfection		
Slabs and bases	S2 Top, W1 Sides	Class H
(Interior, concealed)	S2 Top, W1 Sides	Class I
Slabs, bases, equipment and housekeeping pads	S2 Top, W5 Sides	Class H
(Interior, exposed)	S2 Top, W5 Sides	Class I
Slabs and bases	S2 Top, W1 Sides	Class J
(Exterior, concealed)	S2 Top, W1 Sides	Class K
Slabs and bases	S2 Top, W5 Sides	Class J
(Exterior, exposed)	S2 Top, W5 Sides	Class K
Elevated slabs and integral beams	S2 Top, W5 Sides, W5 Bottom	Class J
(Exterior)	S2 Top, W5 Sides, W5 Bottom	Class K
Fillets	S2 Top, W5 Sides	Class E
	S2 Top, W5 Sides	Class F
Severe Exposure Structures		
Locations: STR 30 Chemical Containment housekeeping pads		
Equipment and housekeeping pads	S2 Top, W5 Sides	Class H
(Interior, exposed)	S2 Top, W5 Sides	Class I

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Cast-in-place concrete shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 CAST-IN-PLACE CONCRETE

A. Cast-in-Place Concrete, Lump Sum. When so provided, payment for cast-in-place concrete shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.

B. Cast-in-Place Concrete, Inclusive. When no quantity is provided, cast-in-place concrete shall be considered inclusive to payment for work associated with the related structure, utility, or improvement.

END OF SECTION

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SECTION 03 62 00
NON-SHRINK GROUTING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing a non-shrink fluid precision grout material, forming, placing and curing where shown on the contract drawings or required by equipment manufacturers, equipment bases shall be grouted in position.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS (NONE)

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specification. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 NON-SHRINK GROUTING

A. Non-shrink grouting shall be as manufactured by Master Builders, U.S. Grout Corporation, or equal.

PART 3 EXECUTION

3.01 PREPARATION AND INSTALLATION

A. Concrete foundation shall be rough and relatively level. Contractor shall remove laitance down to sound concrete and prepare concrete in accordance with manufactured recommendations.

B. Preparation of grout shall be in paddle type mortar mixer or other suitable mechanical mixer.

C. Placing of grout shall be at temperatures of 45 Degrees Fahrenheit to 75 Degrees Fahrenheit. Temperature shall be maintained above 40 Degrees Fahrenheit until strength exceeds 4000 psi.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Non-shrink grouting shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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4.02 NON-SHRINK GROUTING

A. Non-Shrink Grouting, Inclusive. When no quantity is provided, non-shrink grouting shall be considered inclusive to payment for work associated with the related equipment.

END OF SECTION

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SECTION 03 64 23
EPOXY/GROUT INJECTION CRACK REPAIR

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered under this section shall cover furnishing all materials, equipment and labor required for repairing of structural and non-structural cracks in existing concrete, as shown on the contract drawings and as described in these specifications.

B. Work shall include inspection of existing concrete to determine extend and means of repair required. Submit recommendations to Engineer for review prior to start of work.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
    a. ASTM C321 - Standard Test Method for Bond Strength of Chemical Resistant Mortars, Current Edition.
    b. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete, Current Edition.
    c. ASTM C882 – Standard Test Method for Bond Strength of Bonding Systems Used With Concrete By Slant Shear, Current Edition.
    d. ASTM C884 - Standard Test Method for Thermal Compatibility Between Concrete and a Epoxy-Resin Overlay, Current Edition.
    e. ASTM D93 - Standard Test Method for Flash Point by Pensky-Martens Closed Cup Tester, Current Edition.
    f. ASTM D412 - Standard Test Method for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension, Current Edition.
    g. ASTM D638 - Standard Test Method for Tensile Properties of Plastics, Current Edition.
    h. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position, Current Edition.
    i. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics, Current Edition.
    j. ASTM D790 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials, Current Edition.
    k. ASTM D1042 - Standard Test Method for Linear Dimensional Changes of Plastics Under Accelerated Service Conditions, Current Edition.
    l. ASTM D2196 - Standard Test Methods for Rheological Properties of Non Newtonian Materials by Rotational (Brookfield Type) Viscometer, Current Edition.
    m. ASTM D2240 - Standard Test Method for Rubber Property - Durometer Hardness, Current Edition.
    n. ASTM D2369 - Standard Test Method for Volatile Content of Coatings, Current Edition.
    o. ASTM D3574 - Standard Test Method for Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams, Current Edition.

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p. ASTM D4659 – Standard Test Methods for Polyurethane Raw Materials: Determination of Specific Gravity of Isocyanates, Current Edition.

2. American Concrete Institute (ACI), Specifications and Standards:
   a. ACI 504R - Guide to Joint Sealants for Concrete Structures, Current Edition.

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specification. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Epoxy and Chemical Grout. Prior to the start of crack repair, submit manufacturer's product information attesting the conformance of constituents with these specifications, manufacturer's recommendations regarding use, and equipment to be used in the application of the material.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 CHEMICAL GROUT (NON-STRUCTURAL REPAIRS)

A. Polyurethane Grout.
1. The grouting compound shall be a hydrophobic polymer of the polyurethane type. Grout shall expand on contact with water and quickly cure to a tough, flexible, dense, closed-cell foam resistant to most organic solvents, mild acids, alkali, petroleum, and micro-organisms. ANSI/NSF 61 certified for potable water.
2. The accelerator shall be based on tertiary amines, and shall be capable of controlling reaction time from one to thirty minutes depending on quantity of accelerator and temperature of grout. All materials shall be delivered to the site in undamaged, unopened containers. Grouts shall be non-flammable and non-toxic.

B. The sealing materials shall be a polyurethane grout and accelerator system:
1. De Neef Flex LV PURe with De Neef Flex Cat PURe as manufactured by GCP Applied Technologies
2. Or equal conforming to the following physical properties at 68ºF:

Polyurethane Grout Properties:		
Solids	100%	ASTM D2369 B
Viscosity	550 cps	ASTM D2196 A
Density	8.51 lbs/gal	ASTM D4659
Flash Point	Over 270 deg F	ASTM D93
Corrosiveness	Non-corrosive	
Accelerator Properties:		
Viscosity	15 cps	ASTM D2196
Flash Point	221ºF	ASTM D93
Cured Properties:		
Density	8.35 lbs/gal	ASTM D3574
Tensile Strength	174 psi	ASTM D3574
Elongation	100%	ASTM D3574
Toxicity	Non-toxic	

2.02 STRUCTURAL BONDING EPOXY (STRUCTURAL REPAIRS)

A. Epoxy. Epoxy injection material shall be insensitive to the presence of water and be composed of a two-component, ultra-low viscosity, 100% solids, epoxy injection resin system designed specifically for gravity feeding or pressure injection for structurally rebonding cracks in portland cement concrete. Product shall be suitable for application in damp (not wet) conditions.
1. De Neef Denepox I-40 as manufactured by GCP Applied Technologies,
2. Or equal, and conforming to the following physical properties at 77ºF:
   Resin Part "A" Properties:

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Solids	100%	
Color	Clear	
Shelf Life	1 year	
Hardener Part "B" Properties:		
Solids	100%	
Color	Amber	
Shelf Life	1 year	
Mixed Properties:	Test Method	
Mix Ratio	2.85:1 by vol. (A:B)	N/A
Viscosity	85 cps	Brookfield
Potlife @ 77ºF	80 min.	N/A
Tensile Strength	9 ksi	ASTM D638
Flexural Strength	14.4 ksi	ASTM D790
Compressive Strength	12.0 ksi	ASTM D695
Bond Strength (Dry Concrete)	870 psi	ASTM C321
Bond Strength (Wet Concrete)	520 psi	ASTM C321
Elongation	9%	ASTM D638
Slant Shear (Dry Concrete)	1985 psi	ASTM C882
Slant Shear (Water Saturated)	1110 psi	ASTM C882
Splitting Tensile Strength		
Air Dried Concrete	923 psi	ASTM C496
Water Saturated Concrete	703 psi	ASTM C796

B. Surface Seal. Surface seal material shall be insensitive to the presence of water and be composed of a fast setting two-component epoxy gel designed specifically for patching, surface sealing for injection and bonding substates. Thixotropicgel for post adhesion and surface patching when injecting epoxies, especially if done the same day. Product shall meet ASTM C881, Type IV, Grade 3, Class: A, B, and C.

1. De Neef Denepox Rapid Gel as manufactured GCP Applied Technologies
2. Or equal, and conforming to the following physical properties at 77ºF:

Resin Part "A" Properties:		
Solids	100%	
Color	White gel	
Unit Weight	13.97 lbs/gal	
Shelf Life	1 year	
Hardener Part "B" Properties:		
Solids	100%	
Color	Black gel	
Unit Weight	12.71 lbs/gal	
Shelf Life	1 year	
Mixed Properties:	Test Method	
Blended Color	Gray gel	Visual
Mix Ratio	1:1 by vol. (A:B)	N/A
Viscosity	non-sagging gel	N/A
Potlife (3 oz.) @ 77°F	4-5 minutes	N/A
Hardness (Shore D) @ 77°F	75± 5%	ASTM D2240
Geltime (5 mil) @ 77°F	15-20 minutes	N/A
Tensile Strength	6,000 psi	ASTM D638
Flexural Strength	4,000 psi	ASTM D790
Compressive Strength	10,880 psi	ASTM D695
Bond Elongation (48 hours)	2,934 psi	ASTM C321
Elongation	1%	ASTM D638
Water Absorption	0.35% (24 hrs)	N/A

PART 3 EXECUTION

3.01 QUALITY CONTROL

A. Components shall be installed in accordance with manufacturer's specifications and as indicated on the contract drawings.

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B. The work described in this section shall be performed by a Contractor with a minimum of (3) years experience installing these types of materials. Contractor shall submit statement(s) of qualifications and references for review by the Engineer.

C. Testing for Quality Acceptance

1. Core Sampling. To determine the completeness of crack injection, the Contractor shall obtain one 2-inch diameter core sample from each crack repair area as directed by the Engineer. The cores shall be a minimum depth of 12 inches to a maximum of 36 inches as necessary to verify completion of work, and taken at locations selected by the Engineer.
2. Conditions of Compliance and Non-Compliance. The injection shall be considered complete if more than 85% of the crack void at any location is filled with epoxy resin or polyurethane grout as specified. If injection acceptance criteria are not met by the core tests, the Engineer may order re-injection and additional core testing as necessary at no additional cost to the Owner.
3. Test Core Hole Repair. The Contractor shall be responsible for repairing the core holes left in the structure by methods outlined in this specification section, or as otherwise approved by the Engineer.

3.02 CHEMICAL GROUT CRACK REPAIR

A. Purpose. Injection of polyurethane grout is for the purpose of filling voids and for the repair of leaking cracks in portland cement concrete.

B. Storage. Immediately upon receipt at the site of work, all chemical grouting materials shall be stored in a secured, dry, weather-tight structure. All basic chemical grout shall be furnished in containers acceptable for use in the work. A sufficient quantity of basic chemical grout and other components shall be stored at or near the site of work to insure that grouting operations will not be delayed by shortages.

C. Mixing and Handling. Mixing and handling of the chemical grout and accelerator shall be in accordance with the recommendations of the manufacturer and all applicable safety codes and shall be performed in such a manner as to minimize hazard to personnel. It is the responsibility of the Contractor to provide appropriate protective measures to insure that chemicals, or foam produced by said chemicals, are under control of the Contractor at all times. Plastic or metal mixing tanks shall be used. Tanks of concrete, wood or other absorptive material are not permitted.

D. Injection Equipment. The equipment used to inject the polyurethane grout/accelerator mixture into the cracks shall be portable with positive displacement type pumps. The pumps shall be electric or air powered, and shall provide sufficient working pressure to accomplish the specified sealing requirements.

E. Procedures. Remove loose, disintegrated and porous concrete at cracks scheduled for repair. Holes shall be drilled in the existing structure, as necessary, to accomplish the specified sealing requirements. In general, full depth cracks should be prepared for injection by drilling successive holes along both sides of the crack, at a 45-degree angle to intersect the crack at the midpoint of the structural element. Where a maximum depth of 36 inches for crack repair is specified (six foot thick elements or greater), intersect the crack at a point 18 inches from the structure surface where the crack is evident. Injection operations on vertical cracks should commence at the lowest point of the crack and advance upward to successive ports. Injection operations on horizontal cracks shall proceed uninterrupted from one end to the other. The exact method for crack preparation and injection shall be location specific, and shall be determined by the Contractor in the field. Only mechanical packers shall be used. Plastic drive-in packers will not be permitted. Chemical grout shall be injected under such pressure so as not to damage the existing structure.

F. Finishing and Clean-Up. When cracks are completely filled and after sufficient curing time has been allowed, excess chemical grout material and injection ports shall be removed by grinding or other appropriate methods. No grout material shall extend beyond the plane of the surfaces of the in-situ concrete.

G. Safety Precautions. Contractor shall strictly adhere to all safety precautions for handling and using chemical grout materials as recommended by the product manufacturer.

3.03 STRUCTURAL BONDING EPOXY CRACK REPAIR

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A. Purpose. Epoxy injection of cracks is for the purpose of structurally re-bonding damaged portland cement concrete elements to prevent further displacement and/or deterioration.

B. Crack Inspection and Feasibility Decision. Prior to any work being completed or any materials being ordered, Contractor and Engineer shall visually inspect the structure(s) scheduled to receive crack repair treatments, and determine the feasibility for epoxy injection.

C. Equipment for Injection

1. The equipment used to meter and mix the two epoxy resin components and to inject the mixture into the cracks shall be portable with positive displacement type pumps equipped with an interlock to provide positive ration control of the exact proportions of the two components at the nozzle. The pumps shall be electric or air powered and shall provide in-line metering and mixing.
2. The injection equipment shall have automatic pressure control capable of discharging the mixture at any present pressure up to 160 psi (±5 psi), and shall be equipped with a manual pressure control override.
3. The equipment shall have the capability of maintaining the volume ration for the mixture prescribed by the manufacturer of the epoxy resin material within a tolerance of ±5% by volume at any discharge pressure up to 160 psi.
4. The injection equipment shall be equipped with sensors on both the component A and B reservoirs that will automatically stop the machine when only one component is being pumped into the mixing head.

D. Preparation

1. Surface areas adjacent to cracks shall be cleaned of dirt, dust, grease, oil, laitance or efflorescence or other foreign matter that may be detrimental to adhesion of surface seal material. Acids and corrosives will not be permitted for cleaning.
2. Injection ports shall be installed along the cracks at intervals of 4 to 10 inches, or as determined by the Contractor to accomplish full penetration of injection resin. Center the injection ports over the cracks and secure in place using surface seal material. Where possible, install the injection ports over the widest areas of the cracks.
3. Surface seal material shall be applied to the face of the crack between the entry ports. For known through cracks, surface seal shall be applied to both faces of the member. Allow ample time for the surface seal material to gain adequate strength prior to proceeding with the injection operation.

E. Epoxy Injection

1. Install the epoxy injection resin in accordance with the manufacturer's instructions.
2. During installation, pressures shall be limited, in general, to 35 psi at the point of entry into the crack.
3. On vertical cracks, injection shall start at the lowest point and continue upward along the crack. While injecting, resin should flow to and out of the next higher port. When this flow is established, the lower port shall be capped and injection shall continue until all ports have been injected and flow has been established between them.
4. On horizontal cracks, following the procedure for vertical, injection shall start at one end and continue in succession along the crack.

F. Finishing and Clean-Up. When cracks are completely filled, the epoxy resin shall be cured for a sufficient time to allow removal of the surface seal without draining or run-back of epoxy material from cracks. Surface seal material, excess epoxy material, and injection ports shall be removed by grinding or other appropriate methods. No epoxy material shall extend beyond the plane of the surfaces of the in-situ concrete.

G. Test Core-Hole Repair. The Contractor shall be responsible for repairing all core hole(s) left from required quality assurance testing as stipulated herein by one of the following methods.

1. Fill core holes with an epoxy mortar consisting of one part epoxy injection resin and four parts clean, dry, bagged fine aggregate mixed by volume. Finish repair to match surrounding surfaces.
2. Fill core holes with an epoxy mortar consisting of one part epoxy gel to one part of clean, dry, bagged fine aggregate mixed by volume. Finish repair to match surrounding surface.

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3. Core hole repair is not necessary where hole will be concealed by other surface repairs such as Cast-In-Place Concrete Work - Division 03.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Epoxy/grout injection crack repair shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work herein shall be considered in each of the measurement and payment method(s) stipulated, unless otherwise indicated in the Bid Schedule or Special Procedures - Division 01. Work included in the stipulated payment method(s) shall consist of furnishing and placing the structural bonding epoxy and/or polyurethane grout sealant, required cleaning of existing concrete prior to and after injection, coring of the samples, inspecting the core samples, repairing core holes left from testing, and furnishing all equipment, tools, labor, and incidentals necessary to complete the work in accordance with the contract.

4.02 EPOXY/GROUT INJECTION CRACK REPAIR

A. Epoxy/Grout Injection Crack Repair, Lump Sum. When so provided, payment for structural bonding epoxy or polyurethane grout injection crack repair shall be made at the contract lump sum price bid.

B. Epoxy/Grout Injection Crack Repair, Lineal Foot. When so provided, measurement for structural bonding epoxy or polyurethane grout injection crack repair shall be per lineal foot of surface cracks injected as verified/approved by the Engineer. Injection crack repair shall be completed as shown on the contract drawings or as otherwise directed by the Engineer. Payment shall be made at the contract unit price bid per lineal foot of cracks acceptably injected.

C. Epoxy/Grout Injection Crack Repair, Inclusive. When no quantity is provided, items shall be considered inclusive to payment for associated work.

END OF SECTION

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SECTION 04 05 13
MASONRY MORTAR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Section 04 20 00 - Unit Masonry: Installation of mortar.

1.03 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Mortar for masonry.

B. Section 04 72 00 – Cast Stone: Mortar for limestone.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
2. ASTM C150 - Standard Specification for Portland Cement.
3. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
4. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
5. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.
6. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
7. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
8. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength.
9. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
10. ASTM C1329 - Standard Specification for Mortar Cement.
11. ASTM C1357 - Standard Test Method for Evaluating Masonry Bond Strength.
12. ASTM E518 - Standard Test Methods for Flexural Bond Strength of Masonry.

B. International Masonry Industry All-Weather Council (IMIAC):
1. Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. The Masonry Society (TMS):
1. ACI 530/530.1 - Building Code Requirements and Specifications for Masonry Structures and Related Commentaries.

1.05 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Product Data: Submit on the pre-mixed mortar to be used: cement, lime, sand and pigment to be used.

C. Samples: Submit 3/8”x3/8”x4” colored mortar samples illustrating the colors available for selection by the Architect.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with TMS MSJC Code and TMS MSJC Specification.

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1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements [Material and Equipment]: Product storage and handling provisions.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Hot and Cold Weather Requirements: TMS MSJC Specification.

B. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mortar: Premixed Portland cement, lime, sand and pigment: SpecMix or BMI complying with ASTM C270. Factory mixed with products complying with the following:
   1. Portland Cement: ASTM C150, Type I, gray color.
   2. Mortar Aggregate: ASTM C144, standard masonry type.
   3. Hydrated Lime: ASTM C207, Type S.
   4. Pigment:
      a. Prism, SGS or approved equal.
      b. Colors may be selected from full range of standard and premium colors.
      c. Colors from Prism 10, 20 and 40 series colors.
      d. Colors from SGS Solomon Colors shall include A, H and X series colors.
      e. If SpecMix and BMI do not have a color in their line up of colors then a color will be selected from SGS Solomon Colors, Inc.

B. Water: Clean and potable.

C. Masonry cement and site mixed mortars as not permitted.

2.02 MORTAR COLOR

A. Decorative concrete units: Mortar shall be colored.
   1. Color shall match selected masonry units.

B. Plain Units: Mortar shall be standard gray.

2.03 ADMIXTURES

A. Water Repellent: Shall match product integral with decorative concrete units.
   1. Dry-Block by Grace Construction Products
   2. BASF MasterPel 240MA.
   3. No substitutions.

2.04 MORTAR MIXING

A. Thoroughly mix portland cement-lime mortar ingredients in accordance with ASTM C270 property specification requirements.

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B. Mortar Type:
   1. Decorative Concrete Units and Cast Stone: Type N (750 psi)
   2. Masonry below grade: Type M (2500 psi)

C. Add water repellant to mortar for decorative concrete units in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within 2 hours of mixing.

F. Use mortar within 2 hours after mixing at temperatures of 90 degrees F, or 2-1/2 hours at temperatures under 40 degrees F.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

3.02 INSTALLATION

A. Install mortar to requirements in Section 04 20 00.

END OF SECTION

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SECTION 04 05 16
MASONRY GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grout for masonry.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Section 04 20 00 - Unit Masonry: Installation of grout.

1.03 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Grout for concrete block.

B. Section 08 12 13 – Standard Hollow Metal Frames: Grout for steel door frames.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM C150 - Standard Specification for Portland Cement.
   2. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
   3. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
   4. ASTM C476 - Standard Specification for Grout for Masonry.
   5. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.

B. International Masonry Industry All-Weather Council (IMIAC):
   1. Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. The Masonry Society (TMS):
   1. ACI 530/530.1 - Building Code Requirements and Specifications for Masonry Structures and Related Commentaries.

1.05 SUBMITTALS (NONE)

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with TMS MSJC Code and TMS MSJC Specification.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements [Material and Equipment]: Product storage and handling provisions.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Hot and Cold Weather Requirements: TMS MSJC Specification.

B. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

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PART 2 PRODUCTS

2.01 MATERIALS

A. Grout:
   1. Premixed or Ready mix complying with ASTM C476 Standard Specification
   2. Fine or Coarse Aggregate: ASTM C404.
   3. Premixed in bags or silos:
      a. Quikrete Commercial Grade Core Fill Grout – Fine or Coarse.
      b. Spec Mix Core Fill Masonry Grout – Fine or Coarse.
   4. Ready Mix: Mix to comply with ASTM C476 Proportion method or strength method.
   5. Compressive strength: 3000 psi minimum at 28 days.
   6. Slump: 8 inch minimum to 11 inch maximum.

B. Water: Clean and potable.

2.02 GROUT MIXING

A. Use a mechanical batch mixer. Hand mixing is not allowed.

B. Thoroughly mix grout ingredients in accordance with ASTM C476 in quantities needed for immediate use.

C. Do not use anti-freeze compounds to lower the freezing point of grout.

D. Use the grout within 1.5 hours of initial mixing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to grouting request inspection from Architect/Engineer of spaces to be grouted.

3.02 INSTALLATION

A. Install grout to the requirements in Section 04 20 00 – Unit Masonry.

END OF SECTION

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SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Masonry Units.

B. Reinforcement, Anchorage, and Accessories.

C. Masonry Cleaning.

1.02 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

A. Section 03 20 00 - Concrete Reinforcement: Reinforcing bars.

B. Section 04 05 13 – Masonry Mortar: Mortar.

C. Section 04 05 16 – Masonry Grout: Grout.

D. Section 04 72 00 – Cast Stone: Windowsills.

E. Section 05 05 23 - Metal Fastenings.

F. Section 05 50 00 - Metal Fabrications: Loose steel lintels and bearing plates.

G. Section 07 21 13 - Board Insulation: Insulation for cavity spaces.

H. Section 07 27 13 – Sheet Membrane Air/Vapor Retarder.

I. Section 07 62 00 – Sheet Metal Flashing and Trim: Reglets

J. Built-in Items Furnished by Other Sections.

1.03 RELATED SECTIONS

A. Section 05 05 23 - Metal Fastenings: Anchor bolts.

B. Section 07 27 26 - Fluid-Applied Membrane Air/Vapor Retarder.

C. Section 07 92 00 - Joint Sealers: Backer rod and sealant at control joints.

D. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System: FRP door frame wall openings.

E. Division 22 - Plumbing: Plumbing installed in walls and wall openings.

F. Division 23 - Heating, Ventilating, and Air Conditioning: Conduit installed in walls and wall openings.

G. Division 26 - Electrical: Conduit installed in walls and wall openings.

H. Division 40 – Process Integration: Wall openings.

I. Division 44 – Pollution Control Equipment: Wall openings.

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1.04 REFERENCES

A. American Society of Civil Engineers (ACI) International:
   1. ACI 530/530.1- Building Code Requirements and Specification for Masonry Structures and Related Commentaries.

B. American Society for Testing and Materials (ASTM) International:
   1. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. ASTM A580 - Standard Specification for Stainless Steel Wire.
   3. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   4. ASTM A951 - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
   5. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
   6. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
   7. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.

C. International Code Council:
   1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2009 Edition, and referenced standards with 2015 State of Wisconsin amendments.

D. The Masonry Society (TMS):
   1. TMS MSJC - Building Code for Masonry Structures (ACI 530/ASCE 5/TMS 402), Specification for Masonry Structures (ACI 530.1/ASCE 6/TMS 602) and Commentaries.

E. National Concrete Masonry Association:
   1. TEK Manual for Concrete Masonry Design and Construction.

1.05 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Samples: Submit samples of decorative block to illustrate color, texture, and extremities of color range.

C. Product Data: Submit on all accessories and reinforcement.

D. Shop Drawings: Submit reinforcing shop drawings for reinforced concrete masonry wall and lintel construction.
   1. Submit detailed reinforcing drawings prepared in accordance with TMS 402/ACI 530, including bar schedule with bar marks and bends indicated.
   2. Show bar schedules, stirrup spacing, diagrams of bent bars and arrangements of concrete masonry reinforcement.
   3. Verify dimensions and make proper allowance for fitting together work of other trades.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with TMS MSJC Code and TMS MSJC Specification.

1.07 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three (3) years documented experience.

1.08 PRE-INSTALLATION MEETINGS

A. Section 01 31 13 - Project Coordination: Requirements for attending a pre-construction conference prior to commencing work of this section.

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B. Convene minimum one (1) week prior to commencing work of this section.

C. The Engineer/Architect, general contractor on-site foreman, the on-site mason foreman, and the mason project manager must be in attendance at this meeting.

D. Review conditions of installation, installation procedures, and coordination required with related work.

E. All submittals must be submitted for all items and must have been accepted prior to this meeting.

F. No masonry work shall begin on site until after this meeting occurs.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Concrete block, brick, and other materials stored on-site must be stored off the ground and be covered with plastic to prevent the material from becoming wet or covered with ice and snow. The material shall remain covered until it is used.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment: Environmental conditions affecting products on site.

B. Hot and Cold Weather Requirements: International Building Code and The Masonry Society ACI 530.

1.11 COLD WEATHER PROTECTION

A. When the ambient air temperature is below 40 degrees F implement cold weather procedures and comply with ACI 530 specifications for cold weather construction.

B. Temporary enclosures shall be constructed around the areas of work.

C. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelope. Combustion gases shall not be allowed in any temporary enclosure and building envelope.

1.12 COORDINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Coordinate masonry work with installation of window and door anchors.

1.13 EXTRA MATERIALS

A. Section 01 77 00 - Closeout Procedures: Spare parts and maintenance products.

B. Supply (5) of each color of decorative concrete units.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Hollow Loadbearing Block Units: ASTM C90, normal weight, 3250 psi minimum compressive strength on the net area.

B. Nonloadbearing Units: ASTM C129, hollow, normal weight, 3250 psi minimum compressive strength on the net area.

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C. Masonry Units: Modular sized to thickness as indicated on drawings; provide special units for 90-degree corners, bond beams, sash units, end units, lintels, etc.

D. Decorative Block Units: ASTM C90, normal weight, 2500 psi minimum compressive strength on the net area, integral color as selected by Architect, from manufacturer's standard colors, integral waterproofing of Dry-Block by Grace Construction Products or Rheomix Rheopel by Master Builders (product shall be same as provided for mortar).
1. Type 'A': Split face. Color A.
2. Type 'B': Split face. Color B.

2.02 REINFORCEMENT AND ANCHORAGE

A. Joint Reinforcement for Single Wythe Below Grade Walls: Single width, truss-type; ASTM A580 Type 304 stainless steel; cold-drawn wire, all 9 gauge.
1. #120 Truss-Mesh by Hohmann and Barnard.
2. Series 300 Truss Mesh by Wire-Bond

B. Adjustable Wall Ties (for below grade masonry tie): ASTM Type 304 stainless steel; 14-gauge plate; 3/16-inch diameter, 4-inch long triangular tie. Fasten anchor to wall with Tapcon masonry screws. Coordinate backplate length due to installation location with no cavity – tie connection needs to be installed within plane of the insulation.
1. BL-407 Anchor by Hohmann & Barnard
2. #2407 Adjustable Veneer Anchor by Wire-Bond

C. Joint Reinforcement for Decorative Veneer Units: Single width, truss or ladder type; ASTM A580 Type 304 stainless steel; all 9-gauge wires.
1. #1100 Ladder Type Wall Reinforcing by Heckmann
2. #220 Ladder-Mesh or #120 Truss-Mesh by Hohmann and Barnard.
3. Series 300 Truss Mesh or Series 200 Ladder Mesh by Wire-Bond

D. Veneer Tie: Adjustable Thermal veneer anchor with single screw for concrete, CMU, or wood stud construction, dual-diameter barrel with factory-installed EPDM washers for sealing both the face of the insulation and air/vapor retarder. Thermal wings shall be steel reinforced and coated with flame resistant plastic and accept a brick tie. Barrel shall be ASTM A580 Type 304 stainless steel, length to match insulation thickness, hook length to provide up to 1/2-inch adjustability; ASTM A510/ASTM C954 5/16-inch hex head screw; ASTM A580 Type 304, 3/16-inch diameter wire, non-seismic design, vee wall tie, length as required to provide minimum 2-1/2-inch embedment in veneer.
1. Pos-I-Tie ThermalClip System (75-TC) w/ #282-N Pintel Wire Ties by Heckmann
2. Thermal Concrete 2-Seal Wing Nut Anchor by Hohmann and Barnard.
3. SureTie WS Tapco Thermal by Wire-Bond.

E. Windowsill Stone Anchor: Bent corrugated wall tie, ASTM A580 type 304 stainless steel, 14-gauge, 1-1/2-inch wide by 4-1/2-inch long horizontal leg, (1) fastener hole on short bend side for mounting to wall.
1. #187 Corrugated Brick Anchor with Hole by Heckmann
2. 345 Buck Anchor by Hohmann & Barnard.
3. 2501 Veneer Anchor Corrugated by Wire-Bond.

F. Reinforcing Steel: Type as specified in Section 03 20 00.

G. Rebar Positioner: Mill galvanized, 9-gauge wire.
1. Wire Bar Positioner (376) by Heckmann
2. #RB Rebar Positioner by Hohmann and Barnard.
3. #3403 Figure 8 Single Rebar Positioner (only available for 6" and 8" block) by Wire-Bond

H. Acceptable Manufacturers:
1. Hohmann & Barnard
2. Heckmann Building Products, Inc.
3. Wire-Bond

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2.03 MASONRY FLASHINGS

A. Flashing: 40 mil thick by 24-inch wide roll, self-adhering, self-sealing, and self-healing flexible composite membrane with a release sheet with a wall primer.
   1. Grace Construction Products Perm-A-Barrier Wall Flashing and Perm-A-Barrier WB Primer.
   2. Hohmann & Barnard Textroflash and Primer-SA.
   3. Substitutions: None.

B. Drip Plate: 2-inch minimum wide, 26-gauge Type 304 stainless steel drip plate extending 1/2-inch and hemmed bent down at 45 degrees drip edge.
   1. #1007 Hemmed Drip-Edge Flashing by Heckmann
   2. Hohmann and Barnard Drip Plate (DP)
   3. #4165 Drip Edge Flashing by Wire-Bond

C. Termination Bar: 1-inch to 1.5-inch tall, 26-gauge Type 304 stainless steel bar with a 3/8-inch bent top edge for sealant and 1/4-inch diameter holes at 8-inches on center for fasteners.
   1. #1050-T1-SS Termination Bar by Heckmann
   2. #T2 by Hohmann & Barnard
   3. #4210 Termination Bar by Wire-Bond

D. Fasteners: Type 304 stainless steel.
   1. Wood screws for fastening to wood blocking or sheathing.
   2. Powers Fasteners Zamac Nailin stainless steel mushroom head 1/4-inch x 1.25-inch fasteners for masonry walls.

E. Sealant: For termination bar and other areas within masonry cavity wall.
   1. Tremco Dymonic
   2. Master Builders MasterSeal NP 1

2.04 ACCESSORIES

A. Preformed Control Joints: Extruded rubber, ASTM D-2000 2AA-805, preformed control joint.
   1. RS Series Rubber Control Joint by Hohmann and Barnard
   2. 2901 Rubber Control Joint by Wire-Bond
   3. Or equal

B. Building Paper: (at steel lintel bearing for slip plane) 15# asphalt saturated felt.

C. Weep Holes (below windowsills only): Plastic tube type, 3/8-inch outside diameter, stainless steel or brass screen, and no cotton wick.
   1. #330 Plastic Weephole by Heckmann
   2. #341 Round Weep Hole by Hohmann and Barnard

D. Expansion Joint Material: Closed cell polyvinyl chloride foam, resiliency recovery of 95 percent, if not compressed more than 50 percent of original thickness.
   1. NS-Closed Cell Neoprene Sponge by Hohmann & Barnard
   2. Expansion Joint (#3300) by Wire-Bond
   3. Or equal

E. Weeps: Polyester with 90% open weave mesh, flame retardant, anti-microbial, 3 1/2-inch by 3 1/2-inch (or 2-5/8-inch), 3/8-inch thick (or 1/2-inch thick). Color as selected by Architect from manufacturer's standard colors, shall be available in a minimum of six (6) standard colors.
   1. Mortar Trap Weep Vents by Hohmann & Barnard
   2. WeepVent by Mortar Net Solutions
   3. 3610 Mortar Net Weep Vent by Wire-Bond
   4. Or equal

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F. Mortar Net (Mortar Deflector): Polyethylene (HDPE) or nylon woven open mesh, 10-inch high by thickness to fill cavity thick.
   1. #84 WallDefender (*comes in 0.4", 1" , 2")* by Heckmann
   2. #Mortar Trap (*comes in 0.4", 1", 1.5", 2"*) by Hohmann and Barnard
   3. WallDefender (*comes in 0.4", 1", 2"*) by Mortar Net Solutions
   4. Or equal

G. Hot-Dip Galvanizing Touch-Up Paint: Yield shall be 94% pure zinc metallic powder; meet ASTM B-117-64 salt spray (2000 hours); meets performance requirements of MIL-D-46105 and DOD-P-21035A.
   1. Crown Premium 7007 by Aevoe Industries
   2. Or equal approved prior to bidding

2.05 MASONRY CLEANING SOLUTION

A. Decorative Concrete Masonry Unit Cleaning Solution: Sure Klean Custom Masonry Cleaner.

2.06 LINTELS

A. Concrete block bond beams and lintels - size and reinforcement as shown.

B. Steel lintels - provided under Section 05 50 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify items provided by other sections of work are properly sized and located.

D. Verify built-in items are in proper location and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.

B. Establish lines, levels, and coursing. Protect from disturbance.

C. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.03 COLD WEATHER CONSTRUCTION

A. Temporary enclosures shall be constructed around the areas of work.

B. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelope. Combustion gases shall not be allowed in any temporary enclosure and building envelope.

C. When the ambient air temperature is below 40 degrees F implement cold weather procedures and comply with the following:
   1. Preparation - Comply with the following requirements prior to conducting masonry work:
      a. Do not lay masonry units having either a temperature below 20°F (-6.7°C) or containing frozen moisture, visible ice, or snow on their surface.
      b. Remove visible ice and snow from the top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing, using methods that do not result in damage.

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2. Construction - These requirements apply to work in progress and are based on ambient air temperature. Do not heat water or aggregates used in mortar or grout above 140°F (60°C). Comply with the following requirements when the following ambient air temperatures exist:
   a. 40°F to 32°F (4.4°C to 0°C).
      1) Heat sand or mixing water to produce mortar temperature between 40°F (4.4°C) and 120°F (48.9°C) at the time of mixing.
      2) Heat grout materials when the temperature of the materials is below 32°F (0°C).
   b. Below 32°F to 25°F (0°C to -3.9°C):
      1) Heat sand and mixing water to produce mortar temperature between 40°F (4.4°C) and 120°F (48.9°C) at the time of mixing. Maintain mortar temperature above freezing until used in masonry.
      2) Heat grout aggregates and mixing water to produce grout temperature between 70°F (21.1°C) and 120°F (48.9°C) at the time of mixing. Maintain grout temperature above 70°F (21.1°C) at the time of grout placement.
      3) Heat AAC units to a minimum temperature of 40°F (4.4°C) before installing thin-bed mortar.
   c. Below 25°F to 20°F (-3.9°C to -6.7°C): Comply with Paragraph 3.03 C.3.b and the following:
      1) Heat masonry surfaces under construction to a minimum temperature of 40°F (4.4°C).
      2) Use wind breaks or enclosures when the wind velocity exceeds 15 mph (24 km/h).
      3) Heat masonry to a minimum temperature of 40°F (4.4°C) prior to grouting.
   d. Below 20°F (-6.7°C): Comply with Paragraph 3.03 C.3.c and the following: Provide an enclosure and auxiliary heat to maintain air temperature above 32°F (0°C) within the enclosure.
3. Protection - These requirements apply after masonry is placed and are based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry. Protect completed masonry in the following manner:
   a. Maintain the temperature of glass unit masonry above 40°F (4.4°C) for the first 48 hour after construction.
   b. 40°F to 25°F (4.4°C to -3.9°C): Protect newly construction masonry by covering with a weather-resistive membrane for 24 hours after being completed.
   c. Below 25°F to 20°F (-3.9°C to -6.7°C): Cover newly constructed masonry completely with weather-resistive insulating blankets, or equal protection, for 24 hours after completion of work. Extend time period to 48 hours for grouted masonry, unless the only cement in the grout is Type III portland cement.
   d. Below 20°F (-6.7°C): Maintain newly constructed masonry temperature above 32°F (0°C) for at least 24 hours after being completed by using heated enclosures, electric heating blankets, infrared lamps, or other acceptable methods. Extend time period to 48 hours for grouted masonry, unless the only cement in the grout is Type III portland cement.

3.04 COURSING

A. Place masonry to lines and levels indicated.

B. Maintain masonry courses to uniform dimension. Make vertical and horizontal joints equal and of uniform thickness.

C. Lay concrete masonry units in running bond for all exposed block walls, unless noted otherwise on drawings. Course one block unit and one mortar joint to equal 8 inches. All mortar joints shall be tooled concave (including concealed joints).

3.05 PLACING AND BONDING

A. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Buttering corners of joints and deep or excessive furrowing of mortar joints are not permitted.

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C. Remove excess mortar as Work progresses.

D. Back bevel decorative block when placing in cavity wall.

E. Fully bond intersections at external and internal corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Take care to prevent breaking masonry unit corners or edges.

H. Cut mortar joints flush where a finished base is scheduled.

3.06 CAVITY WALL

A. Build inner wythe ahead of outer wythe to receive air/vapor retarder system and cavity insulation.

B. Install masonry flashing as required by this section and as required and provided under Section 07 62 01.

C. Install steel lintels as provided under Section 05 50 00. Galvanized coating shall be touched up as required.

D. Install insulation as required in Section 07 21 13 after installation of air/vapor retarder system in Section 07 27 26.

E. Do not install veneer until air/vapor retarder system of Section 07 27 26 and insulation of Section 07 21 13 are installed.

F. Install weeps in veneer at 16 inches on center horizontally above through wall flashing at shelf angles, lintels, or top of walls and at bottom of walls. Set face of weep back 3/8 inch from face of exterior wall to be flush with face of tooled mortar joint.

G. Install weep holes in veneer at 16 inches on center horizontally above through wall flashing at stone windowsills. A minimum of two (2) weeps shall be installed at each sill.

H. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes. Back bevel mortar on cavity wall side of decorative block.

I. Install mortar deflector at base of wall and at lintels above openings.

3.07 TOLERANCES

A. Variation from Unit to Adjacent Unit: 1/32 inch maximum.

B. Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Variation from Level Coursing: 1/8 inch in 3 feet.

E. Variation of Joint Thickness: 1/8 inch in 3 feet.

F. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.

3.08 REINFORCEMENT AND ANCHORS

A. Install horizontal joint reinforcement 16 inches on center, unless noted otherwise.

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B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 16 inches minimum each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches. Extend 16 inches minimum each side of opening.

E. Do not extend horizontal joint reinforcement across control or expansion joints, unless noted otherwise.

F. Reinforce all bond beams with two (2) #5 bars placed 1 inch from bottom web, unless noted otherwise. Extend vertical reinforcement 6 inches into bond beams at all vertical reinforcing locations.

G. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch of true dimension. Use rebar positioners to secure vertical reinforcement bars in place.

H. Vertical reinforcing bars shall be centered in unit core and grouted solid, unless noted otherwise.

I. At all wall openings: Install one (1) #5 bar vertically in core closest to opening up to bottom of lintel. In next adjacent core, install one (1) #5 bar vertically full height of wall.

J. At corners: Install one (1) #5 bar vertically in core full height of wall.

K. At control joints when shown on the drawings install vertical rebar in the core adjacent to control joint full height of wall.

L. Lap reinforcing bars (splice lap lengths) as follows unless noted otherwise on the drawings:
1. #3 bars: 19 inch
2. #4 bars: 25 inch
3. #5 bars: 31 inch
4. #6 bars: 37 inch

M. Verify that anchorages embedded in concrete attached to structural steel members are properly placed. Embed anchorages in every second joint.

N. Reinforce corners and intersections by lapping horizontal joint reinforcement or by using preformed pieces.

O. Anchors and wall ties at metal stud and existing masonry construction shall be placed at 16 inches on center vertically and horizontally.

3.09 MASONRY FLASHINGS

A. Install membrane flashing per manufacturer's instruction.

B. Apply primer to substrate. Allow to dry.

C. Install a stainless steel drip edge at the face of the veneer. Set drip in two beads of sealant. Flexible flashing to adhere on top of drip. Flashing shall extend to the wall face.

D. Form water dams located at the end of all flashing runs over door and window openings.

E. Provide flashings at all penetrations through the exterior wall.

F. Flashing to be installed before the air/vapor retarder system.

G. Install termination bar the full length of the flashing at the top edge. Secure with fastener at 8-inches on center. Apply sealant along the top edge for the entire length.

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3.10 LINTELS

A. Provide weld-on tie for the steel lintels to Section 05 50 00 for installation.

B. Install loose steel lintels as scheduled and furnished under Section 05 50 00.

C. All steel lintels shall be hot-dip galvanized after fabrication, unless noted otherwise, under Section 05 50 00. Touch up marks and scratches on lintels with hot-dip galvanizing spray paint prior to placement in wall construction.

D. Install reinforced unit masonry lintels over openings where steel lintels are not scheduled or unless otherwise shown. Construct lintels using grout fill and reinforcing. Maintain minimum 8 inch bearing on each side of opening.

E. Use single piece reinforcing bars only.

F. Place and consolidate grout fill without displacing reinforcing.

G. Allow masonry lintels to attain specified strength before removing temporary supports.

3.11 GROUTED COMPONENTS

A. Install grout as provided under Section 04 05 16 – Masonry Grouting.

B. Remove excess mortar from grout spaces.

C. Place and consolidate grout fill without displacing reinforcing.

D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening, unless noted otherwise.

E. Work grout into masonry cores and cavities to eliminate voids.

F. Do not grout in lifts greater than 12 inches without consolidating grout by rodding.

G. Top of lift shall terminate a minimum of 1-1/2 inches from mortar joint, except at opening or top of wall.

H. Install grout per ACI 530.

3.12 PREPARATION TO GROUT

A. Block cells do have to align but it is best. See ACI 530-02, S-23 and S-24 for minimum grout space required and grout pour height.

B. Must allow enough time for mortar to set so enough strength is gained to withstand the pressure of the fluid grout. For grout pours from 1 to 5 feet, wait 12 to 18 hours before grouting. For 12 inch and less pours, you can grout as each course is laid.

C. Prevent excess mortar from extruding or falling into grout spaces. Mortar that projects more than 1/2 inch into the grout space shall be removed.

D. At the foundation:
   1. Grout must come in contact with the foundation.
   2. Dowels in foundation must align with cores to be grouted.

E. Lap rebar shall be in accordance with ACI-530-02.

F. Place rebar in rebar positioners.

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3.13 GROUTING

A. Grout to be provided from a ready-mix truck at the site or from a silo located on site. Trucking in tubs from an off-site location is not acceptable.

B. Grout should be moved from the mixer to the point of deposit as fast as practical.

C. Test grout slump. Must be 8 to 11 inch slump. (See TEK 9.4.)

D. Place grout within 1-1/2 hours of mixing and prior to initial set.

E. Grout lift height not to exceed 5 feet.

F. Grout pour height not to exceed ACI 530-02 Table 7 page S-24 in each day.

G. Consolidate and reconsolidate grout.
   1. Consolidate grout pours 12 inches or less in height by mechanical vibration or puddling. Puddle with a wooden stick.
   2. Consolidate pours exceeding 12 inches in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.
   3. Use a low velocity vibrator with a 3/4-inch head. The vibrator is activated for one to two seconds in each grout cell.
   4. Reconsolidation should generally take place between 3 and 10 minutes after placement. It must be done before plasticity is lost.

H. Grout may be placed by pouring from a bucket.

I. Stop lift at minimum 1-1/2 inch above or below a bed joint except the final pour.

3.14 CONTROL JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints, unless noted otherwise.

B. Use preformed control joint block (sash) units on both sides of control joint, unless shown otherwise on Drawings.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.15 BUILT-IN WORK

A. As work progresses, build in metal door and glazed frames fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, lintels, columns, beams, and other items furnished by other Sections.

B. Build in items plumb and level.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build in organic materials subject to deterioration.

3.16 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves and ground. Coordinate with other Sections of work to provide correct size, shape, and location.

B. Obtain Architect/Engineer approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

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3.17 CLEANING

A. The concrete block shall be cleaned with water and non-metallic tools at the end of each workday or within 24 hours of laying the units of excess mortar and mortar smears.

B. Cleaning of decorative block shall be completed after 14 days and before 28 days of initial placement, the masonry shall be cleaned of all excess mortar, smears, and residue with a masonry cleaning solution.
   1. Extreme caution must be taken with cleaning the wall since damage to the masonry and mortar can result. The mortar must be maintained in a condition that after cleaning, the “skin” still remains on the mortar and no discoloration occurs to the mortar, brick, stone, or other components in or around the wall. The mason will take full responsibility for all damage that occurs during cleaning which could result in the requirement to replace the masonry construction.
   2. All cleaners utilized must be acceptable to the brick manufacturer.
   3. Follow the brick manufacturers and cleaning solution manufacturers procedures and recommendations.
   4. The cleaning solution must be premixed at the mason’s shop in 55-gallon drums to the recommended dilution rate by the cleaning products manufacturer’s recommendations.
   5. A small test area of the building will be cleaned with the solution.
   6. The wall is to be washed starting at the top and working all the way down to the bottom. Before applying the cleaning solution, the wall must be thoroughly soaked with water.
   7. The wall must be thoroughly rinsed with water to remove the masonry cleaning solution.

C. Power washing of any kind is not acceptable.

3.18 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 50 00 - Temporary Facilities and Controls: Protection of provisions.

B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

C. At day’s end, cover unfinished walls to prevent moisture infiltration.

END OF SECTION

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SECTION 04 72 00
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabrication of cast stone masonry of custom color and installation of units.

B. Cast stone windowsill.

C. Anchorage.

D. Cleaning of cast stone masonry.

1.02 RELATED SECTIONS

A. Section 04 05 00- Mortar and Masonry Grout.

B. Section 04 20 00 - Unit Masonry.

C. Section 07 92 00 - Joint Sealants.

1.03 REFERENCES

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

B. American Concrete Institute (ACI):
1. ACI 318 – Building Code Requirements for Reinforced Concrete.

C. ASTM International (ASTM):
1. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM C33 - Standard Specification for Concrete Aggregates.
4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
5. ASTM C150 - Standard Specification for Portland Cement.
6. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method.
7. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
8. ASTM C260 - Standard Specification for Air-Entrained Admixtures for Concrete.
9. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
10. ASTM C426 - Standard Test Method for Linear Shrinkage of Concrete Masonry Units.
11. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
12. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
13. ASTM C666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
14. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
15. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
16. ASTM C1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone.
17. ASTM C1195 - Standard Test Method for Absorption of Architectural Cast Stone.
18. ASTM C1364 - Standard Specification for Architectural Cast Stone.
19. ASTM D2244 - Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

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1.04 DEFINITIONS

A. Cast Stone - a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.

B. Dry Cast Concrete Products – manufactured from zero slump concrete.
   1. Vibrant Dry Tamp (VDT) casting method: Vibratory ramming of earth moist, zero- slump concrete against a rigid mold until it is densely compacted.
   2. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

C. Wet Cast Concrete Products – manufactured from measurable slump concrete.
   1. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.05 SUBMITTALS

A. Section 01 30 00 - Administrative Requirements: Submittal provisions.

B. Samples: Submit 6-inch by 6-inch samples of the Cast Stone that represent the specific finish and colors available.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale including:
   1. Piece profiles
   2. Cross-sections
   3. Reinforcement
   4. Exposed faces
   5. Anchoring methods
   6. Anchors

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Manufacturer must be an active member (in good standings) of the Cast Stone Institute®
   2. Manufacturer must follow EPA(Environmental Protection Agency) and DNR (Department of Natural Resources) regulations regarding:
      a. Permits
      b. Storm water runoff
      c. Waste water management
      d. Air emission control
   3. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
   4. Manufacturer shall have minimum of (10) years of experience manufacturing Cast Stone.
   5. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, architect and contractor references.

B. All products must contain Portland cement.

C. Manufacturing Standards: Comply with recommendations for manufacturing tolerances, procedures and productions methods of the Cast Stone Institute.

1.07 DELIVERY, STORAGE AND HANDLING:

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

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B. Packing and Shipping: Provide protective coverings and crating for finished surfaces to prevent damage during shipping.
   1. Identify and mark individual units with same mark as indicated on approved shop and setting drawings.
   2. Provide pallet label consisting of job name, piece identifier and total pallet weight.
   3. Manufacturer shall provide itemized shipping list, each item per palette per truck, to accompany shipping bill of lading.
   4. Manufacturer shall coordinate shipment scheduling with installing contractor to minimize on-site handling and storage time.

C. Piece Marks: Clearly label each piece with project name, piece weight and corresponding identifier from shop drawings.

D. Unloading: Provide personnel experienced in handling finished stone units to unload and place stone either in its final location or temporary storage.

E. Storage and Protection: When on-site storage is necessary, store stone units and accessory components under cover, off the ground, away from areas subject to high humidity conditions.
   1. Where extended on-site storage is necessary, provide non-staining wood cribbing between stacked units to promote air circulation and prevent condensation.

1.08 PRODUCTION QUALITY CONTROL

A. Testing:
   1. Test compressive strength and absorption from specimens selected at random from plant production.
   2. Samples shall be taken and tested from every 500 cubic feet of product produced.
   3. Perform tests in accordance ASTM C1194 and C1195.
   4. New and existing mix designs shall be tested for strength, absorption and Freeze Thaw compliance prior to producing units.

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Acceptable Manufacturers:
   1. Product descriptions are based manufactured cast stone units by Edwards Cast Stone Company, 777 Edwards Road, Dubuque, IA 52003, (563) 556-0535, to establish minimum standards of quality and performance.
   2. Custom Cast Stone, Indiana.
   3. RockCast by Reading Rock.
   4. Continental Cast Stone.
   5. Approved Equal.

2.02 CAST STONE

A. Comply with ASTM C1364.

B. Physical properties: Provide the following:
   1. Compressive Strength - ASTM C1194: 6,500 psi minimum for products at 28 days.
   2. Absorption - ASTM C1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.
   3. Air Content – ASTM C173 or C231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.
   4. Freeze-thaw – ASTM C1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
   5. Linear Shrinkage – ASTM C426: Shrinkage shall not exceed 0.065%.

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2.03 RAW MATERIALS

A. Portland cement – Type I or Type III, white and/or grey, ASTM C150.

B. Coarse aggregates - Granite, quartz or limestone, ASTM C33, except for gradation, and are optional for the VDT casting method.

C. Fine aggregates - Manufactured or natural sands, ASTM C33, except for gradation.

D. Colors - Inorganic iron oxide pigments, ASTM C979 except that carbon black pigments shall not be used.

E. Admixtures- Comply with the following:
   1. ASTM C260 for air-entraining admixtures.
   2. ASTM C494 Types A - G for water reducing, retarding, accelerating and high range admixtures.
   3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
   4. ASTM C618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.
   5. ASTM C989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water – Potable

G. Reinforcing bars:
   1. ASTM A615. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5-inch.
   2. Welded Wire Fabric: ASTM A185 where applicable for wet cast units.

H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in stainless steel Type 302 or 304.

2.04 COLOR AND FINISH

A. Units shall be as selected by Architect from manufacturer's standard colors.

B. Surface finish shall be smooth.

C. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32-inch and the density of such voids shall be less than 3 occurrences per any 1-square inch and not obvious under direct daylight illumination at a 5-foot distance.

D. All exposed edges to be hand tooled to ensure a consistent quality edge.

E. Units shall exhibit a texture equal to the approved sample when viewed under direct daylight illumination at a 10-foot distance.
   1. ASTM D2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
      a. Total color difference – not greater than 6 units.
      b. Total hue difference – not greater than 2 units.

F. All Cast Stone shall be hand sanded and acid washed with a 10% muriatic acid solution.

G. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from an 8-foot distance.

H. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.

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2.05 REINFORCING

A. Reinforce the units for safe handling and structural stress.

B. Minimum reinforcing shall be 0.25 percent of the cross section area.

C. Reinforcement shall be epoxy coated steel reinforcing bars. All reinforcement shall have minimum coverage of twice the diameter of the bars.

D. Stones greater than 24-inches in one direction shall be reinforced in that direction. Units less than 24-inch in both their length and width dimension shall be non-reinforced, unless otherwise specified.

2.06 CURING

A. Cure units in a warm curing chamber approximately 100ºF at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70ºF for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days at 50°F or 5 days at 70°F) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.07 CLEANER

A. Product as recommended and approved by unit manufacturer.

2.08 MANUFACTURING TOLERANCES

A. Cross section dimensions shall not deviate by more than ±1/8-inch from approved dimensions.

B. Length of units shall not deviate by more than length/360 or ±1/8-inch, whichever is greater, not to exceed ±1/4-inch.
   1. Maximum length of any unit shall not exceed 12 times the average thickness of such unit unless otherwise agreed by the manufacturer.

C. Warp, bow or twist of units shall not exceed length/ 360 or ±1/8-inch, whichever is greater.

D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8-inch, on unformed sides of unit, 3/8-inch maximum deviation.

PART 3 EXECUTION

3.01 PROJECT/SITE CONDITIONS

A. Field Measurements: Verify spacing and projection of anchors to secure cast stone units. Verify overall dimensions of supports.

3.02 EXAMINATION

A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Do not set unacceptable units.

3.03 SETTING TOLERANCES

A. Set stones 1/8-inch or less, within the plane of adjacent units.

B. Joints, plus 1/16-inch, minus 1/8-inch.

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3.04 INSTALLATION

A. Install/set all units and accessories accurately, using skilled, experienced personnel, according to approved shop and setting drawings. Use stone-fitters to perform field-cutting with power saws, when required. Clean stone surfaces before setting, using only water or mild cleaning compounds containing no caustic or abrasives.

3.05 JOINTING

A. Joint size: 3/8-inch.

B. Joint materials:
   1. Mortar: Per Section 04 05 00.
   2. Use a full bed of mortar at all bed joints. Rake mortar back ¼-inch to allow space for sealant.
   3. Leave all joints with exposed tops open for sealant.
   4. Install sealant at all joints. Sealant per Section 07 92 00.

3.06 SETTING

A. Clean stone surfaces before setting, using only water or mild cleaning compounds containing no caustic or abrasives.

B. Drench units with clean water prior to setting. Follow Section 3 of Cast Stone Institute.

C. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stonework in place. Attach anchors securely to stone and to supporting surfaces. Place anchors and dowels firmly and fill holes with mortar or non-shrink grout.

D. Set cast stone accurately, in patterns and locations indicated, with uniform joints of dimensions indicated, and with edges and faces aligned according to established relationships and indicated tolerances.

E. Shim and adjust anchors, supports, and accessories.

F. Set stones supported on solid structural members on setting buttons, shims, or sheets, or a combination of setting buttons, and mortar.

G. Where an open cavity is indicated between cast stone and backup material, keep cavity free of mortar and grout.

H. Set units in full bed of mortar, unless otherwise detailed.

I. Remove excess mortar from unit faces immediately after setting.

3.07 JOINT PROTECTION

A. Comply with requirements of Section 07 92 00.

B. Prime ends of units, insert properly sized backing rod and install sealant.

3.08 REPAIR

A. Repair chips with touchup materials furnished by manufacturer.

3.09 CLEANING

A. Perform final cleaning as soon as possible after mortar has set and been tooled. Clean faces of stone at pointed joints immediately. Remove soiled areas, streaks and stains from prefinished panels using clean water and soft bristle brush, followed by clear water rinse.

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B. Use no wire brushes or other materials or methods which could damage, discoloration, etching of surfaces or joints, without written approval from cast stone manufacturer.

C. Saturate units to be cleaned prior to applying an approved masonry cleaner.

D. Consult with manufacturer for appropriate cleaners.

E. Clean units per cleaner manufacturer's written instructions.

END OF SECTION

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing the fabricated metal as described in this section and as shown on the contract drawings.

B. For grating supports, perimeter embedded angles and free-span supports, Contractor shall design members, connections, fasteners, etc., per requirements listed on Drawings. Design shall be performed by a Professional Engineer Licensed in the State of Wisconsin. Submit calculations and detail drawings to Engineer.

C. For grating plates, Contractor shall design stiffener members, connections, fasteners, etc., per requirements listed on Drawings. Design shall be performed by a Professional Engineer Licensed in the State of Wisconsin. Submit calculations and detail drawings to Engineer.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTION

A. Section 04 20 00 – Unit Masonry: Hot-dip galvanized steel lintels.

1.03 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Metal Fastenings - Division 05

D. Gratings - Division 05

E. High Performance Coatings - Division 09

1.04 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.05 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. The Aluminum Association (AA), Specifications and Standards:
      a. AA Sections 6 and 7 - Aluminum Construction Manual, Specifications for Aluminum Structures, Current Edition.
   2. American Institute of Steel Construction (AISC), Specifications and Standards:
      a. AISC Section 1.23 - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction), Current Editions.
   3. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Editions.
      a. ASTM A36 - Standard Specification for Carbon Structural Steel, Current Edition.
      b. ASTM A123 - Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products, Current Edition.
      c. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Current Edition.
      d. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and General Applications, Current Edition.

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e. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Current Edition.
f. ASTM A325 - Standard Specifications for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength, Current Edition.
g. ASTM A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems, Current Edition.
h. ASTM A385 - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip), Current Edition.
i. ASTM A530 - Standard Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe, Current Edition.
j. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing, Current Edition.
k. ASTM A633 - Standard Specification for Normalized High-Strength Low-Alloy Structural Steel Plates, Current Edition.
l. ASTM A666 - Standard Specifications for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, Flat Bar, Current Edition.
m. ASTM A743 - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Application, Current Edition.
n. ASTM A895 - Standard Specification for Free Machining Stainless Steel Plate, Sheet, and Strip, Current Edition.
o. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate, Current Edition.
p. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes, Current Edition.
q. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire, Current Edition.
r. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes, Current Edition.
s. ASTM B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles, Current Edition.
t. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube, Current Edition.
u. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel, Current Edition.
v. ASTM B766 - Standard Specification for Electrodeposited Coatings of Cadmium, Current Edition.

4. American Welding Society (AWS) Specifications and Standards, Current Edition.
a. AWS A5.1 - Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding, Current Edition.
b. AWS A5.10 - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods, Current Edition.

1.06 SUBMITTALS

A. The Contractor shall submit such submittals and/or catalog cuts required for the construction and installation of the materials. These drawings shall be accurate in every detail and shall contain all information necessary to relate the materials to the specifications.

B. Submittals shall indicate the intended materials arrangement, major support requirements, plot area and all intricate or detailed construction requirements. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

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PART 2 PRODUCTS AND MATERIALS

2.01 METAL SURFACES, GENERAL

A. For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2.02 STEEL

A. Steel for structural components and assemblies shall meet the requirements of the applicable ASTM Standards as follows:

Product and Material	Standard
Carbon Steel Plates of Structural Quality	ASTM A283, Grade C
Structural Steel	ASTM A36

2.03 GALVANIZING

A. Zinc coatings on products fabricated from rolled, pressed, and forged steel shapes, plates, bars and strip, 1/8 inch thick and heavier shall conform to ASTM A123.

B. Zinc coatings on assembled steel products shall meet the requirements of ASTM A123 and shall be applied in conformance with ASTM A385 for the recommended practice for providing high quality zinc coatings on assembled products, unless otherwise specified.

C. Zinc coatings on iron and steel hardware shall meet the requirements of ASTM A153 except that bolts, screws and other fasteners, 1/2-inch or less in diameter, may be coated with electro-deposited zinc or cadmium coating meeting the requirements of ASTM B633, Type RS, or ASTM B766, Type TS unless otherwise specified.

2.04 ALUMINUM ALLOY

A. Aluminum alloy products, unless otherwise specified, shall be Alloy 6061-T6. Aluminum alloy products shall meet the requirements of the applicable ASTM Standard as follows.

Product and Material	Standard
Sheet and plate	ASTM B209
Drawn seamless tubes	ASTM B210
Rolled or cold-finished bars, rods and wire	ASTM B211
Extruded bars, rods, wire, shapes and tubes	ASTM B221
Standard structural shapes	ASTM B308
Extruded structural pipe and tube	ASTM B429

2.05 BOLTS

A. High strength bolts, nuts and washers shall conform to ASTM A325.

B. When galvanized or zinc-coated bolts are specified, the zinc coating shall meet the requirements of ASTM A153; except that bolts 1/2 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating meeting the requirements of ASTM B633, Type RS, or ASTM B766, Type TS unless otherwise specified.

2.06 WELDING ELECTRODES

A. Steel welding electrodes shall conform to the requirements of AWS A5.1, “Specification for Mild Steel Covered Arc-Welding Electrodes”, except that they shall be uniformly and heavily coated (not washed) and shall be of such a nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

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B. Aluminum welding electrodes shall conform to the requirements of AWS A5.10, “Specification for Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes”.

PART 3 EXECUTION

3.01 QUALITY ASSURANCE

A. Take field measurements prior to preparation of submittals and fabrication, where possible without delay to job progress. Allow for trimming and fitting wherever taking field measurements before fabrication.

B. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of miscellaneous metal work. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay. See Division 03 - Concrete and Division 04 - Masonry of these specifications for installation of inserts and anchorage devices.

C. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation.

3.02 FABRICATION

A. Steel shall be structural quality unless otherwise specified. Castings shall be thoroughly cleaned and subjected to careful inspection before installation. Finished surfaces shall be smooth and true to assure proper fit.

B. Fabrication of structural steel shall meet the requirements of Section 1.23 of the “Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction)”, American Institute of Steel Construction.

C. Fabrication of structural aluminum shall meet the requirements of Sections 6 and 7 of the Aluminum Construction Manual, “Specifications for Aluminum Structures”, The Aluminum Association.

3.03 ERECTION

A. The frame of metal supports shall be carried up true and plumb. Temporary bracing shall be placed wherever necessary to resist all loads to which the structure may be subjected, including those applied by the installation and operation of equipment. Such bracing shall be left in place as long as may be necessary for safety.

B. As erection progresses the work shall be securely bolted up, or welded, to resist all dead load, wind and erection stresses. The Contractor shall furnish such fitting up bolts, nuts and washers as may be required.

C. All field welding shall be done in conformance to the requirements for shop fabrication, except those that expressly apply to shop conditions only. Galvanized items shall not be cut, welded or drilled after the zinc coating is applied.

3.04 PROTECTIVE COATINGS

A. Items specified to be galvanized shall be completely fabricated for field assembly before the application of the zinc coatings.

B. Items specified to be painted shall be shop primed with a rust inhibitive primer and field painted in accordance with High Performance Coatings - Division 09 of these specifications.

C. All aluminum items to be in contact with concrete or masonry shall have a bituminous coating.

D. All steel lintels to be installed in masonry walls shall be hot-dip galvanized after fabrication.

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PART 4 MEASUREMENT AND PAYMENT

4.01 METAL FABRICATIONS

A. General. Metal fabrications shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Metal Fabrications, Lump Sum. When so provided, payment for metal fabrication shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. Metal Fabrications, Inclusive. When no quantity is provided, metal fabrication shall be considered inclusive to payment for work associated with the related construction.

END OF SECTION

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SECTION 05 53 00
GRATINGS AND PLATES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing aluminum grates and aluminum plates with stiffeners where shown on the contract drawings.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Metal Fabrications - Division 05: Stiffeners and design of completed component.

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICATIONS PUBLICATIONS (NONE)

1.05 SUBMITTALS

A. The Contractor shall submit such Submittals and/or catalog cuts required for the construction and installation of the materials and all components. These drawings shall be accurate in every detail and shall contain all information necessary to relate the materials to the specifications.

B. Submittals shall indicate the intended materials arrangement, dimensions, major support requirements, plot area, and all intricate or detailed construction requirements. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 ALUMINUM PLATES

A. Horizontal plates shall have a minimum thickness of 1/8-inch and aluminum with diamond pattern surface, except where not installed over grating, plates shall have a minimum thickness of 1/4-inch.

B. Aluminum plates shall be provided with aluminum stiffener plates welded to bottom of plate, except where specifically noted or required by engineered design. Cut (4) thumb holes in each section, except where the section is 12-inches or less in length, cut (2) thumb holes; holes shall have smooth rounded edges.

C. At existing supports, select grate thickness or plate with welded shims, to match existing support angle height, so that top of plate is flush with adjacent surface.

2.02 FASTENERS

A. Fasteners shall be of a mechanical type as provided by the manufacturer.

B. All fasteners shall be Type 316 stainless steel.

C. All fasteners shall be removable.

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2.03 CUTOUTS

A. Cutouts shall be 2 inches greater than the dimension of the obstruction. Banding on smaller dimension openings may be omitted with approval of Engineer prior to fabrication. In any case, all openings greater than 6 inches in diameter or 20 square inches in area shall be banded.

B. Where a valve/gate operator requires installation of an operating wrench or lever periodically, or is to remain in place, provide an opening in the grating section centered on the wrench/lever. Field cut and band (in aluminum) the opening after the valve and grating are both installed in place. Provide removable grating section or hinge the grating section to open in place.

C. Locate pipe penetrations through the grating by measurements in the field after piping system installation is complete. Field cut and band opening (in aluminum) allow space to operate valve handwheels where applicable.

PART 3 EXECUTION

3.01 QUALITY ASSURANCE

A. Take field measurements prior to preparation of Submittals and fabrication, where possible without delay to job progress. Allow for trimming and fitting wherever taking field measurements before fabrication.

B. Furnish inserts and anchoring devices which must be set in concrete for installation of miscellaneous metal work. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay. See Division 03 - Concrete of these specifications for installation of inserts and anchorage devices.

C. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation.

3.02 FABRICATION

A. Fabricate grating in convenient lengths for handling. Individual grating sections shall not weigh more than 20 pounds. Confirm weight of individual sections is acceptable to Owner during shop drawing review.

B. Plates shall be securely welded to underlying stiffeners to form a single piece. Sections shall not weigh more than 40 pounds. Confirm weight of individual sections is acceptable to Owner during shop drawing review.

C. Grating covering stop gates and stop logs shall be fabricated in sections 12-inch in width to allow access and removal of gates and logs.

D. Fabrication shall be predetermined by grating layout plan submitted to and approved by the Engineer. Any fabrication performed prior to receipt of approved layout plan shall be subject to revisions by the Engineer at no change in contract price.

3.03 INSTALLATION

A. Gratings and plates shall be installed as shown on the contract documents and in accordance with manufacturer's recommendations.

B. Gratings and plates shall be installed with edges and surfaces level, plumb, true and free of rack.

C. Gratings and plates shall have aluminum angles, beams, or channels for supports, unless noted otherwise.

D. Mount gratings and plating, flush with top of embedment angle and surrounding concrete surfaces.

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E. Install grating and plating so there is no more than 1/4-inch gap at any grating section's perimeter, and not more than 1/4-inch gap between adjacent sections.

F. Secure all grates and plates in place, except at stop gate locations or other areas that require frequent removal of sections.

PART 4 MEASUREMENT AND PAYMENT

4.01 GRATINGS AND PLATES

A. General. Gratings and Plates shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Gratings and Plates, Lump Sum. When so provided, payment for gratings shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. Gratings and Plates, Inclusive. When no quantity is provided, gratings shall be considered inclusive to payment for work associated with the related construction.

END OF SECTION

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural roof framing.

B. Roof sheathing.

C. Pressure treated lumber.

D. Blocking, nailers, fascia, and fasteners.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry.

B. Section 06 17 53 - Shop-Fabricated Wood Trusses.

1.03 REFERENCES

A. American Lumber Standards Committee (ALSC):
   1. Softwood Lumber Standards.

B. American National Standards Institute (ANSI):
   1. ANSI A135.4 - Basic Hardboard.
   2. ANSI A208.1 - Wood Particleboard and Flakeboard: Types, Grades, and Uses.

C. American Plywood Association (APA).

D. American Wood Protection Association (AWPA) U1-18.

E. National Forest Products Association (NFPA).

F. National Institute of Standards and Technology (NIST):
   1. NIST PS 20 - American Softwood Lumber Standard.

G. Southern Pine Inspection Bureau (SPIB):
   1. SPIB - Standard Grading Rules for Southern Pine Lumber.

H. Western Wood Products Association (WWPA):
   1. WWPA G5 - Western Lumber Grading Rules.

1.04 SUBMITTALS (NONE)

1.05 QUALITY ASSURANCE

A. All lumber and plywood shall bear a grading stamp exposed to view.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

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PART 2 PRODUCTS

2.01 LUMBER MATERIALS

A. Lumber Grading Rules: SPIB and WWPA.

B. Lumber and rafter framing: 19 percent maximum moisture content.
2x4s, 2x6s, 2x8s: SPF No. 1/ No. 2 or better, F_b = 875 psi.
2x10s and 2x12s: SP or DF No. 1 or better, F_b = 1000 psi.

C. Posts: SPF No. 1 and better, F_b = 850 psi, Fc (parallel) = 700 psi.

D. Nailers and Blocking: Spruce-Pine-Fir or Hem Fir No. 2 or better, 19 percent maximum moisture content.

E. Pressure Treated Lumber: Southern Pine No. 2 or better, preservative treated conforming to the U1-18 Standards of the American Wood Protection Association. Each piece shall be treated in accordance with AWPA standards and certified by an approved inspection agency. The wood shall be pretreated to the following Use Categories:
1. Wood in an interior location in with concrete or masonry: UC2
2. Wood in an exterior location in contact with concrete or masonry: UC4A.
3. Wood in an exterior location in contact with or embedded in the ground: UC4B.
4. Structural wood posts embedded in the ground: UC4B.

2.02 SHEATHING MATERIALS

A. Roof Sheathing: Plywood, APA Rated Sheathing, Exposure 1, unsanded, Group 2; or OSB, APA Rated Sheathing, Exposure 1.

B. Pressure Treated Plywood: APA Rated Sheathing, Grade C-D, Exterior, unsanded, Group 2, preservative treated same as lumber.

2.03 ACCESSORIES

A. Masonry Screws: DeWalt (Powers Fasteners) Tapper 304 ¼ inch diameter by 3.25-inch long stainless steel.

B. Self-drilling and tapping screws.

C. Hot dipped galvanized ring shank nails.

D. Metal Connectors:
1. Hot dipped galvanized steel.
2. Connector type as noted on the drawings.
3. Manufactured by Simpson Strong-Tie.
4. Or equal by MiTek (USP Structural Connectors).

E. Hold downs: As shown on Drawings. Finish shall be galvanized.

F. Nails. Hot dipped galvanized or stainless steel in contact with pressure treated lumber.

G. Wood to Metal Screws: Hilti Self-Drilling screws, #3 point, #10 fastener diameter.

H. Wood to Steel Screws for Exterior Applications: Teks Wood-to-Metal screws, #12 fastener diameter x 2 3/4-inch long, with exterior use rated coating.

I. Sill Gasket: Closed cell polythene foam in continuous rolls. Gasket shall be as wide as wall plate.

J. H clips.

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PART 3 EXECUTION

3.01 FASTENERS AND CONNECTORS

A. Fasteners and connectors in contact with treated wood shall be hot dipped galvanized steel or stainless steel.

B. Reference IBC 2015 Table 2304.10.1 Fastening Schedule for minimum fastening requirements.

3.02 FRAMING

A. Set structural members level and plumb, in correct position.

B. Anchor wall plates to the top of masonry walls with 1/2-inch diameter headed anchor bolts at 24-inch on center embedded in continuous reinforced and grout-filled masonry bond beams with 4-inch minimum embedded. Install one anchor within at a maximum of 6 inches from each end of a plate and 12-inch from each corner.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Place horizontal members crown side up.

E. Construct studs full length without splices.

F. Set members level and plumb, in correct position.

G. Fasten members in place:
1. Anchor lumber together with nails.
2. Anchor treated lumber with hot dipped galvanized nails approved for use with the treatment type of the lumber.
3. Anchor treated lumber to masonry and concrete with stainless steel masonry screws or bolts as specified.
4. Anchor lumber to metal with self-drilling and tapping screws.
5. Anchor lumber to existing lumber with galvanized ring shank nails.
6. Anchor plywood to lumber with nails.
7. Anchor plywood to treated lumber with hot dipped galvanized nails.

H. Provide pressure treated lumber at all locations in contact with concrete or masonry.

I. Pressure treated lumber that is cut or drilled shall have the cut or drilled areas filed coated with a preservative treatment.

J. Anchors to be used in contact with treated sheathing and lumber shall be hot dipped galvanized or stainless steel.

K. Place sill gasket directly on concrete foundation and concrete masonry units.

3.03 ROOF SHEATHING

A. Install with the long dimension of the panel across supports, and with panel continuous over two or more spans. Suitable edge support shall be provided where indicated on drawings or in recommendations of the American Plywood Associates by use of panel clips, tongue-and-groove panels, or lumber blocking between joists. Panel end joints shall occur over framing. Allow 1/8-inch spacing at panel ends and 1/4 inch at panel edges, unless otherwise recommended by the panel manufacturer.

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B. Fasten with 8d 2-1/2-inch common nails 6-inch on center along panel edges and 12-inch on center at intermediate supports; except, when supports are spaced 48-inch on center or more, space nails 6 inches on center at all supports.

3.04 WALL SHEATHING

A. At ends of wood trusses, nail 6-inch on center along panel edges and 12 inches on center at intermediate support with 8d-2 ½" common nails. Provide blocking between studs and between trusses for panel edge fastening at all panel joints.

B. Allow 1/8-inch spacing at panel ends and 1/4-inch at panel edges, unless otherwise recommended by the panel manufacturer.

3.05 NAILERS

A. Install where shown or noted on the drawings. Install blocking in walls for the support of cabinets and other work requiring solid blocking support for fastening.

B. Fasten wood nailers to masonry with stainless steel masonry screws. Use one (1) screw at 24 inches on center for 2x4's. Use two (2) screws at 24 inches on center for 2x6's, 2x8's, and plywood on top of masonry walls. Fasten to metal with self-drilling, self-tapping wood to metal screws.

C. Pressure treated lumber that is cut or drilled shall have the cut or drilled areas filed coated with a preservative treatment.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

END OF SECTION

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SECTION 06 16 43
EXTERIOR GYPSUM SHEATHING BOARD

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior Gypsum Sheathing at framed walls to receive EIFS.

1.02 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Product Data: Submit on all accessories and reinforcement.

1.03 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials to the job site in original packages, containers or bundles bearing manufacturer's brand name and identification.

B. Storage: Keep materials dry and under cover. Protect against contact with damp or wet surfaces and exposure to weather. Provide air circulation under covering and around stacks of materials.

C. Handling: Handle materials in such a manner as to prevent breakage and damage to edges.

PART 2 PRODUCTS

2.01 SHEATHING BOARD MATERIALS

A. Dens-Glass Gold Gypsum Sheathing, 5/8-inch by Georgia-Pacific Corporation, no substitutions.

2.02 MISCELLANEOUS MATERIALS

A. Nails and Screws: Provide size, type, material and finish as recommended by manufacturer complying with Federal Specification for nails and screws.

B. Tape: As recommended by manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

A. Inspection: Examine all subframing and verify that the surface of any framing member or furring member does not vary more than 1/4 inch from the plane of faces of adjacent members.

3.02 APPLICATION

A. General: Provide gypsum sheathing where shown using fasteners and spacing as indicated. Use appropriate length material to avoid end joints. Edge joints to be parallel to and occur over framing members. End joints, if required, to be staggered.

B. Screws: No. 6 Type S or s-12, bugle head, self-tapping rust resistant for metal framing. Spacing 8-inch on center at perimeter and 8-inch on center in field.

3.03 INSTALLATION

A. Fasteners to be driven so as to bear right against and flush with the surface of the sheathing. Do not countersink.

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B. Fasteners to be located no closer than 3/8-inch from the edge and the ends of the sheathing panels. Fit sheathing snugly around all window and door openings. Details for installation to comply with Gypsum Association publication GA-252.

C. Use of gloves is recommended when working with Dens-Glass Gold.

D. Tape all joints. Press tape firmly onto sheathing joints and around openings with a gloved hand.

END OF SECTION

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SECTION 06 17 53
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated wood trusses for roof framing.

B. Bridging, bracing, and anchorage.

C. Connectors.

1.02 RELATED SECTIONS

A. Section 05 05 23 - Metal Fastenings.

B. Section 06 10 00 - Rough Carpentry.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. International Code Council:
   1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.

C. National Forest Products Association (NFPA).

D. National Institute of Standards and Technology (NIST):
   1. NIST PS 20 - American Softwood Lumber Standard.

E. Southern Pine Inspection Bureau (SPIB):
   1. SPIB - Standard Grading Rules for Southern Pine Lumber.

F. Truss Plate Institute (TPI):
   1. ANSI/TPI 1 - National Design Standard for Metal Plate Connected Wood Truss Construction.
   2. TPI BWT-76 - Bracing Wood Trusses - Commentary and Recommendations.
   3. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses.
   4. TPI HET-80 - Handling and Erecting Wood Trusses - Commentary and Recommendations.
   5. TPI HIB-91 - Commentary and Recommendations for Handling, Installing and Bracing Metal Plate Connected Wood Trusses.
   6. TPI PCT-80 - Design Specifications for Metal Plate Connected Parallel Chord Wood Trusses.
   7. TPI QST-88 - Quality Standard for Metal Plate Connected Wood Trusses.
   8. TPI 85 - Design Specifications for Metal Plate Connected Wood Trusses.

G. Western Wood Products Association (WWPA):
   1. WWPA G5 - Western Lumber Grading Rules.

1.04 SYSTEM DESCRIPTION

A. Trusses shall be designed in accordance with “National Design Specifications for Stress-Grade Lumber and its Fastenings” (NDS) by National Forest Products Association and “Design Specifications for Metal Plate

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Connected Wood Trusses" by Truss Plate Institute (TPI), latest editions, and the rules of the Department of Commerce, State of Wisconsin.

1.05 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Shop Drawings: Indicate sizes and spacing of trusses, web and chord sizes, loads and truss cambers, and framed openings. Submit design calculations.

C. Product Data: Submit truss configurations and bridging and bracing.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. Lumber Grading Agency: Certified by NIST PS 20.

B. Truss Design, Fabrication, and Installation: In accordance with ANSI/TPI 1 and TPI HIB-91.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

B. Design trusses under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Wisconsin.

1.08 REGULATORY REQUIREMENTS

A. Conform to Wisconsin Commercial Building Code, current edition, for loads, seismic zoning, and other governing load criteria.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Handle and storage of trusses in accordance with manufacturer's instructions and the Truss Plate Institute (TPI HET-80 and TPI HIB-91) recommended practices.

C. Store trusses in a vertical position on a flat surface, raised 4 to 6 inches off the ground or supporting surfaces, supports spaced 8 to 10 feet on center. Cover the trusses to protect from the weather elements but allow air to flow through the trusses.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.01 MATERIALS

A. All lumber used for truss members shall be in accordance with the published values of a recognized rules writing agency and shall bear the grade stamp of that agency.

B. Connector plates shall be manufactured of not less than 20-gauge steel and shall meet or exceed ASTM A653 and shall be galvanized according to ASTM A653.

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2.02 FABRICATION

A. Do not fabricate trusses more than 30 days prior to installation.

B. Fabrication shall be in accordance with Truss Plate Institution recommended practices.

C. Fabricate chord extensions as indicated on drawings.

2.03 CONNECTORS

A. Truss-to-truss connectors shall be designed and provided by truss manufacturer.

B. Steel connectors, anchors, and ties at truss supports as noted on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

A. Coordinate placement of bearing and support items.

3.03 ERECTION

A. Damaged trusses shall not be installed.

B. Trusses with wood that is moldy, damaged or stained by water/snow/ice are not allowed to be installed.

C. Erect trusses in accordance with manufacturer's instructions and the Truss Plate Institution (TPI HET-80 and TPI HIB-91) recommended practices.

D. Set members level and plumb, in correct position.

E. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb, and in alignment until completion of erection and installation of permanent bracing.

F. Do not field cut or alter structural members without approval of Architect/Engineer.

G. Trusses shall not be cut, added onto, or altered in any way without the consent of the Architect.

H. Install metal connectors at locations indicated on drawings.

I. Brace trusses as required by manufacturer and as noted on the drawings.

J. All trusses shall be connected to each interior wall the truss crosses with light-gauge steel clips as indicated on drawings.

3.04 TOLERANCES

A. Section 01 45 00 - Quality Control: Tolerances.

B. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

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SECTION 07 01 90
JOINT SEALANT RESTORATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Contractor shall provide all materials, labor, tools, plant and equipment required to complete all caulking as shown on the drawings, described in the specifications and following the sealant manufacturer's written instructions.

1.02 QUALIFICATIONS

A. Use adequate numbers of skilled workers thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this section.

B. Applicator qualifications:
   1. Applicator shall have three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
   2. Applicator shall designate a single individual as project foreman who shall be on site at all times during construction.

C. Single source responsibility for joint sealants:
   1. Obtain joint sealants from a single manufacturer for each different product required to ensure compatibility.

D. Manufacturer shall instruct applicator in procedures for intersecting sealants.

E. Field adhesion testing (to be performed before job start up).
   1. Conduct field tests for adhesion of joint sealants to actual joint substrates using proposed joint preparation methods recommended by manufacturer.
   2. Conduct test for each joint type of sealant and substrate.
   3. Locate field test joints where inconspicuous or at approved locations.
   4. Test methods: Use manufacturer's standard field adhesion test methods required by sealant manufacturer. Methods should verify priming and substrate preparation techniques required to obtain optimum adhesion.
   5. Sealant manufacturer to evaluate and report results of field adhesion testing.
   6. Do not use joint preparation methods or sealants that produce less than satisfactory adhesion to joint substrate during testing.

1.03 JOBSITE INSPECTIONS

A. Contractor shall visit the site prior to bidding to examine and determine the conditions under which the work of this section will be performed.

B. Contractor shall arrange for the sealant manufacturer's representative to inspect the site and provide written project recommendations.
   1. Applicator shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
   2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver all materials to the jobsite in their original unopened containers, with all labels intact.

B. Store materials in strict accordance with manufacturer's recommendations.

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1.05 PROJECT CONDITIONS

A. Environmental conditions: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by the joint sealant manufacturer.
   2. When joint substrates are wet due to rain, frost, condensation or other causes.

B. Joint width conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application intended.

C. Joint substrate conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion and removed from joint substrates.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sealant, primer, and other related materials: Under Section 07 92 003.

PART 3 EXECUTION

3.01 EXAMINATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
   1. Verify conformance with manufacturer's requirements;
   2. Report unsatisfactory conditions in writing to the Architect;
   3. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Remove existing sealants.

B. Prepare surfaces to receive sealants in accord with sealant manufacturer's instructions except where more stringent requirements are indicated.

C. Thoroughly clean joint surfaces using cleaners approved by sealant manufacturer whether primers are required or not.
   1. Remove all traces of previous sealant and joint backer by mechanical methods, such as by cutting, grinding and wire brushing, in manner not damaging to surrounding surfaces.
   2. Remove paints from joint surfaces except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer.
   3. Remove wax, oil, grease, dirt film residues, temporary protective coatings and other residues by wiping with cleaner recommended for that purpose. Use clean, white, lint-free clothes and change clothes frequently.
   4. Remove dust by blowing clean with oil-free, compressed air.

3.03 INSTALLATION

A. Install sealant system under Section 07 92 00.

B. Install sealants immediately after joint preparation.

END OF SECTION

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SECTION 07 11 13
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Cold applied asphalt bitumen dampproofing at below grade masonry foundation walls.

1.02 RELATED WORK

A. Division 04 – Masonry: Below grade CMU foundation walls

B. Section 31 23 23 – Backfill and Compaction for Buildings.

1.03 SUBMITTALS (NONE)

1.04 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient and surface temperatures above 40 degrees F for 24 hours before application and continuously until dampproofing has cured.

PART 2 PRODUCTS

2.01 MATERIALS

A. Dampproofing:
1. Sealmastic Asphalt Emulsion Dampproofing by W.R. Meadows, Inc.
2. MasterSeal 614 by Master Builder Solutions by BASF.
3. Substitutions: per Section 01 60 00.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify surfaces are solid, free of frozen matter, loose particles, cracks, pits, rough projections, and foreign matter detrimental to adhesion and application of dampproofing.

B. Do not apply dampproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to dampproofing manufacturer.

C. Verify items which penetrate surfaces to receive dampproofing are securely installed.

D. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

A. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

B. Apply mastic to seal penetrations, small cracks, tie bar penetrations, and honeycomb in substrate.

C. Seal watertight items projecting through dampproofing surface with mastic.

3.03 APPLICATION

A. Prime surfaces in accordance with manufacturer's instructions.

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B. Spray apply in accordance with manufacturer's instructions.

C. Apply two (2) coats, continuous and uniform.

D. Apply from 2-inches below finish grade elevation to top of footings. Cover wall/footing joint.

E. Backfill within time period recommended by dampproofing manufacturer.

3.04 PROTECTION

A. Protect membrane from damage.

END OF SECTION

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SECTION 07 21 13
BOARD INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, cavity wall construction, and other areas noted on the Drawings.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Section 04 20 00 - Unit Masonry: Insulation materials for cavity wall construction.

1.03 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete: Sidewalk and foundation construction.

B. Section 04 20 00 - Unit Masonry: Cavity wall construction.

C. Section 07 27 26 - Fluid-Applied Membrane Air/Vapor Retarder.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM C272 - Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
2. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
3. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
4. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
5. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

B. International Code Council:
1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.
2. IECC - International Energy Conservation Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.

C. National Fire Protection Association (NFPA):
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc. (UL):
1. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment: Environmental conditions affecting products on site.

B. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

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PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Polystyrene Insulation Type A: ASTM C578 Type IV; extruded cellular type, conforming to the following:
1. Thermal Resistance: 5-year aged R-values of 5.4 and 5.0 minimum per inch thickness at 40°F and 75°F, respectively.
2. Water Absorption: In accordance with ASTM C272, 0.1 percent by volume maximum.
3. Compressive Strength: Minimum 25 psi.
4. Flame Spread Index: Less than 75.
5. Smoke-Developed Index: Less than 450.
6. Thickness: Thickness indicated in schedule.

B. Manufacturers:
1. DiversiFoam Products.
2. Dow Chemical: Styrofoam brand.
3. Foamular.
4. Owens Corning.

2.02 ADHESIVES

A. Adhesive: Type recommended by insulation manufacturer for application.

B. Acceptable Manufacturer's products:
1. Henkel Loctite PL300 Foam Board Adhesive
2. Henkel Loctite PL Premium Construction Adhesive.
3. BASF MasterWeld 420.
4. DAP Beats the Nail Panel and Foam Construction Adhesive.

2.03 FOAM SEALANT

A. Polyurethane insulating foam sealant; one-component, gun or straw applied; UL classified; containing no solvents, CFC's or VOC's; moisture-resistant.

B. Products:
1. Great Stuff Pro by Dow Chemical Company.
2. Handi-Foam by FOMO.
3. Kwik Foam by DAP, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

C. Verify substrate surface is flat, free of fins, irregularities, and materials or substances that may impede adhesive bond.

3.02 INSTALLATION

A. Foundation Perimeter:
1. Adhere insulation to wall by applying 2-inch diameter spots of adhesive to insulation boards at 16 inches on center both ways.
2. Butt edges and ends tight to adjacent board and to protrusions.

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3. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

B. Cavity Walls:
1. Do not install until air/vapor barrier system of Section 07 27 26 installation is complete.
2. Install boards horizontally between wall reinforcement.
3. Press insulation firmly into liquid-applied air/vapor retarder substrate. At locations where liquid-applied air/vapor barrier is not the substrate, apply 2-inch diameter daubs of adhesive spaced approximately 12 inches on center both ways on inside face of insulation.
4. Place boards in a method to maximize contact bedding. Stagger joints. Butt edges and ends tight to adjacent board and to protrusions.
5. Cut and fit insulation tight to protrusions or interruptions to insulation plane.
6. Install foam sealant at insulation joints and around penetrations through insulation. Once foam has set up, cut foam back to plane of insulation, so that it does not protrude beyond face of insulation.

3.03 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 77 00 – Closeout Procedures: Protection of finished Work provisions.

B. Do not permit Work to be damaged prior to covering insulation.

3.04 SCHEDULES

A. Perimeter Foundation Wall Insulation: Type A, extruded polystyrene, 2-inch thick, square edges if not noted otherwise.

B. Cavity Wall Insulation: Type A, extruded polystyrene, 3-inch thick, square edges.

C. Miscellaneous: As indicated on the drawings.

END OF SECTION

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SECTION 07 21 16
BLANKET INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Batt insulation in exterior wall construction.

B. Batt insulation for filling perimeter door shim spaces, crevices in exterior wall and roof assembly, and other miscellaneous areas.

C. Batt insulation for roof eave at blown attic insulation.

1.02 RELATED WORK

A. Section 06 10 00 - Rough Carpentry.

B. Section 07 27 26 - Fluid-Applied Membrane Air Vapor Retarder.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. International Code Council:
   1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.

C. National Fire Protection Association (NFPA):
   1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc. (UL):
   1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS (NONE)

1.05 COORDINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

PART 2 PRODUCTS

2.01 BATT INSULATION

A. Batt Insulation: ASTM C665; preformed fiberglass; unfaced, width as required for cavity. Thickness shall be to fill cavity, unless noted otherwise provide 5-1/2-inch thick, R-21.
   1. Owens Corning Fiberglas Thermal Batts.

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PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify substrate adjacent materials and insulation are dry and ready to receive installation.

C. Verify mechanical and electrical services within walls have been installed and tested.

3.02 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Install in exterior wall spaces without gaps or voids.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

END OF SECTION

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SECTION 07 21 26
BLOWN FIBERGLASS INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling: Loose fill fiberglass insulation pneumatically placed.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 06 17 53 - Shop-Fabricated Wood Trusses.

C. Section 07 27 13 – Sheet Membrane Air/Vapor Retarder.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM C764 - Standard Specifications for Mineral Fiber Loose-Fill Thermal Insulation.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. International Code Council:
   1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Product Data: Submit data on product characteristics, performance criteria, and limitations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fiberglass Insulation: ASTM C764; per ASTM E84 flame spread index of 25 or less and smoke developed index of 450 or less; no formaldehyde; no asbestos.
   1. Acceptable Products:
      a. CertainTeed InsulSafe SP.
      b. Owens Corning PROPINK L77 loose fill insulation.
      c. Knauf Insulation Jet Stream Ultra Blowing Insulation

B. Ventilation Baffles: Formed plastic.

C. Thickness markers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

B. Verify spaces are unobstructed to allow placement of insulation.

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3.02 INSTALLATION

A. Install thickness markers that are labeled in inches. Install at least one for every 300 square feet throughout the attic. The markers shall be attached to the trusses and shall be marked with the minimum initial thickness and minimum settled thickness with numbers a minimum of 1 inch in height. Each marker shall face the attic access.

B. Install insulation and ventilation baffle in accordance with manufacturer's instructions.

C. Pneumatically place insulation in quantity to allow for settling to achieve a thermal resistance rating as indicated on the Drawings.

D. Place insulation against baffles. Do so as to not impede natural attic ventilation to soffit.

E. Place tight to and behind mechanical and electrical services within the plane of insulation.

F. Completely fill intended spaces. Leave no gaps or voids.

G. Install certification indicating initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed. The insulation installer shall sign and date the certification. Post the certification in a sealed plastic sleeve to a truss adjacent to and visible from the attic access hatch.

3.03 CLEANING

A. Section 01 77 00 - Closeout Procedures: Cleaning provisions.

B. Remove loose insulation residue.

END OF SECTION

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SECTION 07 24 00
EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide and install the exterior insulation and finish system with engineered moisture drainage that incorporates continuous insulation and an air/water-resistive barrier as specified herein and as shown on the drawings in order to provide complete and proper finished product, including:
   1. An integral fluid applied air and water-resistive membrane barrier compatible with the substrate surface and adhesive application of the EIF system.
   2. Accessory materials required for treating sheathing joints, fasteners, penetrations, rough openings, and material transitions compatible with substrate surfaces and the adhesive application of the EIF system.
   3. Joint sealants compatible with specified EIFS for use in all exterior envelope joint waterproofing.
   4. A comprehensive single source limited EIF system warranty inclusive of EIFS, fluid applied air and water-resistive membrane barrier, accessory materials and sealants.

1.02 SUBMITTALS

A. Product Data: Submit data on system materials, product characteristics, performance criteria, limitations, and colors and finishes available.

B. Samples:
   1. Manufacturer's 288 standard color card. Architect will select approximately six colors to have 6x6 sample made.
   2. Provided approximately six Manufacturer's colors samples, minimum 6-inch x 6-inch in size. One color shall be selected for the entire project.
   3. One mock-up 2-foot by 2-foot in size mounted on exterior grade gypsum sheathing of the finish, textures and colors to be used on the project. Shall include all colors proposed.
   4. The mock-up shall be retained for use in comparing the approved appearance to that being installed.

C. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

D. The EPS supplier shall certify in writing that the EPS meets EIFS manufacturer's specifications.

1.03 CLOSEOUT SUBMITTALS

A. Submit a copy of the manufacturer's recommended maintenance and repair manual.

B. Submit a copy of the Exterior Insulation and Finish System with Moisture Drainage manufacturer's comprehensive single source limited warranty.

1.04 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Knowledgeable in the proper installation of the Exterior Insulation and Finish System with Moisture Drainage.
   2. Possess a current copy of the manufacturer's Trained Contractor Certificate for the EIF system specified.
   3. Successfully complete a minimum of three (3) projects of similar scope and scale to the specified project.

B. Insulation Board Manufacturer Qualifications:
   1. Listed by EIFS Manufacturer, and capable of producing the Expanded Polystyrene (EPS) in accordance with the current EIFS Manufacturer's Specification for Insulation Board.

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2. Subscribe to the Dryvit Third Party Certification and Quality Assurance Program.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store components and materials in an environment recommended by manufacturer.

1.06 ENVIRONMENTAL REQUIREMENTS

A. The ambient air and wall temperature on both sides of the wall shall be minimum 40-degree F. The temperature shall remain so for at least 24 hours thereafter or longer if necessary for the material to be sufficiently dried.

1.07 WARRANTY

A. Manufacturer: Provide a five (5) year warranty from the date of substantial completion for materials that they shall be free from defects.

B. Installer: Provide a separate minimum 1-year warranty for all workmanship related to the proper installation and drainage performance of the EIFS application.

PART 2 PRODUCTS

2.01 MANUFACTURERS SYSTEM

A. Dryvit Outsulation Plus MD System consisting of an air/water resistive barrier, accessory materials, adhesive, expanded polystyrene (EPS) insulation board, base coat, reinforcing mesh, and finish coat.
   1. Other Acceptable Manufacturer's allowed only if their system matches the specified Dryvit system, no other substitutions allowed:
      a. STO.
      b. Parex.
      c. Synergy.

B. Fluid-Applied Air- and Water-Resistive Barrier:
   1. Permeable (at Administration Building)
      a. Dryvit Backstop® NTX: A standard film vapor permeable, low-temperature, flexible, polymerbased non-cementitious water-resistive and air barrier coating available in Texture and Smooth versions. Backstop NTX can be installed in ambient air and substrate surface temperatures of 25 °F (3.88 °C) and rising for a minimum 24 hours and exposed for up to 6 months during the construction process.
      b. Tremco ExoAir® 230: A thick film synthetic, permeable, elastomeric air/water-resistive membrane barrier designed to be roller or spray applied. ExoAir 230 can be installed in ambient air and substrate surface temperatures of 40 °F (5 °C) and rising, shall be protected from rain and washout prior to drying and can be exposed for up to 12 months during the construction process. ExoAir is specialty formulated for design options requiring assembles that have been evaluated for NFPA 285.
   2. Non-permeable (at Chemical Building):
      a. Dryvit Backstop® NT-VB (Vapor Barrier): A standard film non-permeable, Class I, lowtemperature, flexible, polymer-based non-cementitious water-resistive and air barrier coating available in Texture and Smooth versions. Backstop NT-VB can be installed in ambient air and substrate surface temperatures of 40 °F (5 °C) and rising for a minimum 24 hours and exposed for up to 6 months during the construction process. Backstop NT-VB Texture is additionally used for treatment of sheathing board joints, inside / outside corners and spotting of fastener heads.

C. Accessory Materials:
   1. Provide compatible accessory materials as required by project conditions for substrate, rough opening and penetration preparation, bridge expansion joints in substrate, material transitions and flashing integration to produce a complete air and water-resistant assembly.

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a. Dryvit Grid Tape™: An open weave fiberglass mesh tape with pressure sensitive adhesive. Used in combination with Backstop NTX Texture for treating sheathing board joints and inside / outside corners and preparing rough openings and penetrations. Backstop NTX Texture is used alone for spotting fastener heads. 2)

b. Dryvit AquaFlash®: Fluid-applied, water-based polymer transition membrane. Used in preparing rough openings and penetrations, bridging expansion joints in substrate, material transitions and flashing integration. AquaFlash can be installed in ambient air and substrate surface temperatures of 40 °F (5 °C) and rising for 24 hours.

1) Dryvit AquaFlash Mesh and Corners: Polyester reinforcing mesh for use with AquaFlash.

c. Dryvit Backstop Flash and Fill: A flexible, waterproof, low temperature gun applied material. Used in substrate preparation, treating sheathing board joints, inside/outside corners and fastener heads, preparing rough openings and penetrations, bridging expansion joints in substrate material transitions and flashing integration. Backstop Flash and Fill can be installed in ambient air and substrate surface temperatures of 32 °F (0 °C) and rising for 24 hours. Note: Dryvit Backstop Flash and Fill may only be used with Dryvit Backstop NTX air/waterresistive barrier.

d. Tremco Dymonic 100: A high-performance, high-movement, single-component, mediummodulus, low-VOC, UV-stable, non-sag, gun applied polyurethane sealant. Used in substrate preparation, treating sheathing board joints and inside/outside corners and fastener heads, preparing rough openings and penetrations, bridging expansion joints in substrate, material transitions and flashing integration. Dymonic 100 can be installed in ambient air and substrate surface temperatures of 40 °F (5 °C) and rising. Where Dymonic 100 must be applied in temperatures below 40 °F, (5 °C), please refer to the Tremco Technical Bulletin for Applying Sealants in Cold Conditions (No. S-08-44 rev 1) that can be found at www.tremcosealants.com.

e. Tremco ExoAir 110AT: A 22-mil composite impermeable membrane that is comprised of 16 mils of butyl and 6 mills of HDPP facer. Used in limited applications as a membrane flashing that will not interfere with the adhesive application of EIFS.

D. Adhesives:

1. Liquid polymer-based adhesive field mixed with Portland cement.
   a. Dryvit Primus®
   b. Dryvit Genesis®
2. Ready mixed dry blend cementitious, copolymer-based adhesive field mixed with water.
   a. Dryvit Primus® DM
   b. Dryvit Genesis® DM
   c. Dryvit Genesis® DMS
   d. Rapidry DM™ 35-50
   e. Rapidry DM™ 50-75
3.

E. Insulation board:

1. Aged Expanded polystyrene board meeting Dryvit specification for insulation board meeting Dryvit Specification DS131 and ASTM E2430 and be manufactured by a board supplier listed by Dryvit.
   a. Thickness as indicated on Drawings, minimum of 2-inches. Incorporating 1/4-inch by 1-inch grooves running vertically and spaced 12-inch on center on the backside.
2. Accessory Components:
   a. Closure Blocks: Minimum thickness of 2 in (51 mm); measuring a minimum of 6 in (152) in height and 4 ft (1.2m) in length. Closure block is required at top of horizontal wall terminations and sills of all wall openings. Closure Block is installed with a Ribbon and Dab adhesive method. Accessory Component shall comply with Dryvit Specification DS131 and be supplied through Dryvit Distribution (See Detail OMD 0.0.02).
   b. Starter Strip: Minimum thickness of 2 in (51 mm) and measuring 6 in x 4 ft (152 mm x 1.2 m) configured to receive the Dryvit Track™ and Vent Track™. Starter Strip is required at base of all walls, at base of horizontal terminations, and heads of all wall openings. Accessory Component shall comply with Dryvit Specification DS131 and be supplied through Dryvit Distribution (See Detail OMD 0.0.05).

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c. Vent Assembly: Minimum thickness of 2 in (51 mm) and measuring 6 in x 12 in (152 mm x 305 mm) configured to receive the Dryvit Vent Track and incorporate a formed aggregate matrix material. Vent Assembly is required at the base of walls and the base of horizontal terminations and is capable of draining water. Accessory Component shall comply with Dryvit Specification DS131 and be supplied through Dryvit Distribution (See Detail OMD 0.0.03).

3. Pre-Coated Insulation Starter Boards, Corners and Shapes:
   a. Machine Coated Starter Boards, Corners and Shapes: Shall be produced by Tremco CPG. The term of the warranty may be extended for an additional 2 years with the use of Tremco produced Machine Coated Starter Boards. If used in conjunction with the approved Tremco sealants, the warranty may be extended for an additional year for a total extended warranty of 3 years.
4. Drainage Track Components:
   a. Dryvit Track: A "J" shaped track complying with ASTM D 1784 and ASTM C 1063 located above the Dryvit Starter Strip.
   b. Dryvit Vent Track: A "J" shaped track complying with ASTM D 1784 and ASTM C 1063 containing a slot for drainage and located above the Dryvit Vent Assembly, along the base of walls and horizontal terminations.
   c. TREMPRO CHEM X PRO™: An adhesive used to attach Drainage Track Components and to the Securock ExoAir 430 sheathing panel.

F. Base Coat: Shall be compatible with the EPS insulation board and reinforcing mesh(es).
1. Liquid polymer-based base coat field mixed with Portland cement.
   a. Dryvit Primus
   b. Dryvit Genesis
   c. Dryvit Dryflex
2. Ready mixed dry blend cementitious, copolymer-based base coat field mixed with water.
   a. Dryvit Primus DM
   b. Dryvit Genesis DM
   c. Dryvit Genesis DMS
   d. Rapidry DM 35-50
   e. Rapidry DM 50-75
   f. Dryvit NCB – Non-cementitious

G. Reinforcing Mesh: An open-weave, glass fiber fabric treated for compatibility with other system materials.
1. Chemical Building: Shall be Dryvit Panzer 20-Mesh mesh.
2. Administration Building: Shall be Standard weight mesh.
3. All corners and exposed edges of insulation boards, such as returns at openings, require Dryvit Corner Mesh™.
4. Dryvit Detail Mesh® is used to wrap boards at terminations and over intricate shapes.

H. Finish: Shall be the type, color and texture as selected by the architect/owner. Coating shall have integral color as selected by Architect from 288 standard colors.
1. Finishes: acrylic coating with integral color and texture, formulated with Dirt Pickup Resistance (DPR). Texture to best match existing building – selected from the following:
   a. Quarzputz® DPR – open texture
   b. Sandblast® DPR – medium texture
   c. Freestyle® DPR – fine texture
   d. Sandpebble® DPR – pebble texture
   e. Sandpebble® DPR – fine pebble texture

I. Coatings, Primers, and Sealants:
1. Demandit® Smooth
2. Demandit® Sanded
3. Demandit® Advantage™
4. HDP Water-Repellent Coating
5. Weatherlastic® Smooth
6. Weatherlastic® HB
7. Tuscan Glaze™

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8. Color Prime
9. Prymit®
10. SealClear™

J. Joint Sealants: see Section 07 92 00.

K. Jobsite-Mixed Materials:
1. Portland cement: Type I, II, or IL, meeting ASTM C150 white or gray in color, fresh and free of lumps.
2. Water: Clean and free of foreign matter.

L. All material shall comply with Dryvit's specifications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
1. Verify access to electric power, clean water and a clean work area at the location where the Dryvit materials are to be applied.
2. Verify the deflection of the substrate does not exceed 1/240 times the span. Verify substrate is flat within 1/4 in (6.4 mm) in a 4 ft (1.2 m) radius.
3. Verify substrate is sound, dry, connections are tight; has no surface voids, projections, or other conditions that may interfere with the Exterior Insulation and Finish System with moisture drainage installation or performance.
4. Verify the slope of inclined surfaces are not less than 6:12 (27 o) where the length of the slope does not exceed 12 in (305 mm) or 3:12 (14 o) were the length of the slope does not exceed 4 in (102 mm).
5. Verify metal roof flashings have been installed in accordance with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) standards.
6. Verify all rough openings are flashed in accordance with the Exterior Insulation and Finish System with Moisture Drainage manufacturer's installation details, or as otherwise necessary to prevent water penetration. Verify chimneys, balconies and decks have been properly flashed as necessary to prevent water penetration.
7. Verify windows and doors are installed and flashed per manufacturer's requirements and installation details.
8. Notify general contractor of all discrepancies prior to the installation of the Exterior Insulation and Finish System with moisture drainage.

B. Verify that expansion joints are installed:
1. Where expansion joints occur in the substrate system.
2. Where building expansion joints occur.
3. At floor lines in wood frame construction.
4. At floor lines of non-wood framed buildings where significant movement is expected.
5. Where the Exterior Insulation and Finish System with moisture drainage abuts dissimilar materials.
6. Where the substrate type changes.
7. Where prefabricated panels abut one another.
8. In continuous elevations at intervals not exceeding 75 ft (23 m).
9. Where significant structural movement occurs, such as changes in roof line, building shape or structural system.

C. Substrate shall conform to manufacturers requirements. Beginning of installation means acceptance of existing conditions.

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3.02 PREPARATION

A. Protect the Exterior Insulation and Finish System with Moisture Drainage materials by permanent or temporary means from inclement weather and other sources of damage prior to, during, and following application until completely dry.

B. Protect adjoining work and property during installation of the Exterior Insulation and Finish System with Moisture Drainage.

C. Prepare the substrate to be free of foreign materials, such as oil, dust, dirt, form-release agents, efflorescence, paint, wax, water repellants, moisture, frost, and any other condition that may inhibit adhesion.

3.03 INSTALLATION

A. Install the EIF system in accordance with ASTM C1397 and the Dryvit Outsulation MD System Application Instructions, DS935. Apply base coat sufficient to fully embed the reinforcing mesh. The recommended method is to apply the base coat in two (2) passes.

B. Apply sealant to base coat surface prepared in accordance with DS153.

C. Install high impact reinforcing mesh as specified at ground level, high traffic areas and other areas exposed to or susceptible to impact damage as designated on contract drawings.

D. Factory back wrapped starter boards shall be installed at all exposed edges.

E. The overall minimum base coat thickness shall be sufficient to fully embed the mesh.

F. Adhere EPS insulation to the substrate.

G. All sealants per section 07 92 00 shall be installed as soon as practical after completion of system installation.
   1. Sealant shall not be applied directly to textured finishes or base coat surfaces. Dryvit Outsulation System base coat surfaces in contact with sealant shall be coated with Demandit Smooth or Color Prime.

H. Temporary protection shall be provided until sealants and flashings are installed to prevent damage from water entry behind the EIFS system.

I. Coordinate with the Owner's roofer under separate contract for the installation if the wall cap and roof edge metal.

3.04 FIELD QUALITY CONTROL

A. The contractor shall be responsible for the proper storage and application of the Outsulation materials.

B. During construction, the job site shall be visited by the manufacturer or its authorized representative.

3.05 CLEANING

A. All excess System materials shall be removed from the job site by the contractor in accordance with contract provisions and as required by applicable law.

B. All surrounding areas, where the System has been applied, shall be left free of debris and foreign substances resulting from the contractor's work.

C. Clean adjacent materials and surfaces of foreign materials resulting from work of this section. Use cleaning materials and procedures so as to not harm the finish of the adjacent materials.

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3.06 SITE QUALITY CONTROL

A. Exterior Insulation and Finish System with Moisture Drainage manufacturer assumes no responsibility for on-site inspections or application of its products.

B. EIFS sub-contractor to certify in writing the quality of work performed relative to the substrate system, details, installation procedures, and as to the specific products used.

C. EPS supplier, if requested, to certify in writing that the EPS meets the Exterior Insulation and Finish System with Moisture Drainage manufacturer's specifications.

D. During construction, the job site shall be visited by the manufacturer or its authorized representative.

E. The sealant contractor, if requested, to certify in writing that the sealant application is in accordance with the sealant manufacturer's and the Exterior Insulation and Finish System with Moisture Drainage manufacturer's recommendations.

3.07 CLEANING

A. Remove all excess Exterior Insulation and Finish System materials from the job site by the contractor in accordance with contract provisions and as required by applicable law.

B. Leave all surrounding areas, where the Exterior Insulation and Finish System with Moisture Drainage has been applied, free of debris and foreign substances resulting from the EIFS sub-contractor's work.

3.08 PROTECTION

A. The System shall be protected from inclement weather and other sources of damage until dry and permanent protection in the form of flashings, sealants, etc., are installed.

END OF SECTION

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SECTION 07 27 13
PLASTIC SHEET MEMBRANE AIR/VAPOR RETARDER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. A continuous vapor retarder throughout the building to the bottom side of the wood truss bottom chords.

B. Air-Vapor Barrier Boxes.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Division 26 – Electrical: Installation of Air-Vapor barrier boxes around recessed electrical boxes.

1.03 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry System.

B. Section 06 10 00 - Rough Carpentry.

C. Section 06 17 53 – Shop-Fabricated Wood Trusses.

D. Section 07 92 00 - Joint Sealants: Penetration sealing.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
3. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.

B. International Code Council:
1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.
2. IECC - International Energy Conservation Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Vapor retarder: 3-ply laminate with 2 layers of low density polyethylene and a high-strength cord grid. Griffolyn Type-65 by Reef Industries (800) 231-6074.

B. Tape:
1. 3M 8087 Construction Seaming Tape.
2. Heavy-duty, weather-resistant, double sided asphaltic mastic tape. Fab Tape by Reef Industries, (800) 231-6074.

C. Air-Vapor Barrier Boxes: Lessco Air-Vapor Barrier Box, Phone 920-948-1120, http://www.lessco-airtight.com/, W1330 Happy Hollow Road, Campbellsport, WI.

PART 3 EXECUTION

3.01 INSTALLATION

A. Secure vapor retarder to bottom side of wood ceiling framing.

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B. Seams shall be lapped with 4 inches minimum. Tape all seams. Tape the seam at the transition between the ceiling and wall.

C. Connect to exterior wall fluid-applied air/vapor retarder as detailed on the Drawings.

D. Completely seal any tears and punctures with tape.

E. Seal all penetrations vapor-tight with tape and/or sealant.

F. Install the air-vapor barrier boxes at all the electrical boxes in walls and ceilings with sheet air-vapor barriers. Install at the time that the electrical boxes are being set. Install the air-vapor barrier boxes in accordance with the manufacturer's instructions.

G. Seal the air-vapor barrier to the air-vapor barrier boxes.

END OF SECTION

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SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR/VAPOR RETARDER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes the following material and installation for a complete air/vapor retarder system for exterior masonry cavity wall.

B. Work includes, but is not limited to, liquid-applied air/vapor retarder system located in the non-accessible part of the wall, sheet rubberized-asphalt self-adhered air/vapor retarder membrane, and other materials to bridge and seal air leakage pathways and gaps.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Masonry back-up walls and wall openings.

B. Section 06 10 00 - Rough Carpentry: Top of wall plates and accessories.

C. Section 07 62 00 - Sheet Metal Flashing and Trim.

D. Section 07 92 00 - Joint Sealants: Joint and penetration perimeter sealant materials and installation.

E. Division 22 - Plumbing: Through-wall fixture penetrations.

F. Division 23 - Heating, Ventilating, and Air Conditioning: Through-wall penetrations and wall openings.

G. Division 26 - Electrical: Through-wall penetrations.

H. Division 44 – Pollution Control: Through-wall penetrations.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM C836 – Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
2. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
3. ASTM D903 – Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
4. ASTM D1644 – Standard Test Methods for Nonvolatile Content of Varnishes.
5. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as a Steep Roofing Underlayment for Ice Dam Protection.
6. ASTM D3767 – Standard Practice for Rubber – Measurement of Dimensions.
7. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
8. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
9. ASTM D5295 – Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems.
10. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
11. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
12. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials.
13. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

B. Wisconsin Commercial Building Code, Current Edition.

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1.04 PERFORMANCE REQUIREMENTS

A. Provide air/vapor retarder constructed to perform as a continuous air/vapor retarder, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Membrane shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.

B. Provide an air retarder assembly that has been tested in accordance ASTM E2357 to provide air leakage results not to exceed: 0.06 cfm/sf at 0.30 inch H_2O.

C. Provide vapor retarder assembly that has been tested in accordance with ASTM E96, Method B, to provide results not to exceed: 0.08 perms.

D. Provide seamless, monolithic air/vapor retarder assembly to a thickness of 60 mils on masonry walls or uneven substrate.

1.05 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Shop Drawings: Submit showing locations and extent of air/vapor retarder and details of all typical conditions, intersections with other envelope systems and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.

C. Manufacturer's Product Data Sheets: Submit for each type of membrane, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

D. Submit certification of compatibility by air/vapor retarder manufacturer, listing all materials on the project that it connects to or that come in contact with it.

E. Samples: Submit 3 inch by 4 inch minimum size, for each air/vapor retarder material required for Project.

F. Submit test results of air permeability testing of primary air retarder material (ASTM E2178 or ASTM E283).

G. Submit installer's certification from product manufacturer.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:
   1. The air retarder contractor and each installing worker shall be certified by the product manufacturer.
   2. Each Lead Certified Applicator can supervise a maximum of five (5) registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air retarders of the types being applied. Lead Certified Applicators shall perform or directly supervise all air/vapor retarder work on the project.

B. Air/vapor retarder installers must be trained and certified by the product manufacturer.

C. Single-Source Responsibility: Obtain air/vapor retarder materials from a single manufacturer regularly engaged in manufacturing the product.

D. Products shall comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

E. Section 01 31 13 - Project Coordination: Meeting requirements.

F. Preconstruction Meeting: Convene minimum one (1) week prior to commencing Work of this section.

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G. Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air and vapor retarder membrane unless it has been inspected, tested, and approved.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

C. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air/vapor retarder manufacturer. Protect stored materials from direct sunlight.

D. Avoid spillage. Immediately notify Owner, Architect if spillage occurs and start clean up procedures.

E. Clean spills and leave area as it was prior to spill.

1.08 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials.

B. Place materials defined as hazardous or toxic waste in designated containers.

C. Ensure emptied containers are sealed and stored safely for disposal away from children.

1.09 PROJECT CONDITIONS

A. Section 01 60 00 - Material and Equipment.

B. Environmental Conditions: Apply air/vapor retarder within range of ambient and substrate temperatures recommended by air/vapor retarder manufacturer. Do not apply air/vapor retarder to a damp or wet substrate, unless the manufacturer specifically permits that for the product.
   1. Do not apply air/vapor retarder in snow, rain, fog, or mist.
   2. Do not apply air/vapor retarder when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.10 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Warranty provisions.

B. Furnish 2-year manufacturer's warranty for liquid and membrane materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Liquid Air/Vapor Retarder: Synthetic rubber, spray applied. Vapor Impermeable.
   1. Air-Bloc 16MR Air and Vapor Barrier as manufactured by Henry Building Envelope Systems.
   2. Perm-A-Barrier® NPL 10/ NPL 10 LT Fluid-applied impermeable air and vapor barrier membrane by GPC (Grace Construction Products).
   3. Rub-R-Wall Airtight Air/Vapor Retarder liquid-applied 100% rubber copolymer membrane as manufactured by Rubber Polymer Corporation.
   4. Equal Products:
      a. Air-Shield LM (polymer modified) or LSR (synthetic rubber) by WR Meadows.
      b. R-Guard VB by Prosoco.
      c. ExoAir 120 SP (asphaltic) or ExoAir 130 (synthetic acrylic) by Tremco.

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5. Products Not Considered Equals:
    a. By Performance:
        1) Products that do not provide a finished 60 mil thickness.
        2) Products with water vapor permeance exceeding 0.1 perms (dry cup) or 1 perm (wet cup).
        3) Products with air permeability that exceed 0.0004 cfm/ft^2 (ASTM E2178).
    b. Products that are not considered equal:
        1) Poly-Guard, Poly-Guard AirLock Flex.
        2) BASF, Enershield-I.
        3) TK-Airmax 2102 NP.

2.02 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended by air/vapor retarder manufacturer for intended use and compatible with the air/vapor retarder membrane for a complete air- and vapor-retarder system.

B. Self-Adhesive Membrane Flashing: 32 mils of self-adhesive rubberized asphalt integrally bonded to 8 mil cross-laminated, high density polyethylene film to provide a minimum 40 mil thick membrane shall be interleaved with disposable silicone-coated release paper until installed:
1. Blueskin® SA by Henry Building Envelope Systems.
2. Perm-A-Barrier® Wall Flashing by Grace Construction Products.
3. Rub-R-Wall SA by Rubber Polymer Corporation.

C. Primer:
1. Water based liquid primer for extruded polystyrene, concrete, masonry, gypsum sheathing, wood, metal, and painted substrates;
    a. Aquatac Primer as manufactured by Henry Building Envelope Systems.
    b. Perm-A-Barrier® WB Primer by Grace Construction Products.
2. Solvent based, VOC compliant primer for concrete, masonry, gypsum sheathing, wood, metal, and painted substrates:
    a. HE573 as manufactured by Henry Building Envelope Systems.
    b. Bituthene Primer B-2 by Grace Construction Products.
    c. Rub-R-Wall Primer by Rubber Polymer Corporation.

D. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes as recommended by self-adhesive membrane flashing or liquid membrane air retarder material manufacturer.

E. Substrate Filler for Rub-R-Wall: Rub-R-Wall Mastic manufactured by Rubber Polymer Corporation.

F. Sealants provided under Section 07 92 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions under which air/vapor retarder systems will be applied, with Installer present, for compliance with requirements. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
1. Do not proceed with installation until after minimum concrete curing period recommended by air/vapor retarder manufacturer.
2. Ensure that:
    a. surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
    b. concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
    c. masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.

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3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
4. Notify Architect in writing of anticipated problems using air/vapor retarder over substrate.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air/vapor retarder application.

B. Prime masonry substrates with conditioning primer when installing modified asphalt membrane transition membranes.

C. Prime wood, metal, and painted substrates with primer recommended by membrane manufacturer.

D. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air/vapor retarder and at protrusions according to air/vapor retarder manufacturer's written instructions.

3.03 INSTALLATION

A. Air Bloc 32MR:
1. Install materials according to manufacturers instructions.
2. Transition joints: Prior to the application of the Air Bloc 32MR, seal transitions with primer and Blueskin TWF transition strip at beams, columns, changes in substrate material, and similar joints or connections to provide continuity of air/vapor retarder assembly. Generally, apply transition strips so that a minimum of 3 inches coverage is achieved over both substrates. Position strip over firm bearing.
3. Apply air/vapor retarder membrane within recommended application temperature ranges. Consult manufacturer when membrane cannot be applied within these temperature ranges.
4. Apply Air Bloc 32MR by air assisted spray equipment in a continuous unbroken film at a wet film thickness of 1/8 inch to the substrate. Imbed insulation as work progresses.
5. Ensure that Air Bloc 32MR is applied in full contact around protrusions such as brick ties.
6. Overlap Blueskin TWF transition membrane a minimum of 1 inch.
7. Complete application of membrane to provide a seamless, monolithic surface to a thickness of 40 mils *[60 mils on masonry walls].*

B. Perm-A- Barrier® Liquid:
1. Install materials in accordance with manufacturer's instructions.
2. Apply waterproofing over concrete block. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
3. Treat construction joints and install flashing as recommended by manufacturer.
4. Spray apply a continuous uniform film at 60 mils wet film thickness using multiple, overlapping passes.
5. When spraying use a cross-hatching technique (alternating horizontal and vertical passes) to ensure even thickness and coverage.
6. When spraying use high pressure, multi-component, airless spray equipment approved bay material manufacturer.
7. Carry membrane into any openings a minimum of 2 inches.
8. Seal all brick-ties and other penetrations as work progresses.

C. Application of Transition Membrane for Perm-A- Barrier® Liquid:
1. After allowing the Fluid Applied Membrane to cure to tack-free, apply transition membrane with a minimum overlap of 3 inches onto each surface at all beams, columns and joints as indicated in detail drawings.
2. Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
3. Use pre-cut, easily handled lengths for each location.
4. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.

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5. When properly positioned, place against surface by pressing firmly into place by hand roller.
6. Overlap adjacent pieces 2 inches and roll all seams with a hand roller.
7. Seal top edge of transition membranes and flashing with termination mastic
8. Apply liquid membrane to all fastener heads, overlapping board by 1 inch.

D. Rub-R-Wall:
1. Install materials in accordance with manufacturer's instructions.
2. Transition joints: Seal with primer and transition strip at changes in substrate material and similar joints or connections to provide continuity of air/vapor retarder assembly. Generally, apply transition strips so that a minimum of 3 inches coverage is achieved over both substrates. Position strip over firm bearing.
3. Apply air/vapor retarder membrane within recommended application temperature ranges. Consult manufacturer when membrane cannot be applied within these temperature ranges.
4. Using airless spray equipment having a minimum pressure of 3000 psi, apply prime coat of air/vapor retarder membrane over outer surface of inner wythe masonry.
5. Use alternating horizontal and vertical passes to ensure complete coverage of substrate and transition strips. Seal masonry anchors or other penetrations air tight.
6. Check surfaces again and if necessary, fill any remaining gaps with mastic substrate filler prior to covering with membrane.
7. Complete application of membrane to provide a seamless, monolithic surface to a thickness of [40 mils] 60 mils on masonry walls.
8. Adhere insulation to air/vapor retarder membrane after initial set time of approximately 1 to 2 hours, and while membrane is still tacky, to prevent convection currents occurring behind the insulation.

E. Built-in Door Frames: Do not apply air/vapor retarder to door frame. Run air/vapor retarder up to edge of door opening to a location which will not be exposed after perimeter sealant is installed.

F. Window and Door Frames Not Built In: Lap transition strip from wall substrate with 3 inches of full contact over firm bearing into window or door frame opening with full 1 inch to be installed under installed windows or door frames, unless noted otherwise. Coordinate installation depth at opening with product or supplier. Membrane shall not be exposed within building.

G. Wall/Roof Junction: Prime all surfaces. Lap transition strip from wall substrate with 6 inches of full contact over firm bearing to roof air seal membrane with 4 inches of full contact.

H. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

3.04 PROTECTING AND CLEANING

A. Protect air/vapor retarder system from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Protect air/vapor retarder from exposure to the elements as required by the manufacturer.

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3.05 PROTECTION AND CLEANING

A. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.

B. Protect membranes to avoid damage from other trades, and construction materials during subsequent operations. Protection products may be installed on the same day as the membrane. Extruded polystyrene insulation boards are compatible with membranes. Bonding of the insulation is achieved if the insulation products are installed when the membrane is tacky; generally within 1 to 2 hours after the Procor membrane is installed.

C. Schedule work to ensure that the air and vapor retarder system is covered as soon as possible after installation. Protect air and vapor retarder system from damage during subsequent operations. If the air and vapor retarder system cannot be covered within 60 days, or shorter time as recommended by manufacturer after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

END OF SECTION

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SECTION 07 31 16
STONE COATED METAL ROOF SHINGLES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Formed metal roofing panels with colored stone chip finish, underlayment, ridge vent, hip flashing, valley flashing, pipe flashing, eave flashing fasteners and accessories for a complete watertight roofing system.

1.02 RELATED WORK

A. Provisions established within General and Supplementary Conditions of the Contract, Division 1 – General Requirements, and the Drawings are collectively applicable to this Section.

1.03 SUBMITTALS

A. Section 01 33 00 – Submittals Procedures.

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, finishes, fasteners, accessories, and manufacturers written installation instructions.

C. Samples for Initial Selection: Manufacturer's color charts and samples consisting of units or sections of units showing the full range of colors, textures, and patterns available. Color selection by Owner.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Conform to applicable building code for roof assembly fire hazard requirements.
2. Conform to building code for minimum wind uplift resistance.

1.05 REFERENCES

A. Fire-Test-Response Characteristics: Provide DECRA Shingle with fire-test-response characteristics indicated, as determined per test method ASTM E108 – Test For Fire Resistance of Roof Covering Materials, for application and slopes indicated.
1. Fire-Test Exposure: Class A.

B. ASTM A792/A792M: Sheet Steel, Aluminum-Zinc Alloy Coated by the Hot Dip Process, Structural (physical) Quality.

C. UL 1897 and UL 580: Wind Uplift Resistance of Roof Assemblies.

D. ASTM C920: Specification for Elastomeric Joint Sealants.

E. Impact Resistance: UL 2218, Class 4.

F. Appraisal Certificates:
1. International Code Council (ICC), Whittier California, Report No. ESR 1483.
2. Underwriters Laboratories, Inc., Northbrook, Illinois, USA File No. R14710.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store and handle roofing materials to ensure dryness. Store in a dry, well-ventilated, weather tight place. Protect from corrosion, staining and traffic and wind damage. Store rolls of felt and other sheet materials on end on pallets or another raised surface.

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1.07 WARRANTY

A. Manufacturing Warranty: Written, transferable, limited warranty provided by DECRA Roofing Systems, covering manufacturing defects/excessive granule loss. Refer to warranty for specifics.
   1. Warranty Period: 50 years from date of Substantial Completion.
   2. Wind Warranty: 120 mph winds, full warranty period.
   3. Hail Penetration: full warranty period.
   4. Watertightness: 5-year warranty from installing contractor for 100 materials and labor.
   5. Leak Barrier: 30-year warranty.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. DECRA Roofing Systems, Inc., 1230 Railroad Street, Corona, CA 92882 (951-272-8180), (951-272-4476 FAX); www.decra.com.

2.02 MATERIALS

A. Metal Shingle: DECRA Shingle XD two course formed interlocking panels resembling dimensional roofing shingles.
   1. Material: Rolled and pressure formed, Aluminum-Zinc Alloy Coated Steel with two vertical ribs forming two flat steps, each of which shall have raised and lowered pan sections.
   2. Finish: Ceramic coated colored stone chip finish.
   3. Thickness: 0.0138 inches.
   4. Steel: Grade 37.
   5. Size: 14-1/8” wide by 52-3/8” long.
   6. Exposure: 12-1/4” wide by 49-1/2” long.
   7. Weight: 150 pounds per square.
   8. Color: Selected by Owner from 5 standard colors.

B. Flashing:
   1. Valley: DECRA Roofing Systems, Inc., Shingle Valley, Aluminum-Zinc Alloy coated Steel sheet 0.0165 inches. Pressure formed into a valley with a stone coated valley cap. Finish: Match upper exposed stone coated surface of the valley cap to the shingle material.
   2. Rake / Gable Channel: DECRA Roofing Systems, Inc., Shingle Rake/Gable Channel, Aluminum-Zinc Alloy Coated Steel sheet, 0.0165 inches. Pressure formed to match roofing material, color, and finish to be applied along rakes and gables.
   3. Short Course Clip: DECRA Roofing Systems, Inc., Shingle Short Course Clip, Aluminum-Zinc Alloy Coated Steel sheet, 0.0165 inches. Pressure formed for use with starting a short course or when Shingle Edge Clip w/ Drip Edge will not conform to existing eave/fascia.
   4. Pipe Jack Flashing: 0.0165 inches galvanized or Aluminum-Zinc Alloy Coated Steel, clean, prime and paint to match roof material.
   5. Underpan: DECRA Roofing Systems, Inc., DECRA Shingle Underpan: Aluminum-Zinc Alloy Coated Steel sheet, 0.0165 inches, pressure formed to counter flash roof penetrations matching Shingle material profile.

C. Ridge: Shingle Hip & Ridge covers hips and ridges without vents, matching shingle material, color, and finish.
   1. Hips / Ridges: DECRA Roofing Systems, Inc., Shingle Hip & Ridge, Aluminum-Zinc Alloy Coated Steel sheet, 0.0165 inch. Pressure formed to match roofing material, color, and finish to be applied along hips and ridges.
   2. Roof to wall flashing: DECRA Roofing Systems, Inc. XD Channel – Aluminum-Zinc Alloy coated steel sheet, 0.0165 inch pressure formed to flash along the hips and ridges.
   3. Screws: Minimum No. 9 (1/4 inch diameter) x 1-1/2 inch long, corrosion resistant, black or color coordinated to match the panels.
   4. Wood blocking shall be provided.

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D. High Roof Vent Panel: DECRA Panel Vents, 64 sq.in. free area per vent, 52 1/8" by 14 1/8" size.

2.03 ACCESSORIES

A. Sheet Metal Materials: Aluminum-Zinc Alloy Coated Steel sheet: ASTM A 792/A 792M, Class AZ50 coating designation; minimum Grade 37.

B. Leak (Ice & Water) Barrier Underlayment: ASTM D 1970; high temperature self-adhering, rubberized asphalt bonded to sheet polyethylene underlayment; 60 mils thick with strippable treated release paper.
   1. CertainTeed WinterGuard HT.
   2. GAF MetalMate Film-Surfaced Leak Barrier.
   3. Owens Corning WeatherLock Flex.

C. Sealant: One-part elastomeric polyurethane, sealant as recommended in writing by panel manufacturer. Where sealant will be exposed, provide in color to match panels.
   1. Standard: ASTM C920-86.

D. Fasteners: Corrosion resistant screws. Screws: Minimum No. 9, hex head, of sufficient length to penetrate substrate 1/2 inch minimum see manufacturer's instructions for fastening positions. Recommended length is 1-1/2 inch long.

E. Decorative Stack Vent Covers: Dual wall decorative vent cover. Cap Master by Mid-American Building Products (800) 521-8486 or equal. Color to be selected by Owner.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate and conditions for compliance with requirements for maximum moisture content, soundness of roof deck and other conditions affecting performance of DECRA metal roofing. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrate of any projections and substances detrimental to metal panel roofing. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with roofing nails.

B. Coordinate installation of metal shingles with roof deck, flashing and other adjoining work to ensure proper sequencing. Do not install roofing until vent stacks and other penetrations through roofing have been installed, are securely fastened and flashing is in place.

3.03 INSTALLATION

A. General: Comply with manufacturer's written instructions for products and applications indicated, unless more stringent requirements apply.

B. Underlayment: Apply layer of leak barrier underlayment on entire surface to receive metal shingles. Wrap up adjacent wall surfaced.

C. Install a complete system including the shingles and all metal flashings for starter clip with drip edge at the eaves, rake/gable channel at the gables, side flashing and XD channel at roof to wall flashings, vent pipe flashings, shingle valley flashing, hip and ridge flashings and ridge vents for a complete, proper and water tight water roofing system.

D. Valleys: Install in accordance with manufacturer's instructions with a minimum 6 inch overlap in direction of flow, provide continuous solid wood blocking.

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E. Shingle Panels: Install DECRA Shingle XD, accessories, flashing, and hip & ridge level and plumb. Use fasteners per above specifications.
   1. Install each DECRA Shingle XD® panel left to right in accordance with manufacturer's instructions. Do not create a pattern.
   2. The right side of each panel must be pushed into position to engage the Side-Lap locking mechanism.
   3. Fasten each panel with minimum 5 fasteners horizontally along the back flange of each panel at pre-punched tabs. Review manufacturer's instructions for fastener placement.
   4. First course of panels positioned at eave will clip into Starter Clip with Drip Edge.

F. Hip & Ridge: Install Shingle Hip & Ridge along hips, ridges and rakes as indicated on approved submittals and in accordance with manufacturers written instructions. Bend and fold exposed ends of hips ridges and neatly, cap with an end cap or a piece of similar material at vented locations install over ridge vent material.

G. Install a high roof Panel Vents at all locations where shown on the drawings. Install per shingle and vent manufacturer recommendations.

3.04 CLEANING AND PROTECTION

A. Damaged Units: Replace panels and other components of the work that have been dented, damaged or have deteriorated beyond successful repair by finish touchup with acrylic coating and stone chip granules.

B. Cleaning: After completing installation, remove any debris from the roof.

C. Foot Traffic: Avoid walking on side laps.

3.05 DETAILS

A. Reference the DECRA Shingle XD details. Comply with these manufacturer's details for the installation of the new roofing system.

END OF SECTION

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SECTION 07 50 00
PREPARATION FOR RE-ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of existing roofing, flashings and miscellaneous items in preparation for a new roof system.

1.02 RELATED SECTIONS

A. Section 07 31 16 - Stone Coated Metal Shingles: new roofing system.

1.03 ENVIRONMENTAL REQUIREMENTS

A. Do not remove existing roofing when weather conditions threaten the integrity of the building contents or intended continued occupancy.

B. Maintain continuous temporary protection during and prior to installation of new roofing system.

1.04 SCHEDULING

A. Schedule work to coincide with commencement of installation of new roofing system.

B. Remove only existing roofing materials that can be replaced with new materials promptly.

C. Do not perform roof work on days when the weather forecast calls for rain or snow, or on days when it is raining or snowing.

PART 2 PRODUCTS AND MATERIALS - Not Used

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall examine all sheathing after the existing roofing has been removed. Sheathing that is deteriorated will needed to be considered for replacement with the Engineer. Associated change in cost shall be conveyed by the GC. The Owner shall give Contractor approval to remove the sheathing prior to removal. The contract shall document quantity to be removed. Replace sheathing as specified.

3.02 MATERIALS REMOVAL

A. Remove all existing items associated components to accommodate the roof replacement and/or roof extension where applicable and/or indicated on the Drawings.

B. Contractor shall remove from the site all materials scheduled to be removed and dispose of properly.

C. Removal and disposal of all materials shall be in compliance with all applicable rules, regulations, and codes.

D. The existing roof has not been tested for the presence of asbestos.

E. Sweep clean the surface of the deck and use a power blower or vacuum to remove all debris and dust from the entire deck including in the deck flutes before installing any insulation.

F. Recycle the metal flashings.

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3.03 DUST CONTROL

A. It is imperative that dust be kept to a minimum during removal of the roofing system. Roof shall be vacuumed using a power vacuum.

B. Roof dust, as created by an exposed roof broom, shall not be permitted.

C. Closed chutes shall be used to remove debris from the roof.

D. Debris shall be transported on covered trucks.

E. Debris shall be removed as it accumulates. The Contractor is responsible for proper disposal of all materials not scheduled for re-use.

END OF SECTION

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SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Includes sheet metal flashing and trim as shown on the drawings, specified herein, and as needed for a complete and proper installation.

1.02 RELATED WORK

A. Section 04 20 00 - Unit Masonry.

B. Section 06 10 00 - Rough Carpentry.

C. Section 07 24 00 - Exterior Insulation and Finish Systems.

D. Section 07 31 16 – Stone Coated Metal Shingles.

E. Section 07 71 24 – Seamless Gutters and Downspouts.

F. Division 23 - Mechanical: Flashing all roof penetrations.

G. Division 26 - Electrical: Flashing all roof penetrations.

1.03 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
1. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM B32 - Standard Specification for Solder Metal.
3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. National Roofing Contractors Associates (NRCA):
1. NRCA - Roofing Manual.

D. Sheet Metal and Air Conditioning Contractors (SMACNA):
1. SMACNA - Architectural Sheet Metal Manual, 6th Edition.

E. Aluminum Association (AA) - Aluminum Construction Manual:
1. Aluminum Sheet Metal Work and Building Construction.

1.04 WARRANTY

A. Provide a limited 20-year warranty on the Kynar 500 Finish against cracking, crazing, chipping, peeling, and chalking.

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B. All manufactured products shall be warranted to be free of defects in material and workmanship for a period of five (5) years from date of shipment. The warranty shall cover repairing or replacing defective materials at no cost to the Owner.

1.05 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing work with five (5) years minimum experience.

1.06 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Submit Shop Drawings: Fill out and submit manufacture's product cut sheet. Identify material profile, material type and thickness, profile dimensions, quantities, fastening methods, and installation details.

C. Submit manufacturer's installation instructions.

D. Samples: Provide sample, when requested by Architect, of metal flashing illustrating typical seam, external, material, and finish.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling requirements.

B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Aluminum Termination Bar: AA 6063-T6 Aluminum Termination Bar with holes at 8 inches on center and a 45 degree by ¼ inch flange at the top to receive caulk.

B. Reglet and Counterflashing: Shall be 2-Piece Counter flashing Thru-Wall Version, Metal-Era, Inc. 24 gauge steel, G-90, with Kynar 500 finish, color as selected.

C. Miscellaneous Flashings: Counterflashings and sheet metal flashing required at mechanical equipment and other miscellaneous items shall be 24 gauge galvanized steel, ASTM A525, G90, coresteel with Kynar 500 finish of color as selected. Provide 20-year finish warranty. Construct per SMACNA Architectural Sheet Metal Manual. These flashings shall be shop bent.

D. Drip Edge: Prefinished and performed aluminum as manufactured by Rollex or equal of color as selected.

E. Aluminum Fascia: Prefinished and preformed aluminum as manufactured by Rollex or equal of color as selected. Fascia shall be 'L' shaped to cover the fascia board. Provide all accessories and trim.

F. Aluminum Soffit: Prefinished and preformed aluminum as manufactured by Rollex or equal of color as selected. Soffit shall be the Stealth, 16-inch vent soffit panel. Provide all accessories and trim.

G. Nails for Fastening Roof Edge and Counter Flashings to Roof Sheathing: Standard round wire shingle type, hot dipped zinc coated steel, minimum 3/8 inch head diameter and 10 to 12 gauge barbed shank of sufficient length to penetrate just through roof sheathing.

H. Nails for Fastening Flashings to Blocking: Hot dipped zinc coated steel type as recommended by flashing manufacturer.

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I. Plastic Roof Cement: Must conform to Federal Specification SSC-153 Type I or latest revision thereof.

J. Sealant: Tremco Dynomic or Sonneborn Sonolastic NP1.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practical lengths.

C. Form shop bent material in accordance with recommendations of the SMACNA Architectural Sheet Metal Manual.

D. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

B. Verify roof termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install manufactured material in accordance with manufacturer's instruction.

B. Install starter and edge strips, and cleats before starting installation.

C. Insert flashings into reglets to form tight fit.

D. Lap Lock Cleat Seam and seal all joints.

E. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal metal joints watertight.

G. Conform to drawing details and details included in SMACNA and NRCA manual for installation of shop bent material.

H. Flash and seal all work projecting through or mounted on roof.

I. Weather lap joints of counter-flashings onto roof sheathing 3 inches minimum and seal weather tight with plastic roof cement.

J. Provide flashings at all penetrations through the roof.

END OF SECTION

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SECTION 07 71 24
SEAMLESS GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum gutters, downspouts, and accessories as shown on the drawings, specified herein, and as needed for a complete and proper installation.

1.02 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete: Precast concrete splash blocks.

1.03 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry.

B. Section 07 31 16 – Stone Coated Metal Shingles

C. Section 07 62 00 – Sheet Metal Flashing and Trim: Preformed Metal Soffit and Fascia.

1.04 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
   4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
   1. ASTM B32 - Standard Specification for Solder Metal.
   2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. Federal Specification Unit (FS):
   1. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
   1. Architectural Sheet Metal Manual.

1.05 SUBMITTALS

A. Section 01 33 00 – Submittals: Submittal provisions.

B. Product Data: Submit data on prefabricated components.

C. Submit samples of colors for selection.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA Manual.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Material and Equipment: Product storage and handling provisions.

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B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to drain.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

1.08 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Warranty provisions.

B. Provide a limited 20-year warranty on the finish against cracking, crazing, blistering, chipping, peeling, chalking, and fading.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gutters:
1. 0.032 inch prefinished and preformed aluminum.
2. 6 inch seamless 'K' style, supported by concealed brackets.
3. Rollex aluminum gutter coil.

B. Downspouts:
1. Pefinished and preformed aluminum.
2. 4 inch by 5 inch closed.
3. Rollex Rainware.

C. Color as selected by Architect from manufacturer's standard colors, match fascia and soffit selections.

2.02 COMPONENTS

A. End Caps, Downspout Elbows, Joint Fasteners, Expansion Joints, Welded Mitered Corners: Profiled to suit gutters and downspouts.

2.03 FABRICATION

A. Field measure site conditions prior to fabricating work.

B. Form gutters and downspouts of profiles and sizes indicated.

C. Fabricate with required connection pieces.

D. Form sections square, true, and accurate in size, in maximum possible lengths and free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

E. Fabricate gutter and downspout accessories; seal watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and conditions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of substrate.

3.02 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions. Provide a watertight system.

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B. Provide elbow on end of downspout to direct water from building. Maintain 4-inch clearance between end of elbow and splash block.

C. Set splash blocks under downspouts at all locations not directly connected to storm sewer.

END OF SECTION

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SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparing sealant substrate surfaces.

B. Sealant and joint backing.

1.02 RELATED SECTIONS

A. Division 03 - Concrete: Sealants used in conjunction with cast-in-place concrete.

B. Section 04 20 00 - Unit Masonry: Sealants used in conjunction with masonry.

C. Section 04 72 00 – Cast Stone: Sealants used in conjunction with cast stone.

D. Section 07 24 00 - Exterior Insulation and Finish Systems.

E. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System: Sealants used in conjunction with door frames.

F. Section 08 81 00 – Glass Glazing: Glazing sealants and accessories.

G. Section 09 77 50 - Fiberglass Reinforced Plastic Surfaced Laminated Panels: Sealants used in conjunction with FRP panels.

H. Division 22 - Plumbing: Sealants used in conjunction with plumbing penetrations, fixtures, and equipment.

I. Division 23 - Heating, Ventilating, and Air Conditioning: Sealants used in conjunction with mechanical penetrations, fixtures, and equipment.

J. Division 26 - Electrical: Sealants used in conjunction with electrical penetrations.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   2. ASTM C1193 - Standard Guide for Use of Joint Sealants.
   3. ASTM C1382 - Test Method for Determining Tensile Adhesion Properties of Sealants When Used In Exterior Insulation and Finish Systems (EIFS) Joints.
   4. ASTM D1667 - Standard Specification for Flexible Cellular Materials – Poly (Vinyl Chloride) Foam (Closed-Cell).
   5. ASTM D1056 – Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

B. Sealing and Waterproofers Institute (SWI):
   1. SWI - Sealant and Caulking Guide Specification.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Product Data: Indicate sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

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C. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.

D. Warranty: Include coverage for installed sealants and accessories failing to achieve watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

1.05 QUALITY ASSURANCE

A. Conform to Sealant and Waterproofers Institute requirements for materials.

B. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

C. Applicator qualifications:
   1. Applicator shall have at least three (3) years experience in installing materials of types specified and shall have successfully completed at least three (3) projects of similar scope and complexity.
   2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

D. Single source responsibility for joint sealants:
   1. Obtain joint sealants from single manufacturer for each different product required to ensure compatibility.
   2. Manufacturer shall instruct applicator in procedures for intersecting sealants.

E. Perform work in accordance with ASTM C1193 guidelines, except where more stringent requirements are indicated or specified.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment.

B. Do not install solvent curing sealants in enclosed building spaces.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 PRODUCT STORAGE AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Deliver the materials to the job site in the manufacturer's unopened containers with all labels intact and legible at time of use.

C. Store materials in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

1.08 SEQUENCING AND SCHEDULING

A. Section 01 31 13 - Project Coordination: Work coordination provisions.

B. Coordinate the work of this Section with all Sections referencing this Section.

1.09 SUBSTRATE CONDITIONS

A. Provide joints properly dimensioned to receive the approved sealant system.

B. Provide joint surfaces that are clean, dry, sound and free of voids, deformations, protrusions, and contaminants which may inhibit application or performance of the joint sealant.

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1.10 WARRANTY

A. Deliver to the Architect signed copies of the following written warranties against adhesive and cohesive failure of the sealant and against infiltration of water and air through the sealed joint for a period of three (3) years from date of completion.
   1. Manufacturer's standard warranty covering sealant materials.
   2. Applicator's standard warranty covering workmanship.

PART 2 PRODUCTS

2.01 GENERAL

A. Compatibility:
   1. Provide joint sealants, joint fillers, and accessory joint materials that are compatible with one another and with joint substrates under project conditions.
   2. Install joint sealants, joint fillers, and related joint materials that are nonstaining to visible joint surfaces and surrounding substrate surfaces.

B. Provide colors selected by Architect from manufacturer's standard color range, unless noted otherwise.

2.02 SEALANTS

A. Low Modulus Silicone Sealant:
   1. Tremco Spectrem 3, GE SCS 2000, Dow 795, Pecora 895, Tremco Spectrem 4
   2. Locations to be used:
      a. Vertical joints which are bordered on one or both sides by a porous building material such as concrete, natural stone, or masonry or a non-porous building material such as painted metal, anodized aluminum, mill finish aluminum, stainless steel, vinyl siding, PVC, or porcelain tile.
      b. Interior and exterior door frames perimeters.
      c. Interior and exterior window and louver perimeters.
      d. Exterior concrete masonry, brick and stone joints.
      e. Exterior wall penetrations of plumbing, HVAC, and electrical items.
   3. Primer for mortar, masonry, concrete, and other porous substrates: Tremsil Silicone Porous Primer.

B. Low Modulus Silicone Sealant for EIFS:
   1. Tremco Spectrem 4-TS.
      a. Primer, where needed:
         1) TREMprime Silicone Porous Primer for porous surfaces
         2) TREMprime Silicone Metal Primer for metals or plastics
   2. Color: custom color to match adjacent EIFS color.
   3. Location to be used: EIFS Joints.

C. Self-Leveling Polyurethane Sealant:
   1. BASF MasterSeal SL 1, Vulkem 45SSL, Sikaflex 1CSL.
   2. For areas where the slope of the slab makes self-leveling material impractical BASF MasterSeal SL 2, Vulkem 45SSL, Sikaflex 2cNS.
   3. Color: Match floor color.
   4. Locations such as interior and exterior concrete slab control and perimeter expansion joints.

2.03 ACCESSORIES

A. Primer: Non-staining type, as recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, as recommended by sealant manufacturer; compatible with joint forming materials.

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C. Backer Rod: Polyethylene foam rod or rope or other compatible non-waxing, non-extruding, non-staining resilient material as recommended by sealant manufacturer, closed cell, sized 25 percent wider than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Masking Tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces that is suitable for masking.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify that joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

C. Beginning of installation means acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces to receive sealants in accordance with sealant manufacturer's instructions and recommendations.

B. Examine joint sizes and correct as required to allow for anticipated movement and to achieve proper width/depth ratio per manufacturer's recommendations for specified sealant.

C. Thoroughly clean joint surfaces using cleaners approved by sealant manufacturer, whether primers are required or not.
1. Remove all traces of previous sealant and joint backer by mechanical methods, such as by cutting, grinding and wire brushing, in manner not damaging to surrounding surfaces.
2. Remove paints from joint surfaces except for permanent, protective coatings.
3. Remove wax, oil, grease, dirt film residues, temporary protective coatings and other residues by wiping with cleaner recommended for that purpose. Use clean, white, lint-free cloth and change cloths frequently.
4. Remove loose materials and foreign matter.
5. Remove dust by blowing clean with oil-free, compressed air.

D. Verify that joint backing and release tapes are compatible with sealant.

E. Measure joint dimensions and size materials to achieve required width/depth ratios.

F. Protect elements surrounding the work of this Section from damage or disfiguration.

3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions, and SWI "Sealant: The Professional's Guide".

B. Where necessary to protect adjacent surfaces, mask adjacent surfaces with tape prior to priming and/or caulking.
1. Use masking tape where required to prevent sealant or primer contact with adjoining surfaces that would be permanently stained or otherwise damaged by such contact or the cleaning methods required for removal.
2. Apply tape so as not to shift readily and remove tape immediately after tooling without disturbing joint seal.

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C. Provide backer rod uniformly to depth required by sealant manufacturer for proper joint design using a blunt instrument.
   1. Fit securely by compressing backer material 25 percent to 50 percent so no displacement occurs during tooling.
   2. Avoid stretching or twisting joint backer.
   3. Install to achieve a neck dimension no greater than 1/3 the joint width.

D. Install bond breaker where backer rod is not used or where recommended by sealant manufacturer, adhering strictly to the manufacturers installation requirements.

E. Prime joint substrates where required.
   1. Use and apply primer according to sealant manufacturers recommendations.
   2. Confine primers to sealant bond surfaces; do not allow spillage or migration onto adjoining surfaces.
   3. Prime immediately prior to caulking.

F. Install sealants immediately after joint preparation.

G. Install sealants to fill joints completely from the back, without voids or entrapped air, using proven techniques, proper nozzles, and sufficient force that result in sealants directly contacting and fully wetting joint surfaces.

H. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

I. Install sealants to uniform cross-sectional shapes with depths relative to joint widths that allow optimum sealant movement capability as recommended by sealant manufacturer.

J. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

K. Tool sealants in manner that forces sealant against back of joint, ensures firm, full contact at joint interfaces and leaves a finish that is smooth, uniform and free of ridges, wrinkles, sags, air pockets and embedded impurities. Provide concave tooled joints.

L. Remove sealant from adjacent surfaces in accord with sealant and substrate manufacturer recommendations as work progresses.

M. Protect joint sealants from contact with contaminating substances and from damages. Cut out, remove, and replace contaminated or damaged sealants, immediately, so that they are without contamination or damage at time of substantial completion.

N. Clean adjacent surfaces immediately and leave work neat and clean. Remove excess and droppings using recommended cleaners as work progresses. Remove masking tape immediately after tooling of joints.

3.04 CLEANING AND REPAIRING

A. Section 01 77 00 - Closeout Procedures: Cleaning provisions.

B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.05 PROTECTION OF FINISHED WORK

A. Section 01 77 00 - Closeout Procedures: Protecting installed work.

B. Protect sealants until cured.

END OF SECTION

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SECTION 08 16 00
FIBERGLASS REINFORCED POLYESTER DOOR AND FRAME SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced polyester doors and frames.

B. Coordinate required door undercut with specified hardware.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Wall opening construction.

B. Section 05 50 00 - Metal Fabrications: Steel lintels.

C. Section 07 21 16 - Blanket Insulation: Insulation for frame.

D. Section 07 92 00 - Joint Sealants: Perimeter sealing.

E. Section 08 71 00 - Door Hardware.

F. Section 08 81 00 – Glass Glazing: Glass for doors and frames.

G. Section 09 96 00 - High Performance Coatings: Field painting of door and frames.

1.03 REFERENCES

A. Americans with Disabilities Act (ADA) of 1990, Accessibility Guidelines for Buildings and Facilities, 2010 edition.

B. American National Standards Institute (ANSI):
1. ANSI A117.1 - 2009 - Accessible and Usable Buildings and Facilities.

C. American Society for Testing and Materials (ASTM):
1. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
2. ASTM E413 - Standard Classification for Rating Sound Insulation.

D. International Code Council:
1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.
2. IECC - International Energy Conservation Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cutouts for glazing, and finish.

C. Product Data: Indicate door configurations, location of cutouts for hardware reinforcement, and manufacturer literature.

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1.05 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8, SDI-100 and ANSI A117.1.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of FRP doors and frames with a minimum of 10 years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Store doors and frames at the building site off the ground, under cover with adequate ventilation. If the door wrapper becomes wet, remove immediately. Store vertically with the least possible angle. Do not stack horizontally.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.09 COORDINATION

A. Coordinate work with wall opening construction, glazing, and hardware installation.

B. Coordinate electric security hardware installation and wiring connections.

1.10 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Warranty provisions.

B. Warranty:
1. Furnish a one (1) year warranty for products to be free of defects in materials and workmanship.
2. Furnish a 10-year corrosion warranty against degradation or failure due to corrosion.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Manufacturers - non-rated doors and frames:
1. Chem-Pruf, Brownsville, Texas; (800) 444-6424.
2. Corrim Company, Oshkosh, Wisconsin; (920) 231-2000.
3. FRP Composites, Wisconsin Rapids, Wisconsin; (715) 421-3770.
4. Simon Door Company LLC, Brownsville, Texas; 866-894-7511.
5. Tiger Door, Inc., Omaha, Nebraska; (888) 891-4416.
6. Special-Lite.
7. Substitutions: None.

B. Doors and Frames
1. Flush type fiberglass reinforced plastic - solid core doors and frames.
2. System Thermal Transmittance: U-value of not more than 0.087 nominal BTU per AAMA 15031.

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2.02 DOOR CONSTRUCTION

A. FRP door panels shall be made of fiberglass-reinforced plastics using resins and reinforcements tailored to the corrosive environment peculiar to particular project. Door panel shall have a fiberglass content of not less than 25 percent by weight and all exterior surfaces shall be treated with ultra-violet inhibitors. The door panels shall be flush construction having no seams or cracks. All mortises shall be provided by the manufacturer. Unless otherwise specified, door thickness shall be nominal 1-3/4 inches.

B. Face Sheets:
   1. One continuous piece of FRP material of suitable structural integrity and resin composition to provide a door panel with the ability to perform reliably in the specified environment and physical constraints.
   2. Standard face sheets shall be manufactured using a corrosion-resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass.
   3. Face sheets shall be 0.070-inch to 0.125-inch thickness.

C. Core: All voids between the door faces shall be completely filled with expanded polyurethane foam, minimum density 4 pounds per cubic foot, maximum flame developed index less than 25 in accordance with ASTM E84.

D. Stiles and Rails: Door panels shall be constructed with the use of a full stile and rail structure. Doors that do not have an engineered stile and rail system are not acceptable. The stile and rail system is to be fabricated entirely from FRP components and shall, of themselves, provide the structural integrity for the door panels. The stile and rail system of itself shall provide an impenetrable barrier between the edge of the door and the core material. The stiles and rails shall provide the primary support for hardware accessories and attachments. Pultrusion: In compliance with pultrusion industry standards.

E. Reinforcements: Door panels shall be adequately reinforced and compression members fabricated from suitable corrosion resistant materials so as to accommodate hinges, closer units, locksets, kickplates, push pull plates, exit devices, strikes, etc. No wood blocking and steel or aluminum plates, ribs, fitting, or fasteners are to be used.

F. Thru-bolting: Doors shall contain sufficient internal reinforcing in the areas of thru-bolt hardware as specified. Reinforcement shall be a corrosion-resistant compression member with the ability to resist typical thru-bolt torquing and maintain the sealed integrity of the panel.

G. Finish: Standard coat to be gray or white, matte finish, paintable.

2.03 FRAME CONSTRUCTION

A. One-piece molded cross-section with molded stop, fabricated entirely from FRP materials.

B. Frames shall be reinforced with anchor blocks and prepared for the attachment of hinges, closer units, panic exit devices and any other pertinent hardware. Mortises for the hinges shall be prepared by the factory. All hardware reinforcements will be made from polymer materials, unless alternates are approved.

C. Corner Joints: Head and jamb members shall be standard 45 degrees miter, providing a neatly mitered corner connection, fabricated for Knocked Down (KD) field assembly. Jambs and header shall be joined at corners with hidden FRP angle chips and stainless steel flat head screws. Screws shall not be visible on interior or exterior frames faces.
   1. Chemically welded frames are acceptable.
   2. Joints in frame shall be sealed per manufacturer instructions for a seamless final appearance.

D. Finish: Standard coat to be gray or white, minimum 15 mils thick, matte finish, paintable.

E. Provide mortar guard box.

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2.04 ACCESSORIES

A. Removable Glazing Stops: Rolled FRP channel shape, batted corners; prepared for counter sink style tamper-proof stainless steel screws; stops must not extend beyond face of door.

B. Hardware: All doors and frames shall be machined using templates available from the manufacturer of specified hardware. Doors and frames shall be internally reinforced for specified surface hardware before core is installed in door. Hardware shall be field installed.

C. Fasteners: Stainless steel. Conceal fasteners wherever possible.

2.05 FABRICATION

A. Glazing: Glass support structure shall ensure that the glass area is weathersealed as to not permit moisture and contaminants to enter the core of the door. Glazing must allow for ready access for repair, in the event of damage or replacement, without affecting the sealed integrity of the cutout in the door panel itself.

B. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of material in manner which prevents damage to exposed surfaces.

C. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

D. Clearance: Door shall be manufactured with proper hinge rail clearance depending upon hinge type used, and 1/8 inch at head, 1/8 inch at lock rail, and 3/16 inch at bottom rail above threshold or finished floor without threshold.

2.06 FINISHING

A. Field finish under Section 09 96 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's requirements.

B. Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.

C. Install doors and frames in accordance with SDI-100.

D. Coordinate installation of glass and glazing specified in Section 08 80 00.

E. Coordinate with wall construction for anchor placement.

3.03 ADJUSTING

A. Section 01 77 00 - Closeout Procedures: Adjustment provisions.

B. Adjust door for smooth and balanced door movement.

END OF SECTION

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SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hardware for hollow steel, wood, and fiberglass reinforced polyester doors and frames.

B. Thresholds.

C. Gasketing.

D. Weatherstripping for existing overhead doors.

E. Overhead door jamb and head seals.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish templates to Section 08 16 00 for door and frame preparation.

1.03 RELATED WORK

A. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System.

1.04 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ANSI A156 - Complete Set of 24 BHMA Standards (A156 Series) with Binder.

B. Americans with Disabilities Act (ADA) of 1990, Accessibility Guidelines for Buildings and Facilities, 2010 edition.

C. Architectural Woodwork Institute (AWI).

D. Builders' Hardware Manufacturers Association (BHMA).

E. Door and Hardware Institute (DHI).

F. International Code Council:
   1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.

G. National Association of Architectural Metal Manufacturers (NAAMM).

H. Steel Door Institute (SDI).

I. Underwriters Laboratories Inc. (UL):
   1. UL 305 - Panic Hardware.
   2. UL - Building Materials Directory.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with the following requirements:
   1. ANSI A156 series.

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2. UL 305.

1.06 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Closeout provisions.

B. Project Record Documents: Record actual locations of installed cylinders and their master key code.

C. Operation and Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

D. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.07 QUALIFICATIONS

A. Manufacturers: Companies specializing in manufacturing door hardware with minimum three (3) years experience.

B. Hardware Supplier: Company specializing in supplying commercial door hardware with three (3) years documented experience.

1.08 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Shop Drawings: Indicate locations and mounting heights of each type of hardware.

C. Product Data: Submit catalog cuts.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Package hardware items individually with necessary fasteners, instrumentations, and templates; label and identify package with door opening code to match hardware schedule.

C. Protect hardware from theft by cataloging and storing in secure area.

1.10 COORDINATION

A. Section 01 31 13 - Project Coordination: Coordination provisions.

B. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

C. Provide templates or actual hardware as required to ensure proper preparation of doors and frames.

D. Coordinate Owner's keying requirements during course of work, prior to submittal of shop drawings.

1.11 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Warranty provisions.

B. Closer: Furnish 10-year warranty.

1.12 MAINTENANCE MATERIALS

A. Section 01 77 00 - Closeout Procedures: Maintenance materials.

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B. Furnish special wrenches and tools applicable to each different or special hardware component.

C. Furnish maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Geared Hinges: Roton, Pemco, Hager.

B. Latch Sets: Dorma, Schlage, Sargent. No substitutions.

C. Cylinder Locks: Schlage. No substitutions.

D. Exit Devices: Dorma, Sargent, Von Duprin. No substitutions.

E. Closers: Dorma, LCN. No substitutions

F. Gasketting: National Guard, Reese, Zero, Pemco.

G. Thresholds: National Guard, Reese, Zero, Pemco.

H. Threshold Gasket: Weather-Bloc Systems, www.weatherblocsystems.com; 414-375-8101.

I. Protection Plates: Builders Brass, Hager, Hiawatha, Rockwood.

J. Latch Guards: Hager, Ives.

2.02 KEYING

A. Door Locks: Key per Owner requirements to existing master key systems at substantial completion.

B. Supply two (2) keys for each lock.

C. Supply keys per Owner requirements.

2.03 FINISHES

A. Finishes are identified in Schedule at end of this Section.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

C. Verify that power supply is available to power operated devices.

D. Beginning of installation means acceptance of substrates.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of SDI, NFPA 80, and BHMA.

B. Use the templates provided by hardware item manufacturer.

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C. Mounting heights for hardware from finished floor to centerline of hardware item shall comply with ADA, ANSI, and BHMA.

D. Conform to ADA and ANSI for positioning requirements for accessibility.

3.03 ADJUSTING

A. Section 01 77 00 - Closeout Procedures: Testing, adjusting, and balancing.

B. Adjust hardware for smooth operation.

3.04 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 77 00 - Closeout Procedures: Protecting installed construction.

B. Do not permit adjacent work to damage hardware or hardware finish.

3.05 SCHEDULE (H.S. = Hardware Set)

H.S.1 (exterior single FRP door)

1 geared hinge	780-112HD *(no door offset)*	Hager
1 lockset	ND60RD (ANSI F88 *vestibule lock*)	Schlage
1 latch guard	LG12	Ives
1 closer	P4040XP Spring H-Cush *Install over weatherstripping*	LCN
1 kickplate	190S 12-inch 32D	Hager
1 jamb seal	700S *(1.5" wide)* *Mount under closer*	NG
1 threshold	613	NG
1 threshold gasket	ThresTite, 0.188"x4.5" *Install under threshold*	Weather-Bloc
1 threshold seal	700S *(1.5" wide)* *Install on top of threshold*	NG
1 door shoe w/ sweep	95WH	NG

H.S.2

1 exit device (*active*)	CD 98 996L-NL (ANSI 03) xcylinder *Key retracts latch bolt does not unlock door*	Von Duprin
2 cylinders	*for exterior and dogging*	Schlage
1 jamb seal	700S *(1.5" wide)* *Extend seal across exterior face of closer mounting hardware*	NG

H.S.3 (STR 05 - existing OH doors – provide all new opening weatherstripping)

Head and jamb weatherstripping — Weatherseal Climate 2" Molding (American Door Supply or Equal), 2" extruded vinyl stop embossed with a wood grain texture and 1-3/8" vinyl blade type seal molded into the stop.

H.S.4

1 exit device	CD 98 996L-BE (*always operable, no cylinder*) US28 powder coat	Von Duprin

NOTES:

1. Finishes:
   a. US26D/32D, unless noted otherwise.
   b. Closers sprayed aluminum, unless noted otherwise.
2. Hinge Size:
   a. Rotons: Continuous, heavy-duty, no offset.
3. Lock type design as follows, unless noted otherwise: Verify and match Owner's existing system.
   a. Schlage, Rhodes (RHO).
   b. Von Duprin, 6 lever.

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c. Full size interchangeable cores (FSIC), except where mortise is required.

4. Closers:
   a. Parallel arm.
   b. Mount on “push” side of door, unless noted otherwise.
5. Weatherstripping:
   a. Do not cut weatherstripping at jamb or head for panic device latch or closer. These items are to be installed over the top of the weatherstripping, unless noted otherwise.
   b. Overhead Door Seal: Brown or White, color as selected by Architect.

END OF SECTION

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SECTION 08 81 00
GLASS GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass and glazing for doors.

1.02 RELATED SECTIONS

A. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System.

1.03 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

B. American Society of Civil Engineers (ASCE):
   1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. American Society for Testing and Materials (ASTM) International:
   1. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
   2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   3. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
   4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
   5. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   6. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls By Uniform Static Air Pressure Difference.
   7. ASTM E546 - Standard Test Method For Frost/Dew Point of Sealed Insulating Glass Units.
   8. ASTM E576 - Standard Test Method For Frost/Dew Point of Sealed Insulating Glass Units in the Vertical Position.
   9. ASTM E773 – Standard Test Methods for Accelerated Weathering of Sealed Insulating Glass Units.
   10. ASTM E1425 - Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylights, and Glazed Wall Systems.

D. Federal Specification Unit (FS):
   1. FS A-A-272B - Caulking Compounds.
   2. FS TT-S-01543 - Sealing Compound, Silicone Rubber Base.

E. Glass Association of North America (GANA) - formerly FGMA:
   1. GANA - Sealant Manual.
   2. GANA - Glazing Manual.
   3. GANA - Laminated Glass Design Guide.

F. International Code Council:
   1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2018 Edition, and referenced standards with 2018 State of Wisconsin amendments.

G. Sealed Insulated Glass Manufacturers Association (SIGMA).

1.04 SUBMITTALS

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A. Section 01 31 13 - Project Coordination: Submittal provisions.

B. Product Data:
   1. Glass: Provide structural, physical, and environmental characteristics, size limitations, special handling or installation requirements, and manufacturer product literature.
   2. Glazing Sealants, Compounds, and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors where exposed.

C. Submit warranty.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, and SIGMA for glazing installation methods.

1.06 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three (3) years experience.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment: Environmental provisions.

B. Do not install glazing when ambient temperature is less than 50 degrees F.

C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on drawings.

1.09 COORDINATION

A. Section 01 31 13 - Project Coordination: Coordination provisions.

B. Coordinate the Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.10 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Warranty provisions.

B. Manufacturer's Warranty:
   1. Furnish 10-year warranty, include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.
   2. Furnish 10-year warranty to include coverage for delamination of laminated glass and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Insulated Unit Fabricator
   1. Custom Glass Product.
   2. HGP.
   3. Old Castle Glass.

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2.02 GLASS MATERIALS

A. Type A: Insulated unit, double pane, 1/4-inch tempered glass panes, light bronze tinted, low-E, non-metallic spacer, dual seal, total unit thickness of 1 inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify that openings for glazing are correctly sized and within acceptable tolerance. Verify surfaces of glazing channels or recesses are clean, free of obstructions impeding moisture movement, weeps are clear, and ready to receive glazing. Beginning of installation means acceptance of substrates.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer. Prime surfaces in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Perform installation in accordance with GANA Glazing Manual.
   1. Glazing Sealants: Comply with ASTM C1193.

B. Install in accordance with glazing and frames manufacturer's instructions.

3.04 CLEANING

A. Section 01 77 00 - Closeout Procedures: Cleaning provisions.

B. Remove glazing materials from finish surfaces. Remove labels from glass after work is complete. Clean glass and adjacent surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Section 01 50 00 - Temporary Facilities and Controls: Protection of finished work provisions.

B. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

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SECTION 09 77 50
FIBERGLASS REINFORCED PLASTIC SURFACED LAMINATED PANELS

PART 1 GENERAL

1.01 WORK INCLUDES

A. This section describes the requirements for furnishing and installing fiberglass reinforced plastic surfaced panels according to manufacturer's recommendations.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 06 17 53 – Shop-Fabricated Wood Trusses

C. Section 07 27 13 – Sheet Membrane Air/Vapor Retarder.

D. Division 22 - Plumbing: Penetrations by plumbing items.

E. Division 23 - Heating, Ventilating, and Air Conditioning: Penetrations by mechanical items.

F. Division 26 - Electrical: Penetrations by electrical items.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Shop Drawings: Indicate and dimension the location of joints and fastener attachments.

C. Samples: Panel for color selection; 10-inch length of each type of trim and molding, fastener.

1.04 QUALITY ASSURANCE

A. Provide panels, molding, and adhesive only from the manufacturer specified to ensure warranty and color harmonization of accessories.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Package sheets on skids or pallets for shipment to project site.

C. Deliver adhesive in sealed containers with labels legible and intact.

D. When moving more than a single sheet, place sheets face-to-face and back-to-back.

E. Protect surface during cutting and working by application of temporary, strippable coating or by other means recommended by panel manufacturer.

F. Remove foreign matter from face of panel by use of a soft bristle brush, avoiding abrasive action.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Installation shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from plaster, concrete, or terrazzo work has dissipated.

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B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used.

C. Do not allow containers of adhesive to be opened until all potential sources of flame or spark have been shut down or extinguished and until warnings against their ignition during adhesive application have been posted.

D. Provide ventilation to disperse fumes during application of solvent-based adhesive.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ceiling Panels: Field verify existing panel thickness – notify Architect if existing product is of different thickness than specified product.
1. The nominal overall panel thickness shall be 0.63 inch. 0.09-inch thick fiberglass reinforced plastic panel Class C shall be factory laminated to 5/8-inch thick OSB or plywood.
2. The color shall be white.
3. Kemply pre-laminated panel (Glasbord fiberglass reinforced plastic panels laminated to a rigid substrate) as manufactured by Crane Composites (formerly Kemlite), Fiber-Lite as manufactured by Nudo Products, Inc., or equal. For distribution and technical information please call Crane Composites, (800) 435-0080.
4. Alternate products shall meet or exceed the following properties:
   a. Flame spread index of 200 or lower, smoke developed index under 450 per ASTM E-84 latest version.
   b. Barcol hardness (scratch resistance) of 30 per ASTM D-2583.
   c. Panels will exhibit no more than a 0.046 percent weight loss after a 25-cycle Taber test.

B. Moldings:
1. Harmonizing PVC moldings shall be provided at all butt joints, end joints, and penetrations through the panels.
   a. Outside Angle: 1-1/2 inch, 10-foot lengths; Nudo V-123.
   b. Inside Angle: 1-1/2 inch, 10-foot lengths; Nudo V-121. Match existing trim height – field verify.
   c. H molding, two-piece division bar, surface mount w/ stainless steel screws; Nudo V-29.
   d. J molding; Nudo V-17.
2. Manufactured by Nudo Products or Keel Division (888) 533-5782, no substitutions.

C. Construction Adhesive: Waterproof construction adhesive.

D. Rivets: Nylon rivets, color to match panel color.

E. Sealant: Kemlite Construction Sealant 255, silicone sealant.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

B. Do not begin installation until backup surfaces are put into satisfactory condition.

3.02 APPLICATION

A. Do all cutting with carbide tipped saw blades or drill bits, or cut with snips.

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B. Install panels with manufacturer's recommended gap for panel field and corner joints.

C. Fastener holes in panels must be predrilled 1/8-inch oversize.

D. Apply construction adhesive to the contact surface of all supporting members.

E. Mechanically fasten panel no further than 8 inches on center around the panel edges and 12 inches on center on intermediate supports.

F. Use nylon rivets to fasten panel where the fasteners will be exposed. Use non-corroding screws where the fastener will be concealed.

G. Using products acceptable to manufacturer, install the FRP system in accordance with manufacturer's printed instructions.

H. Provide harmonizing PVC moldings at all butt joints and end joints. Install silicone sealant in all moldings, around all panel edges, fasteners and penetrations to provide a moisture proof installation.

I. Provide PVC angles at locations noted on drawings. Set each leg of the angle in a bead of silicone sealant. Fasten one leg of the angle with nylon rivets at 24 inches on center.

J. At locations where a PVC angle covers a division bar, the face section of the division bar shall be cut back so that the PVC angle can mount tight to the face of the FRP without a hump outward at the division bar. The division bar shall be cut back in a manner that it will butt tight to the edge of the adjacent PVC angle.

3.03 CLEANING

A. Remove any adhesive or excessive sealant from face using solvent or cleaner recommended by panel manufacturer.

END OF SECTION

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SECTION 09 96 00
HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The Contractor shall paint all surfaces required as indicated on the contract drawings and as specified herein. The work includes painting and finishing items and surfaces and preparation of surfaces to receive coatings throughout the project as shown on the drawings and in the Painting Schedule in this section, or by direction of the Engineer.

B. Painting work includes, but is not necessarily limited to:
   1. Site
      a. Pipe bollards
      b. Parking markings
   2. STR05 Administration Building
      a. Exterior exposed existing and new steel lintels at openings.
      b. Exterior exposed concrete masonry unit foundation wall.
      c. New exterior FRP doors and frames
      d. Exposed conduit and piping on exterior of building.
      e. New gas piping.
   3. STR30 Chemical Building
      a. Chemical containment walls and floors, new and existing.
      b. Existing exterior FRP door and frame.
      c. New interior masonry walls.
   4. STR60 Pump and Digester Building
      a. New sludge piping, fittings, valves, etc., including color coding.
      b. New non-insulated water lines.
   5. STR70 Sludge Processing Building
      a. New sludge piping, fittings, valves, etc., including color coding.
   6. STR75 Sludge Drying Building
      a. Interior masonry walls as noted on the Drawings.
      b. Existing interior FRP door and frame at Electrical Room.
   7. Miscellaneous existing surface touch-up at removed items.

C. Paint all surfaces exposed to view whether or not colors are designated in Painting Schedule, except where the natural finish of the material is obviously intended or specifically noted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

D. Contractor shall paint existing surfaces damaged by construction activities and surfaces to receive work. Surface preparation and painting system shall be as scheduled in this section. Color shall be selected by Owner from samples submitted by Contractor to as closely as possible match existing surfaces.

E. Examine specifications and drawings of all other trades and become thoroughly familiar with provisions regarding their painting.

1.02 WORK NOT INCLUDED

A. Existing: Do not paint existing work that has not been disturbed.

B. Exposed Work: surface mounted conduit, ductwork, brackets, supports, hangers, fasteners, etc., inside buildings with painted surfaces does not need to be painted, new or existing.

C. Shop Priming: Unless otherwise specified, shop primer coats are included under the various sections for structural steel, miscellaneous metal, hollow metal work, architectural woodwork, and shop-fabricated or factory-built mechanical and electrical equipment, and similar items.

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D. Pre-Finished Items: Unless otherwise indicated, do not paint factory-finished or pre-finished items such as (but not limited to) metal toilet enclosures, acoustic materials, architectural woodwork, finished mechanical and electrical equipment including light fixtures, switch gear and power distribution cabinets, decorative masonry units or process piping with exterior bituminous coating. All process equipment, such as pumps and blowers, shall be painted the color indicated in the Color Schedule found elsewhere in this section.

E. Concealed Surfaces: Unless otherwise directed, painting is not required on surfaces such as walls or ceilings in concealed areas and inaccessible areas (i.e., foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts, and crawl space walls).

F. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium (chrome) plate, and similar finished materials will not require finish painting, except as otherwise directed.

G. Operating Parts: Do not paint any moving parts of operating units, slide and bearing surfaces, mechanical and electrical parts such as valve and damper operators, linkages, sending devices, motor and fan shafts, unless otherwise directed or; machined or polished surfaces of equipment where such surfaces are susceptible to rolling or sliding friction.

H. Labels: Do not paint over any required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates. (This does not include cast or embossed names on equipment castings.)

1.03 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals – Division 01

C. Concrete – Division 03 (All Sections)

D. Masonry – Division 04 (All Sections)

E. Metals - Division 05 (All Sections)

F. Woods, Plastics, and Composites – Division 06 (All Sections)

G. Thermal and Moisture Protection - Division 07 (All Sections)

H. Openings - Division 08 (All Sections)

I. Special Construction - Division 13 (All Sections)

J. Plumbing – Division 22 (All Sections)

K. Heating, Ventilating, and Air Conditioning – Division 23 (All Sections)

L. Electrical – Division 26 (All Sections)

M. Exterior Improvements – Division 32 (All Sections): Painting of pavement

N. Process Integration - Division 40 (All Sections)

O. Pollution Control Equipment – Division 44 (All Sections)

1.04 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

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1.05 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto. Current edition, unless noted otherwise.

1. American Concrete Institute
   a. ACI 347 – Guide to Formwork in Concrete
2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
   a. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer and Related Products.
3. International Concrete Repair Institute (ICRI):
   a. ICRI Technical Guideline 310.2R – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair
4. Steel Structures Painting Council (SSPC), Specification and Standards:
   a. Steel Structures Painting Manual, Volume 2, “Systems & Specifications”, Current Edition.
   b. SSPC Guide 23, Field Methods For The Determination Of Moisture In Concrete and Masonry Walls and Ceilings
   c. SSPC-TR 3/NACE 6A192 – Dehumidification, Temperature Control, Surface Preparation
   d. SSPC-TR 2/NACE 6G198 – Wet Abrasive Blast Cleaning
   e. SSPC-TR 1/NACE 6G194 – Thermal Pre-Cleaning
   f. SSPC-SP WJ-4/NACE WJ-4 – Light Waterjetting
   g. SSPC-SP WJ-3/NACE WJ-3 – Thorough Waterjetting
   h. SSPC-SP WJ-2/NACE WJ-2 – Very Thorough Waterjetting
   i. SSPC-SP WJ-1/NACE WJ-1 – Waterjetting To Bare Substrate
   j. SSPC-SP 7/NACE No. 4 – Brush-Off Blast Cleaning
   k. SSPC-SP 7 (WAB)/NACE WAB-4 – Brush-Off Wet Blast Cleaning
   l. SSPC-SP 6/NACE No. 3 – Commercial Blast Cleaning
   m. SSPC-SP 6 (WAB)/NACE WAB-3 – Commercial Wet Blast Cleaning
   n. SSPC-SP 5/NACE No. 1 – White Metal Blast Cleaning
   o. SSPC-SP 5 (WAB)/NACE WAB-1 - White Metal Wet Blast Cleaning
   p. SSPC-SP 3 – Power Tool Cleaning
   q. SSPC-SP 2 – Hand Tool Cleaning
   r. SSPC-SP 16 – Brush-Off Blast Cleaning Non-Ferrous Metals
   s. SSPC-SP 15 – Commercial Power Tool Cleaning
   t. SSPC-SP 14 (WAB)/NACE WAB-8 – Industrial Wet Blast
   u. SSPC-SP 13/NACE 6 – Surface Prep of Concrete
   v. SSPC-SP 11 - Bare Metal Power Tool Cleaning
   w. SSPC-SP 10/NACE No. 2 – Near-White Blast Cleaning
   x. SSPC-SP 10 (WAB)/NACE WAB-2 – Near White Wet Blast
   y. SSPC-SP 1 – Solvent Cleaning

1.06 DEFINITIONS

A. “Paint” as used herein means all coating systems materials, including primers, emulsions, enamels, epoxies, stains, varnishes, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

B. “Immersion” service is defined as being below the elevation of the top of the wall of a structure containing liquid.

C. “High Moisture” service is defined as an area where the humidity is typically higher than surrounding areas. Surfaces to be coated with “High Moisture” service paint will be labeled as such in the Painting Schedule.

D. Bug Holes (in concrete): Surface voids, as small or irregular cavities, usually not exceeding 5/8-inch (or 15-mm) in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation. Bug holes may be considered defects if the width or depth exceeds the maximum allowable sizes as defined by ACI 301.

1.07 SUBMITTALS

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A. Submit manufacturer's specifications, including label analysis and application instructions for each material specified. Furnish a complete set of color cards of proposed products to the Engineer for color selection by the Owner. The Engineer will furnish a schedule designating where various colors shall be applied.

B. Submittals for products other than those specified as the standard of quality in this specification, shall be presented ten (10) days before bid date along with manufacturer's data sheets, and written performance criteria comparisons. No coating system shall be approved that changes generic type, thickness, number of coats or level of quality without written permission of the Engineer.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.09 DELIVERY, STORAGE, AND HANDLING

A. Material and Equipment - Division 01: Product storage and handling provisions.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Paint Materials: Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Material and Equipment - Division 01: Environmental provisions.

B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

C. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelop. Combustion gases shall not be allowed in any temporary enclosure and building envelope.

D. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

E. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

F. Minimum Application Temperatures for Paints: 50 degrees F, unless required otherwise by manufacturer's instructions.

G. Minimum Application Temperature for Varnish and Stain Finishes: 65 degrees F, unless required otherwise by manufacturer's instructions.

1.11 QUALITY CONTROL

A. The Contractor shall submit a Quality Control Plan which identifies trained Quality Control personnel and identifies Quality Control procedures, including all tests, testing equipment, and standards, to be utilized.

B. Before proceeding with painting, finish one complete sample panel, space, room or item of each color scheme showing selected color, finish texture, and workmanship. Request review and approval by the Engineer of first finished sample panel, space, room or item. Use first acceptable sample panel, space, room or item as the standard for similar work throughout.

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1. Approved samples will be kept on job for comparison;
2. Engineer reserves right to select unopened containers of materials furnished on job and have materials tested at an approved laboratory;
3. Owner will pay for first tests. Retests of rejected materials and tests of replacement materials shall be paid for by Contractor. Remainder of contents of containers not required for testing will be returned to Contractor.

C. Include on label of each container:
1. Manufacturer's Name and Type of Material
2. Federal Specification Number, if applicable
3. Manufacturer's Stock Number and Batch Number
4. Contents by Volume of Major Pigment and Vehicle Constituents
5. Thinning Instructions
6. Application Instructions
7. Color

1.12 REGULATORY REQUIREMENTS

A. Conform to Internation Building Code (IBC) for flame/fuel/smoke rating requirements for finishes as these references are applicable to materials and workmanship under this Contract.

1.13 CLOSEOUT SUBMITTALS

A. Closeout Procedures - Division 01: Project closeout provisions.

1.14 EXTRA MATERIAL

A. Closeout Procedures - Division 01: Extra material provisions.

B. Provide a one (1) gallon container of each color, type, and finish to Owner for paint for walls and ceilings.

C. Provide one (1) quart container of each color, type, and finish to Owner for all other paint.

D. Label each container with color, texture, and room locations in addition to the manufacturer's label.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. The products listed are intended to establish a basis for comparison of products of other manufacturers. Substitutions shall comply with the requirements of the General & Supplementary Conditions and as specified herein.

B. All materials specified herein, and approved for use under this Contract shall be manufactured by one of the Manufacturers listed as follows: Tnemec, Sherwin-Williams, or equal.

2.02 MATERIALS

A. Provide the best grade (quality) of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable. Refer to the Painting Schedule in this section for the types of paint and finishes to be applied to the various surfaces throughout the project.

B. Use only thinners recommended by the manufacturer and then only to the extent expressed on the latest printed data sheet.

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PART 3 EXECUTION

3.01 DELIVERY, STORAGE AND PROTECTION

A. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label. Labels on each container shall include the following information:
   1. Manufacturer's Name and Type of Material
   2. Federal Specification Number, if applicable
   3. Thinning Instructions
   4. Application Instructions
   5. Clean-up Instructions
   6. Color

3.02 JOB CONDITIONS

A. Environmental Requirements: Comply with manufacturer's recommendations as to environmental conditions under which coating and coating systems may be applied. Do not apply paint in areas where dust is being generated.

B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures to within manufacturer's approved temperature range for at least 24-hours before, during, and 48-hours after application of finishes, unless otherwise required by manufacturer instructions.

C. Protection: Cover or otherwise protect finished work, surfaces not being painted concurrently, or not to be painted.

D. Factory Painted Surfaces: The surface preparation and painting of materials and equipment shall be to manufacturer's standard, unless otherwise specified in applicable portions of these specifications.

E. Product Data Sheets (PDS) and Safety Data Sheets (SDS) for all materials shall be maintained on site at all times, along with manufacturer's technical bulletins that provide instructions for surface preparation and application.

3.03 SUBSTRATE EXAMINATION

A. Examine all surfaces to which paint is to be applied, and the conditions under which the work is to be performed. The Applicator shall notify the Contractor and Engineer in writing, of any conditions detrimental to the performance of this work.

B. All surfaces shall be a minimum of 5-degrees F. above the ambient dew point (and rising) prior to the application of any coatings.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Board: 12-percent
   2. Masonry, Concrete, and Concrete Masonry Units: 12-percent
   3. Wood: 15-percent (measured in accordance with ASTM D4442)

D. Test the surface of cementitious materials to verify the pH is within manufacturer's allowed range.

E. Examine cast-in-concrete surfaces for the presences of cracking. Where the type of crack is in question, moving or non-moving, consult with the Engineer prior to start of coating preparation.

F. Do not proceed with this work until unsatisfactory conditions have been corrected and are acceptable to the Applicator. Starting of painting work will be construed as the Applicator's acceptance of the surfaces and conditions.

3.04 TEMPORARY CONSTRUCTION

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A. Furnish, install and remove upon completion of painting all scaffolding, ladders or other facilities required to complete painting work.

B. Provide temporary heating and ventilating facilities as required to conform to manufacturer's environmental conditions and within confined spaces; these facilities and all other methods or equipment required to facilitate painting work or afford protection of workers or work shall be furnished, installed and removed at the completion of work as part of this contract.

3.05 SURFACE PREPARATION

A. General
1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
2. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, escutcheons, and similar items not to be painted, or provide surface applied protection prior to preparation and painting operations. Remove obstructions as necessary to permit complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, install the removed items by workers skilled in the trades involved.
3. Clean surfaces to be painted before applying surface treatments. Remove all oil, grease, and foreign contaminants to meet the requirements of SSPC-SP1 prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet, newly painted surfaces.

B. Uncoated Steel and Iron
1. Pre-Clean all surfaces per SSPC-SP1 to remove all oil, grease and all other foreign contaminants with a cleaner/solvent recommended by the coating manufacturer.
2. Pre-Clean all surfaces to SSPC-SP1 followed by a minimum combination of SSPC-SP2 Hand Tool Cleaning/ SSPC- SP3 Power Tool Cleaning.
3. Prepare steel substrates in accordance with the Steel Structures Painting Council surface preparation number indicated in the application schedule and as outlined below, unless otherwise required by the paint manufacturer's most recent printed application instructions:
    a. SSPC-SP-1: thoroughly wipe with appropriate solvent using clean rags and solvent
    b. SSPC-SP-6/NACE 3: "Commercial Abrasive Blast
    c. SSPC-SP-6/NACE 3: surface Brush Blast using fine sand or grit to obtain finish similar to medium sand paper
    d. SSPC-SP-10: surface blast to Near-White Metal Finish
4. Prior to the application of prime coats, the surface shall meet the specified surface preparation standard. Clean and touch-up shop primer that has become marred.
5. Provide dehumidification equipment as necessary to maintain relative humidity at 40% or less.

C. Shop Primed Steel Surfaces
1. Pre-Clean all surfaces to SSPC-SP1 followed by a minimum combination of SSPC-SP2 Hand Tool Cleaning or SSPC-SP3 Power Tool Cleaning, to remove all oil, grease and all other foreign contaminants with a cleaner/solvent recommended by the coating manufacturer.
2. Touch-up paint structural steel, miscellaneous metal, hollow metal doors and frames and other materials which have been prime coated, as required, where shop coat has been damaged by welding or handling and erection; paint rivets, bolts and welds which are unpainted after assembly and erection.

D. Galvanized Steel
1. Pre-Clean all surfaces per SSPC-SP1 to remove all oil, grease and all other foreign contaminants with a cleaner/solvent recommended by the coating manufacturer.

E. Hot-Dipped Galvanized (HDG) Surfaces
1. HDG metal, which has not been weathered in an exterior environment for a minimum of 6 months and will be in an exterior exposure with a benign atmospheric exposure, shall be either abrading or etching using an approved etching cleaner.

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2. HDG metal, which has weathered in exterior exposure for a minimum of 6 months, shall be cleaning as per SSPC-SP1.
3. HDG metal in a hazardous environments shall be prepared to SSPC-SP16 Brush Blasting Standards.
4. HDG hollow metal doors or decking shall be cleaned by a solvent wipe or power-washed.
5. HDG metal (shiny galvanized metal): the surface shall be cleaned with a water based degreasing agent or the appropriate solvent cleaner prior to application of primers and coatings or be prepared to SSPC-SP16 standards.
6. Touch-up galvanized coating where scratched or damaged with an approved 100-percent solids zinc-rich galvanizing paint.

F. Aluminum and Stainless Steel
1. Clean to remove surface contamination by steam or high-pressure water.
2. Remove oxidation with acid etch and solvent washing.
3. Apply etching primer immediately following cleaning.

G. Copper
1. Clean to remove surface contamination by steam, high-pressure water, or solvent washing.
2. Apply vinyl etch primer immediately following cleaning.

H. Cementitious Materials
1. Pre-clean all surface to remove all oil, grease, efflorescence and other foreign contaminants
2. Preparing surface to SSPC-SP13/NACE 6 Concrete Surface preparation Standards.
3. Surface profile of surfaces to be painted shall be based on manufacturer's instructions and ICRI Guideline 310.2R Standards.
4. The pH of the concrete shall be a minimum of 10 prior to the application of repair products, primers or coatings.
5. Where the surface test for pH indicates surfaces are not within allowable range by the paint manufacturer, apply appropriate Alkali Resistant Primer per manufacturer's instructions.
6. Cementitious Materials (mortar, concrete, etc.) shall be cured a minimum of 28 days prior to the application of primers, paints and coatings.
7. Fill all voids, bug holes, non-moving cracks, and other surface defects using an approved cementitious mortar or epoxy filling compound per manufacturer's instructions to provide uniform surface texture prior to application of block filler or primer.
8. Apply block filler to surface of concrete masonry units, precast-concrete plank, and cast-in-place concrete to achieve a pinhole free surface prior to application of top coats.

I. Gypsum Board
1. Latex fill minor defects. Sand smooth and do not raise nap of paper on wallboard. Spot prime defects after repair.

J. Wood
1. Clean wood surfaces to be painted of all dirt, soil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required.
   a. Sandpaper smooth those finished surfaces exposed to view, and dust off;
   b. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other approved sealer, before application of the priming coat;
   c. Apply knot sealer to all pitch pockets and resinous sapwood before priming coat is applied;
2. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

K. Asphalt or Bituminous
1. Clean to remove foreign particles.

L. Insulated Coverings
1. Clean to remove dirt, grease, and oil from canvas and cotton.

M. Miscellaneous
1. Preparation for other materials not previously listed shall be as required by product manufacturer.

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3.06 MATERIAL PREPARATION

A. Mix and prepare painting materials in accordance with the manufacturer's directions. Stir materials before application to produce a mixture of uniform density, and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and, if necessary, strain the material before using.

3.07 COLORS

A. For estimating purposes, bidder shall assume that each individual room shall have one wall color and a second color for trim and accents. Ceilings may be painted different color than walls.

B. Access doors shall be enameled to contrast adjacent wall surfaces. Steel door lintels shall be painted to match door frames.

C. Hollow metal work will generally be enameled same color, but different color than adjacent walls.

D. Exposed piping and ducts generally (except for identification banding) will be painted color and texture to match adjacent walls, or ceilings.

E. Intermediate coats of paint shall be tinted slightly darker than each preceding coat unless otherwise directed. Undercoats shall be tinted slightly lighter than finish coats.

3.08 APPLICATION

A. Contractor and applicator shall ensure the proper Dry Film Thickness is achieved in all paint/coating applications to satisfy the specification requirements and manufacturers recommendations, and as per Best Industry Standards.

B. It is the responsibility of the contractor to have the necessary calibrated dry film thickness gauges and wet film thickness gauges to ensure proper application.

C. All surfaces to be painted or coated shall be a minimum temperature of 5 degrees F above the dew point (and rising prior) to application of any primers, paints or coatings. Follow instructions and recommendations provided on the manufacturer product data sheets regarding temperature, relative humidity and other environmental factors.

D. Brush or roll materials smoothly in solid, even colors without drops, runs, lumps, defective brushing, discoloration or clogging of lines and angles. Make edges of paint adjoining other materials or colors sharp and clean without overlapping by masking edges of paint adjoining other materials or colors to obtain sharp, clean division.

E. Follow Manufacturer Instructions provided on the Product Data Sheets regarding re-coat windows and cure times.

F. Where thinning is necessary, only the products of the manufacturer furnishing the paint, and for the particular purpose, will be allowed; thin paint in strict accordance with the manufacturer's instructions and only with the full knowledge and approval of the Engineer.

G. Do not apply finish coats until after other trades, whose operations would be detrimental to finish painting, have completed work in the areas to be painted, and the areas have been approved by the Engineer for painting.

H. Touch up suction spots or "hot spots" in masonry or concrete after application of first coat and before applying second coat, to produce even result in finish coat. If undercoats, stains or other conditions show through the final coat of paint, apply additional coats until the paint film is of uniform finish, color and appearance.

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I. Woodwork and doors shall be finished on all edges, tops and bottoms in same manner as specified for faces.

J. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.

K. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.

L. Paint the backsides of access panels, and removable or hinged covers to match the exposed surfaces.

M. Exposed conduit, ductwork, and piping shall be painted to match background color, unless noted otherwise.

N. At completion, touch up and restore finish where damaged. Paint top and bottom edges of metal doors one coat.

3.09 FIELD QUALITY CONTROL

A. Inspection and Testing
   1. Inspection by the Engineer does not limit the Contractor's responsibilities for quality control inspection and testing as specified herein or as required by the Manufacturer's instructions.
   2. Contractor shall maintain a Quality Control Plan which documents and records the following information. This information shall be collected on a form and maintained on the job site for each day of work performed by the Contractor.
      a. Record of the following environmental conditions a minimum of four (4) times daily, prior to commencing work, post morning break, post lunch break, and post afternoon break:
         1) General weather conditions
         2) Air temperature
         3) Surface temperature
         4) Dew point
         5) Relative humidity
      b. Area of work completed each day
      c. Product and manufacturer information, batch numbers, and quantities of all material used on site each day
      d. Date and time of initiation and completion of surface preparation
      e. Date and time that materials were mixed and applied
      f. Details on surface preparation equipment and coating equipment used each day
   3. Contractor to perform the quality control procedures listed below in conjunction with the requirements of this Section:
      a. Inspect all materials upon receipt to ensure that all are supplied by the approved Manufacturer.
      b. Provide specified storage conditions for the coating materials and applicable solvents.
      c. Inspect and record findings for the degree of cleanliness of substrates used.
      d. Inspect and record substrate profile.
      e. Measure and record ambient air temperature using a thermometer and measure and record substrate temperature using an infrared or other surface thermometer.
      f. Measure and record relative humidity and dew point temperature using a sling psychrometer in accordance with ASTM E337.
      g. Provide correct mixing of coating materials in accordance with the Manufacturer’s instructions.
      h. Inspect and record that the "pot life" of coating materials is not exceeded during installation.
      i. Verify curing of the coating materials in accordance with the Manufacturer's instructions.
      j. Upon completion of the coating system, the area shall be cleaned and prepared to permit close visual inspection by the Engineer or the Engineer's representative. Any and all deficiencies or defective work (not in compliance with this section or related sections) will be marked for repair or removal/replacement by the Contractor at no additional cost to the Owner.

B. Acceptance Criteria

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1. Acceptance Criteria for Surface Preparation Work:
   a. All surfaces shall be prepared in accordance with the specification and referenced standards therein.
2. Acceptance Criteria for Coating System Application Work:
   a. Acceptable coating work will be based upon the following:
      1) No pock-marks, depressions, waviness or ridges, pinholes or holidays in either size or frequency.
      2) No intercoat bond failures between lifts.
      3) Proper curing of coatings.
   b. The Engineer or Engineer's Representative shall, at their discretion, inspect the following:
      1) Profile and degree of cleanliness of substrate.
      2) Thickness of materials/coverage rate confirmation.
      3) Ambient temperature and humidity requirements and substrate temperature.
      4) Curing and recoat times.
      5) Proper curing of the resurfacing materials.
   c. Rework required on any holidays or any other inadequacies found by the Engineer or the Engineer's Representative in the quality of the coating work shall be marked. Such areas shall be re-cleaned and reworked by the Contractor according to these specifications and the Manufacturer recommendations at no additional cost to the Owner.
   d. The Contractor is responsible for keeping the Engineer informed of all progress so that inspection for quality can be achieved.
   e. The Contractor is ultimately responsible for the quality performance of the applied materials and workmanship. Inspections by the Engineer or the Engineer's Representative do not limit this responsibility.

C. Final Inspection
1. Perform a final inspection to determine whether the resurfacing system work meets the requirements of the specifications. The Engineer and the Engineer's Representative will conduct final inspection with the Contractor.

3.10 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damages by cleaning, repairing or replacing, and repainting, as directed by the Engineer. Provide “Wet Paint” signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.11 CLEAN-UP

A. During the progress of the work, remove from the project all discarded paint materials, rubbish, cans and rags. Upon completion of painting work, clean all window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

3.12 PAINTING SCHEDULE

A. Provide the following finish painting systems for the various substrates as shown on the contract drawings and/or schedules and as specified herein.
1. Submit Painting Schedule to Engineer for color selection by Owner (see following for schedules);
2. Apply paints to surfaces in accordance with the schedule;
3. If surfaces have been primed at the mill, factory or shop, omit the surfacer coat specified hereinafter, except for touch-up; for touch-up, use surfacer of the same composition as the mill, factory or shop surfacer.

B. Substrates of “New or Previously Unpainted Surfaces” shall be defined and coated by painting systems scheduled as follows:

Substrate	System

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1.	Concrete and Masonry (cementitious materials):		
	a.	Block Masonry, Exterior	A
	b.	Block Masonry, Interior	B
	c.	Concrete Walls, Interior	C
	d.	Concrete Floors, Interior	D
	e.	Poured Concrete or Asphalt Pavement, Exterior	F
2.	Metals:		
	a.	Building Accessories, Interior	G
	b.	Building Accessories, Exterior	H
	c.	Galvanized Metals, Interior, Non-Immersion	I
	d.	Galvanized Metals, Exterior, Non-Immersion	J
	e.	Ferrous Metals, Interior, Non-Immersion	M
	f.	Ferrous Metals, Exterior, Non-Immersion	N
	g.	Mill Finish Aluminum	P
3.	Plumbing and Miscellaneous:		
	a.	Plumbing - Copper, PVC and HDPE	R
4.	Wood:		
	a.	Wood, Interior and Exterior	U
5.	Dissimilar Materials		Z

3.13 PAINTING SYSTEMS

A. Where more than one manufacturer is listed, it is the contractor's option to select from the list. A single manufacturer shall be used for each item.

B. All products shall be installed per manufacturer printed instructions.

C. Where no thickness is listed for a coat, install to thickness recommended by manufacturer.

D. Each coat shall be applied to an even finish. Apply next coat per manufacturer instructions for recoating time.

E. System A: Block Masonry, Exterior
   1. Surface Preparation: Clean and dry and joints cured. Remove excess mortar and mortar smears.
   2. Surfacer: One (1) coat Block Filler Epoxy, applied by spray and back roll technique to fill voids for even, pinhole free final finish.
      a. Tnemec Series 69
      b. Sherwin Williams Heavy Duty Block Filler
   3. Surfacer: One (1) coat Acrylic Emulsion.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
      c. or equal
   4. Finish: Apply one (1) or two (2) topcoat(s) to provide an even pinhole free finish.
      a. Tnemec Series 73
      b. Sherwin-Williams Acrolon 218

F. System B: Block Masonry, Interior
   1. Surface Preparation: Clean and dry and joints cured.
   2. Surfacer: One (1) coat Block Filler Epoxy, applied by spray and backroller application, to fill voids as needed to provide an even, pinhole free final finish.
      a. Tnemec Series 69
      b. Sherwin Williams Heavy Duty Block Filler
   3. Intermediate: One (1) coat Polyamidoamine Epoxy, applied by spray and backroller application.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646
   4. Finish: One (1) coat Polyamidoamine Epoxy, applied by spray and backroller application.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646

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G. System C: Concrete Walls, Interior
   1. Surface Preparation: Per the requirements of SSPC-SP13/NACE 6 and the surface profile requirements of ICRI Guideline 310.2 R and the manufacturer's instructions.
   2. Surfacer: One (1) coat thinned by volume Polyamidoamine Epoxy, roller applied.
      a. Tnemec Series 69
      b. Sherwin Williams Heavy Duty Block Filler
   3. Intermediate: One (1) coat Polyamidoamine Epoxy, roller applied, same color as surfacer, without added thinner.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646
      c. or equal
   4. Finish: One (1) coat Polyamidoamine Epoxy, unthinned.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646

H. System D: Concrete Floors, Interior
   1. Moisture Vapor Transmission: Perform testing per ASTM D4263 (Plastic Sheet Method) to determine if moisture vapor transmission (MVT) is occurring. If testing indicates MVT is present, perform additional testing per ASTM F1869 (Calcium Chloride Testing) or ASTM F2170 (Insitu RH Probes). Testing per ASTM F 1869 shall produce results of less than 3lbs/1000sq ft. /24 hours. Testing per ASTM F2170 shall produce results of less than 75% RH.
   2. Surfacer: One (1) coat thinned by volume Polyamidoamine Epoxy, roller applied.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646
   3. Intermediate: One (1) coat Polyamidoamine Epoxy, roller applied.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646
   4. Finish: One (1) coat Polyamidoamine Epoxy.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646

I. System E: Concrete Ceilings, Interior
   1. Surfacer: One coat thinned by volume per Manufacturer with Manufacturer's Thinner; Manufacturer, Color, Polyamidoamine Epoxy, applied by spray and backroller application, to manufacturer's recommended dry film thickness and per all other manufacturer's recommendations.
      a. Tnemec Series 69
      b. Sherwin Williams Heavy Duty Block Filler
   2. Finish: One (1) coat Polyamidoamine Epoxy, applied by spray and backroller application.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646

J. System F: Poured Concrete, Exterior
   1. Surface Preparation: Prepare surface per SSPC-SP13/NACE #6, to surface profile specified in ICRI Guideline 301.2R, and manufacturer's instructions.
   2. Surfacer: One (1) coat Acrylic Emulsion, roller applied.
      a. Tnemec Series 180
      b. Sherwin Williams Conflex XL
   3. Finish: One (1) coat Acrylic Emulsion, roller applied.
      a. Tnemec Series 180
      b. Sherwin Williams Conflex XL

K. System G: Metal Building Accessories, Interior
   1. Surface Preparation: SSPC-SP6 Commercial-grade blast level of cleanliness.
   2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of not less than 4.0 mils. Primer to be shop applied for new materials; field applied for existing materials.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646

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3. Shop or Field Intermediate: One (1) coat Polyamidoamine Epoxy, to an average DFT of 3.0 to 5.0 mils.
    a. Tnemec Series 69
    b. Sherwin-Williams Macropoxy 646
4. Touch-up in Field:
    a. Spot surface prepare by degreasing nuts and bolts and sanding and wire brushing the erection damage
    b. Follow with a spot primer of Modified Polyamidoamine Epoxy primer, brush applied in two (2) coats to build a minimum of 5.0 mils over these areas.
    c. Apply a final finish coat by brush, roller or spray to these areas only to the extent of 3.0 mils DFT.
5. Finish: One (1) coat Modified Polyamidoamine Epoxy, to an average DFT of 2.0 to 3.0 mils.
    a. Tnemec Series 69
    b. Sherwin-Williams Macropoxy 646

L. System H: Metal Building Accessories, Exterior
1. Surface Preparation: SSPC-SP6 Commercial-grade blast level of cleanliness.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of not less than 4.0 mils. Primer to be shop applied for new materials; field applied for existing materials.
    a. Tnemec Series 69
    b. Sherwin-Williams Macropoxy 646
3. Shop or Field Intermediate: One (1) coat Polyamidoamine Epoxy, to an average DFT of 3.0 to 5.0 mils.
    a. Tnemec Series 69
    b. Sherwin-Williams Macropoxy 646
4. Touch-up in Field:
    a. Spot surface prepare by degreasing nuts and bolts and sanding and wire brushing the erection damage
    b. Follow with a spot primer of Modified Polyamidoamine Epoxy primer, brush applied in two (2) coats to build a minimum of 5.0 mils over these areas.
    c. Apply a final finish coat by brush, roller or spray to these areas only to the extent of 3.0 mils DFT.
5. Finish: One (1) coat Acrylic Polyurethane, to an average DFT of 2.0 to 3.0 mils.
    a. Tnemec Series 73
    b. Sherwin-Williams Acrolon 218

M. System I: Galvanized Metals, Interior, Non-Immersion
1. Surface Preparation: Sweep-blast to roughen new spangle on the galvanized surface. Follow this with solvent cleaning to the extent of an SSPC-SP-1 level of cleanliness.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of 5.0 mils.
    a. Tnemec Series 69
    b. Sherwin-Williams Macropoxy 646
3. Finish: One (1) coat Modified Polyamidoamine Epoxy, to an average DFT of 2.0 to 3.0 mils.
    a. Tnemec Series 69
    b. Sherwin-Williams Macropoxy 646

N. System J: Galvanized Metals, Exterior, Non-Immersion
1. Surface Preparation: Sweep-blast to roughen new spangle on the galvanized surface. Follow this with solvent cleaning to the extent of an SSPC-SP-1 level of cleanliness.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of 5.0 mils.
    a. Tnemec Series 69
    b. Sherwin-Williams Macropoxy 646
3. Finish: One (1) coat Polyamidoamine Epoxy, to an average DFT of 2.0 to 3.0 mils.
    a. Tnemec Series 73
    b. Sherwin-Williams Acrolon 218

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O. System K: Galvanized Metals, Interior, Immersion
   1. Surface Preparation: Blast to the extent of an SSPC-SP-10 near-white level of cleanliness and apply primer before any rust bloom reforms.
   2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   3. Finish: One (1) coat Polyamidoamine Epoxy, to a DFT of 6.0 to 8.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646

P. System L: Ferrous Metals, Interior and Exterior, Immersion
   1. Shop Surface Preparation: Blast to the extent of an SSPC-SP-10 near-white level of cleanliness and apply primer before any rust bloom reforms.
   2. Shop Primer: One (1) coat Polyamidoamine Epoxy, spray applied to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Duraplate 235
   3. Intermediate: One (1) coat Polyamidoamine Epoxy, spray applied to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Duraplate 235
   4. Field Finish: One (1) coat Polyamidoamine Epoxy, spray applied to a minimum DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Duraplate 235

Q. System M: Ferrous Metals, Interior, Non-Immersion
   1. Surface Preparation: Blast to the extent of an SSPC-SP-6 Commercial-Grade level of cleanliness and prime before any rust bloom reforms.
   2. Shop Primer: One (1) coat Polyamidoamine Epoxy, spray applied to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   3. Intermediate: One (1) coat Polyamidoamine Epoxy, spray applied to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   4. Finish: One (1) coat Modified Polyamidoamine Epoxy, to an average DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646

R. System N: Ferrous Metals, Exterior, Non-Immersion
   1. Surface Preparation: Blast to the extent of an SSPC-SP-6 Commercial-Grade level of cleanliness and prime before any rust bloom reforms.
   2. Shop Primer: Spray apply one even coat of Manufacturer, Color, Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   3. Intermediate: Spray apply one even coat of Manufacturer, Color, Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   4. Field Finish: One (1) coat Acrylic Polyurethane, to an average DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 73
      b. Sherwin-Williams Acrolon 218

S. System O: Mill, Factory Paint Piping, Equipment and Machinery, Interior and Exterior
   1. Shop Surface Preparation: Blast to the extent of an SSPC-SP-6 Commercial-Grade level of cleanliness and prime before any rust bloom reforms.
   2. Shop Primer: Spray apply one even coat of Manufacturer, Color, Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69

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b. Sherwin-Williams Macropoxy 646

3. Intermediate: Spray apply one even coat of Manufacturer, Color, Polyamidoamine Epoxy, to a DFT of 5.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
4. Field Finish: Spray apply one field finish coat of Manufacturer, Color, Acrylic Polyurethane, to a minimum DFT of 2.0 to 3.0 mils.
   a. Tnemec Series 73
   b. Sherwin-Williams Acrolon 218

T. System P: Mill Finish Aluminum
1. Surface Preparation: Sweep-blast to roughen new spangle on the mill surface. Follow this with solvent cleaning to the extent of an SSPC-SP-1 level of cleanliness.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of 5.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
3. Field Finish: One (1) coat Acrylic Polyurethane, to an average DFT of 2.0 to 3.0 mils.
   a. Tnemec Series 73
   b. Sherwin-Williams Acrolon 218

U. System Q: Gypsum Board
1. Surface Preparation: Clean and dry joints cured and sanded. Blow down or sweep thoroughly, with a soft bristled brush.
2. Surfacer: One (1) coat Poly Vinyl Acrylic Sealer, roller applied.
   a. Tnemec Series 51-792
   b. Sherwin-Williams Promar 200 Zero VOC Int Latex Primer
3. Finish: One (1) coat Acrylic Emulsion, roller applied.
   a. Tnemec Series 6
   b. Sherwin-Williams Pro Industrial Acrylic (matte, eg-shel, gloss)

V. System R: Plumbing – Copper, PVC and HDPE
1. Surface Preparation: Hand sand to roughen and then solvent clean with mineral spirits to the extent of an SSPC-SP-1 level of cleanliness.
2. Field Finish(es): Two (2) thin coats Polyamidoamine Epoxy, brush, roller, or spray apply to an average DFT of 2.0 to 3.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646

W. System S: Equipment and Machinery Exhaust Piping
1. Surface Preparation: Blast to the extent of an SSPC-SP-6 Commercial-Grade level of cleanliness.
2. Field Finish(es): Brush, roller, spray apply two thin coats (2.0 to 3.0 mils DFT each) of Manufacturer, Color, Inorganic Zinc.

X. System T: Piping Insulation
1. Surface Preparation: Clean and dry. Blow down or sweep thoroughly, with a soft bristled brush.
2. Field Finish(es): Brush, roller, spray apply two thin coats (2.0 to 3.0 mils DFT each) of Manufacturer, Color, Manufacturer specified.
   a. Special per application, to be specified by manufacturer.

Y. System U: Wood, Interior and Exterior
1. Surface Preparation: Sand as needed. Clean and dry. Blow down or sweep thoroughly, with a soft bristled brush.
2. Field Primer: Brush apply one even coat of Alkyd Wood Primer to a dry film thickness as recommended by the manufacturer and allow to harden before topcoating.
3. Acceptable Primer:
   a. Tnemec Series 36
   b. Sherwin-Williams PrepRite ProBlock Interior-Exterior Latex Primer-Sealer
4. Field Finish: Brush apply two thin coats (2.0 mils DFT each) Acrylic Emulsion.

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a. Tnemec Series 6
b. Sherwin-Williams Pro Industrial Multi-Surface Acrylic (matte, eg-shel, gloss)

Z. System Z: Dissimilar Metal Protection
1. Surface Preparation: Scarify the Surface, SP-1
2. First Coat:
a. Tnemec Series 46H-413 @ 20 mils DFT.
b. Sherwin Williams HilMil Sher-Tar @20 mils DFT.

3.14 COLORS SCHEDULE

A. Colors for any components not specifically mentioned herein shall be selected by the Owner; submit Color Schedule to Engineer.

B. Paint for components listed shall be of the colors scheduled as follows:

COMPONENT	COLOR
1. Potable Water Piping	Blue
2. Non-Potable Water Piping	Blue with Red Bands
3. Compressed Air Piping	Green
4. Gas Piping, Natural	Orange
5. Sewage Piping	Gray
6. Sludge Piping	Brown
7. Alum Piping	Orange
8. Equipment and Tanks	Match Attached Piping
9. Miscellaneous Metals	Selected by Engineer
10. Heat Ducts and Grilles	Match Background
11. Electrical Conduit	Match Background
12. Domestic Drainage/Vent	Black or Dark Gray
13. Other Lines	Selected by Engineer

Notes:
1. Color coded bands will be placed every 30-inches along the axis of the piping. Bands shall be 4-inch to 6-inch in length.
2. Match Owner's existing color coding system. Field verify during construction.

PART 4 MEASUREMENT AND PAYMENT

4.01 HIGH PERFORMANCE COATINGS

A. General. High performance coatings shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
1. High Performance Coatings, Lump Sum. When so provided, payment for high performance coatings shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. High Performance Coatings, Inclusive. When no quantity is provided, high performance coatings shall be considered inclusive to payment for work associated with the related construction.

END OF SECTION

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SECTION 09 96 23
WEATHER/GRAFFITI-RESISTANT COATINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Weather seal and graffiti control coating to protect exterior masonry surfaces.
   1. STR05 Administration Building new decorative masonry veneer shall receive coating.

1.02 RELATED WORK

A. Section 04 20 00 – Unit Masonry.

B. Section 07 92 00 – Joint Sealers.

1.03 SUBMITTALS (NONE)

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in graffiti-resistant coatings with minimum three (3) years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three (3) years documented experience and approved by manufacturer.

1.05 MOCK-UP

A. Section 01 45 00 - Quality Control: Mockup provisions.

B. Apply protective treatment to each type of masonry on the mock-up wall constructed under Section 04 20 00. Let test area cure before inspection.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment: Environmental conditions affecting products on site.

B. Maintain ambient and surface temperatures above 40 degrees F and below 90 degrees F for 24 hours before application and continuously until protective treatment has cured.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Prosoco, Inc.

B. Approved equal prior to bidding. Substitution request shall be submitted at least seven (7) calendar days prior to bid date. Request shall include product data, manufacturer literature, and list of recent projects.

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2.02 PROTECTIVE TREATMENT COATINGS

A. Clear-drying, water-based silicone elastomer formulated for concrete block and other porous masonry materials to protect treated surfaces from repeated graffiti attacks without altering the natural appearance of the protected materials.

B. Sure Klean Weather Seal Blok-Guard & Graffiti Control WB15 by Prosoco.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify surfaces are complete and ready to receive protective treatment.

B. Newly constructed surfaces shall cure for 28 days before application.

C. Sealant and caulking compounds shall be in place and cured before application.

D. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

A. Prepare surfaces to receive protective treatment in strict accordance with manufacturer's instructions.

B. Protect people, vehicles, plants, painted surfaces, anodized metal, metal, glass, and all non-masonry surfaces from product, residue, splash, fumes and wind drift.

3.03 APPLICATION

A. Apply protective coating in strict accordance with manufacturer's instructions.

B. Do not dilute or alter product.

C. Field test surface to confirm it is capable of receiving a second coat per manufacturer's standards.

D. If surface is capable of receiving a second coat, apply coat as soon as the first coat is dry to the touch, or within 2 hours of the first coat.

E. If surface is not capable of receiving a second coat, do not apply and turn over the associated second coat quantity of coating to Owner.

3.04 PROTECTION

A. Protect in accordance with manufacturer's instructions.

B. Protect from rain for at least 6 hours after application.

END OF SECTION

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SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Exterior Letters.

B. Accessible Parking Sign and Post.

1.02 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Shop Drawings: Indicate letters and sign styles, lettering font, foreground and background colors, locations, and overall dimensions of each sign and letter.

1.03 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three (3) years documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Package letters and signs, labeled in name groups.

C. Store adhesive attachment tape at ambient room temperatures.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental provisions.

B. Do not install signs when ambient temperature is lower than recommended by manufacturer.

C. Maintain this minimum temperature during and after installation of signs.

D. Provide ventilation to disperse fumes during application of solvent-based adhesive.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Building Exterior Letters: Cast aluminum letters
   1. Manufacturer: Gemini Incorporated or equal
   2. Size: Are indicated on Drawings.
   3. Font: As selected from manufacturer's standard.
   4. Finish; select from manufacturer's standard as follows:
      a. Anodized Finish: dark bronze or black.
      b. Painted: Primed for paint, paint. Color: As selected from manufacturer's standard colors, minimum of 40 colors.
   5. Mounting: Projecting stud mount.
   6. Provide layout drawing, showing font, size, and layout, for review by Architect.
   7. Fabricate installation template after layout has been approved.

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B. Accessible Parking Sign: State of Wisconsin DOT Standard Signs R7-8A and R7-8V with required wording and symbol, 8-gauge, radius corners.

C. Accessible Parking Sign Post: 1 ½ inch diameter galvanized steel pipe.

2.02 ACCESSORIES

A. Mounting Hardware: As required for installation location and substrate, as provided by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify that surfaces are ready to receive work.

C. Beginning of installation means acceptance of substrates.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs and letters after substrate is finished, in locations indicated.

3.03 CLEANING

A. Section 01 77 00 - Closeout Procedures: Cleaning provisions.

B. Clean signs per manufacturer's instructions.

END OF SECTION

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SECTION 10 14 69
WARNING SIGNS

PART 1 GENERAL

1.01 WORK INCLUDES

A. Informational and accident prevention signs.

1.02 RELATED WORK

A. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System: Mounting substrate.

B. Section 09 96 00 – High Performance Coatings: Paint finish for door.

1.03 DESIGN REQUIREMENTS

A. General: Accident prevention signs shall conform as to design with OSHA Section 1910.145 of Subpart J, Part 1910, Chapter XVII, Title 29 of the Code of Federal Regulations.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Store adhesive attachment tape at ambient room temperatures.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 –Material and Equipment: Environmental provisions.

B. Do not install signs when ambient temperature is lower than recommended by manufacturer.

C. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 GENERAL

A. Sign lettering shall be single stroke and shall contrast in color with the background. For those messages for which there are international symbols, the international symbols shall be used.

2.02 PRODUCTS

A. Material: Aluminum, fiberglass, or high-impact plastic, suitable for exterior surface mounting. Sign material and message shall be fade resistant.

B. Sign Size: 14-inch by 10-inch.

C. Sign Messages:
   1. Chemical Room: (white sign)
      a. First Line: DANGER or WARNING (white letters surrounded by red over black rectangle)
      b. Proceeding Lines: CHEMICAL STORAGE (black letters)

2.03 ACCESSORIES

A. Tape Adhesive: Permanent adhesive, designed for exterior installation.

PART 3 EXECUTION

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3.01 EXAMINATION

A. Section 01 31 13 – Project Coordination: Coordination and project conditions.

B. Verify that surfaces are ready to receive work.

C. Beginning of installation means acceptance of substrates.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs after substrate is finished, in locations indicated.

3.03 CLEANING

A. Section 01 77 00 – Closeout Procedures: Cleaning provisions.

B. Clean signs per manufacturer’s instructions.

END OF SECTION

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SECTION 10 44 16
FIRE EXTINGUISHERS

PART 1 GENERAL

1.01 WORK INCLUDES

A. Wall Mounted Fire extinguishers and wall brackets.

1.02 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 10 - Standard for Portable Fire Extinguishers.
   2. NFPA 17 – Standard for Dry Chemical Extinguishing Systems.

1.03 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10 requirements for extinguishers. Furnish extinguishers classified and labeled by Underwriters Laboratories Inc. for purpose specified and indicated.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

A. Manufacturers:
   1. Amerex.
   2. Ansul.
   3. J.L. Industries (Activar).
   4. Larsens Manufacturing Company.
   5. Nystorm Products Company.
   6. Potter Roemer.

B. Ten pound Model MP10, Larsen's. UL Rating: 4A-80B:C.

C. Finish: Red enamel.

2.02 ACCESSORIES

A. Brackets, exposed: Support bottom of extinguisher, by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install mounting bracket at each extinguisher location, so that top of extinguisher is 48 inches above the finished floor

B. Place extinguisher on wall bracket. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 13 34 00
FABRICATED ENGINEERED STRUCTURES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Section includes modifications to existing pre-engineered, shop-fabricated structural steel building, including but not limited to:
   1. Secondary framing for building modifications.
   2. Framing to support mechanical equipment and piping supported from the framing.
   3. Flashing and sealing wall penetrations.
   4. Wall siding. Reuse existing wherever possible.
   5. Roof panel.
   6. Liner panel. Reuse existing wherever possible.
   7. Fiberglass batt insulation. Reuse existing wherever possible.
   8. Vapor retarder. Reuse existing wherever possible.

1.02 RELATED WORK

A. Division 03 – Concrete

B. Division 23 – Heating, Ventilating, and Air Conditioning: Wall openings.

C. Division 40 – Process Integration: Wall openings for pipes.

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 REFERENCES

A. American Institute of Steel Construction (AISC):
   1. AISC S335 - Specification for Structural Steel Buildings Allowable Stress Design, and Plastic Design.
   2. AISC S342L - Load and Resistance Factor Design Specification for Structural Steel Buildings.
   3. AISC S344L - Metric Load and Resistance Factor Design Specification for Structural Steel Buildings.

B. ASTM International:
   1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
   2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
   5. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   6. ASTM A325M - Standard Specification for Bolts, Steel, Heat Treated 830MPa Minimum Tensile Strength [Metic].
   7. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
   8. ASTM A490M - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
   9. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   10. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

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11. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
12. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
13. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
14. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
15. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
16. ASTM C991 - Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.
17. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

C. American Welding Society (AWS):
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.

D. International Code Council:
1. IBC - International Building Code, 2015 Edition, and referenced standards with 2018 State of Wisconsin amendments.

E. Metal Building Manufacturers Association (MBMA):

F. MBMA - Low Rise Building Systems Manual.

G. Sheet Metal and Air Conditioning National Association (SMACNA)
1. Architectural Sheet Metal Manual

H. The Society for Protective Coatings (SSPC):
1. SSPC - Steel Structures Painting Manual.
2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.05 DESIGN REQUIREMENTS

A. Design members to withstand dead load, applicable snow load, vertical and horizontal seismic loads, and design loads due to pressure and suction of wind calculated in accordance with applicable Wisconsin code.

B. Design and provide members to support imposed loads. Coordinate with each trade for locations and weights.

C. Maximum allowable deflection: 1/180 of span with imposed loads for exterior wall system.

D. Size and fabricate wall systems free of distortion or defects detrimental to appearance or performance.

1.06 PERFORMANCE REQUIREMENTS

A. Conform to applicable Wisconsin Commercial Building code for submission of design calculations, reviewed shop and erection drawings, and erection drawings as required for acquiring permits.

B. Cooperate with regulatory agency or authority and provide data as requested authority having jurisdiction.

C. Provide components of each type from one manufacturer compatible with adjacent materials.

1.07 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

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B. Shop Drawings: Submit connection details.

C. Product Data: Submit data on profiles and components. Submit product data with profile for wall panels.

D. Samples: Submit color samples for selection by Architect. Submit two (2) samples of siding, 6-inch x 6-inch in size of colors selected.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three (3) years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum five (5) years experience.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

C. Store prefinished material off ground protected from weather, to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

D. Prevent contact with materials capable of causing discoloration or staining.

E. Store products in manufacturer's unopened packaging until installation of products.

1.10 COORDINATION

A. Section 01 31 13 - Project Coordination: Coordination provisions.

B. Coordinate work to meeting interior remodeling requirements.

1.11 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Warranty provisions.

B. Furnish twenty (20) year warranty to include coverage for exterior pre-finished surfaces color coat against chipping, cracking or crazing, blistering, peeling, chalking, or fading.

PART 2 PRODUCTS

2.01 COMPONENTS - FRAMING

A. Structural Steel Members: ASTM A36/A36M, A529/A529M, or A572/A572M, Grade 50.

B. Structural Tubing: ASTM A500, Grade B.

C. Plate or Bar Stock: ASTM A529/A529M.

D. Bolts, Nuts, and Washers: ASTM A325.

E. Welding Materials: AWS D1.1; type required for materials being welded.

F. Primer: SSPC Paint 20, Red Oxide.

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G. Purlins, Girts and Other Secondary Framing Members:
   1. Fabricated by cold forming process shall conform to ASTM specification ASTM A-570, Grade 55.
   2. Wall girts shall be 8-inches deep – to match existing, except as noted.

H. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.

2.02 PANELS

A. Exterior Wall and Roof Panels: Exposed fastener ribbed panel with 1¼" high ribs at 12"-13½" on center, 36-inch wide panels. Match existing building profile – field verify.
   1. Pre-Finished Galvanized Steel Sheet: ASTM A792, ASTM A755, ASTM A924, Grade D, Coating Designation G90 (Z275), minimum 26-gauge core steel, shop pre-coated with finish coat.
   2. Manufacturers: Panels listed are approximate – match existing.
      a. American Building Company; Long Span III.
      b. McElroy Metal Inc.; R-Panel.
      c. Peterson Aluminum Corp.; 'R' Panel.
      d. Or equal.

B. Liner Panel: Exposed fastener ribbed profile, ¾-inch deep ribs at 6-inch on center, 36-inch wide sheets. Match existing liner profile – field verify.
   1. Pre-Finished Galvanized Steel Sheet: ASTM A792, ASTM A755, ASTM A924, Grade D, Coating Designation G90 (Z275), minimum 29-gauge core steel, shop pre-coated with finish coat.
   2. Manufacturers:
      a. American Building Company
      b. McElroy Metal Inc
      c. Peterson Aluminum Corp.
      d. Or equal.

C. Joint Seal Gaskets: Manufacturer's standard type.

D. Fasteners: Manufacturer's standard type, galvanized to ASTM A153/A153M 2.0 oz/sq ft, finish to match adjacent surfaces when exposed.
   1. Sealing EPDM washer at exterior applications.

E. Flashing: Manufacturer's standard sheet steel matching panel material and finish, break-formed to profiles indicated on drawings and for a complete system, including, but not limited to:
   1. J-trim.
   2. Terminations and transition strips.

F. Fabrication
   1. Form sections to shape indicated on Drawings, accurate in size, square, and free from distortion or defects.
   2. Form pieces in longest practical lengths.
   3. Panel Profile: Manufacturer's standard profile for specified system.

G. Factory Finishing
   1. PVDF (Polyvinylidene Fluoride) Coating: High Performance Organic Finish, AAMA 605.2; multiple coat, thermally cured fluoropolymer finish system.
   2. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system as recommended by finish system manufacturer.
   3. Color: Colors as selected by the Architect from manufacturer's standard colors.
   4. All products covered in this section shall be by one manufacturer to ensure color matching.

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2.03 INSULATION AND VAPOR RETARDER

A. Insulation: Fiberglass blanket insulation unfaced, type and thickness to match existing.

B. Vapor Barrier and Thermal Blocks
   1. Vapor Barrier Fabric shall be:
      a. Woven reinforced high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene film.
      b. Class A compliant with a flame spread index of 25 or less and smoke developed index of 50 or less based on ASTM E-84 test standards.
      c. Perm rating shall be a minimum of 0.02 grains per hour per square foot based on ASTM E-96.
      d. Manufactured in large custom pieces by extrusion welding from roll goods.
      e. Pieces shall be fabricated to substantially fit the large defined building areas with minimum practical sealing to be done on job site.
      f. Color for ceiling fabric shall be White. Color for walls shall be White.
      g. Certified for free fall protection by the manufacturer.
   2. Steel Strap: Galvanized steel, primed and painted White.
   3. Fasteners: Self-drilling screws with sealing washers and painted heads to match the strap color.
   4. Sealants: Vapor barrier sealant for sealing vapor barrier laps and/or double-sided bonding tape.
   5. Thermal blocks: 1-inch rigid polystyrene board insulation.

2.04 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant, color to match panel.

B. Sealants: Under Section 07 92 00.

C. Fasteners: Manufacturer's standard type screw to suit application. Exposed fasteners with same finish as panel system.

D. Field Touch-Up Paint: As recommended by panel manufacturer.

E. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify weather resistive barrier and foundation insulation protection is installed.

C. Beginning of installation means acceptance of substrates.

3.02 ERECTION – SECONDARY FRAMING MEMBERS

A. Erect framing in accordance with AISC Specification.

B. Do not field cut or alter structural members without approval of Architect/Engineer.

C. After erection, prime welds, abrasions, and surfaces not shop primed.

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3.03 ERECTION – WALL SYSTEMS

A. Install fiberglass blanket insulation continuous over top of wall girts and framing members. Seal all vapor retarder joints vapor-tight.

B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

C. Fasten cladding system to structural supports, aligned level and plumb.

D. Erect in accordance with the manufacturer's requirements

3.04 PENETRATIONS

A. Flash and seal all wall penetrations weather tight.

3.05 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.
   1. Remove strippable coating and perform dry wipe-down cleaning of panels as erected.

3.06 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 77 00 - Closeout Procedures: Protecting installed construction.

B. Protection: Protect installed product's finish surfaces from damage during construction.
   1. Protect installed products from damage by subsequent construction activities.
   2. Replace products having damage other than minor finish damage.
   3. Repair products having minor damage to finish in accordance with panel manufacturer's recommendations.
   4. Architect shall be sole judge of acceptability of repair to damaged finishes; replace products having rejected repairs.

C. Clean all cuttings and loose fasteners from roof structure and gutters.

D. Do not permit traffic over finished roof surface.

END OF SECTION

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PROJECT MANUAL FOR
2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION
COLUMBIA COUNTY, WI

VOLUME II

November 2025
Project #00090019



Prepared By:

MSA Professional Services, Inc.
1230 South Boulevard
Baraboo, WI 53913

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PROJECT MANUAL FOR
2025 WWTF UPGRADE
WISCONSIN DELLS - LAKE DELTON SEWERAGE COMMISSION
COLUMBIA COUNTY, WI COUNTY

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SECTION 22 00 00
PLUMBING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Plumbing where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:

1. Domestic hot, cold, and tempered water piping systems and water service.
2. Waste and vent systems and waste service.
3. Plumbing fixtures and trim as shown on the Drawings.
4. Plumbing equipment.
5. Water heating system.
6. Pipe and pipe fittings. Pipe hangers and supports. Valves. Piping specialties, drainage specialties, and supply specialties.
7. Mechanical Identification. Sleeves. Mechanical sleeve seals.
8. Piping and equipment insulation, jackets, and accessories.
9. Caulking of penetrations, openings, and fixtures.
10. Pay attention to requirements in Special Conditions.

B. Coordinate services, with required meters, with local utilities. Verify water and gas service pressure at connection.

1.02 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

A. Section 12 35 53 – Laboratory Casework: Install laboratory sink and faucet furnished under this section and install and furnish water and sanitary system connections. Install vacuum fixture and furnish and install vacuum piping between vacuum pump and fixture.

1.03 WORK OF OTHER SECTIONS

A. Openings for work in walls, floor, roof, ceiling, etc., required by this section shall be provided under other sections. Locations and size of these openings shall be the responsibility of this Contractor.

B. Division 03 - Concrete.

C. Division 04 - Masonry.

D. Division 06 - Woods, Plastics, and Composites.

E. Division 07 - Thermal and Moisture Protection.

F. Section 07 92 00 - Joint Sealants: Sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters exposed after finished installation.

G. Division 09 - Finishes.

H. Section 09 91 00 – Painting [09 96 00 - High Performance Coating]: Painting of piping, insulation, etc.

I. Section 23 00 00 - Heating, Ventilating, and Air Conditioning: Fuel-fired heating equipment.

J. Division 26 - Electrical: Electrical line voltage wiring (100 volts and greater) connections.

K. Section 33 31 13 – Public Sanitary Utility Sewerage Pipe: Sanitary sewer service.

L. Section 40 23 23 - Process Piping, Valves and Specialties (for Wellhouses).

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RELATED SECTIONS

Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these specifications.

Section 07 92 00 - Joint Sealants: Requirements for sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters.

1.04

Section 07 92 00 - Joint Sealers: Requirements for sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters concealed after finished installation.

A.

Division 26 - Electrical: Requirements for electric connections specified by this section.

B.

Division 31 – Earthwork: Requirements for trenching and backfilling.

C.

GENERAL PROVISIONS

D.

E.

Everything essential for the completion of the work implied to be covered by these Specifications to make the System ready for normal and proper operation must be furnished and installed by the Contractor. Accordingly, any omission from either the plans or the Specifications, or both, of details necessary for the proper installation and operation of the system shall not relieve the Contractor from furnishing such detail in full and proper manner.

1.05

A.

The plans show various details indicating the general arrangement of the plumbing work, sizes and locations of piping, equipment, etc. The said plans with figures, lettering, etc., shall be considered a part of these Specifications and no charge or alternation shall be made in either case unless ordered by the Engineer.

B.

In addition to the plumbing plans, see General Plans of the building, all plumbing work appearing on the latter plans will be part of this contract unless especially specified to be done by other contractors, as well as, said work detailed on the plumbing plans.

C.

D.

“Chemical Area” indicated on the Drawing shall define materials to be used in the area designated as described herein or on the Drawings. Miscellaneous materials not specifically scheduled or specified and used in this space shall be resistant to corrosion from the chemical contained in the room under non-immersion, non-splash, or non-spray service.

1.06

A.

QUALITY ASSURANCE

B.

C.

Section 01 40 00 - Quality Requirements [Quality Control]: Quality provisions.

1.

2.

Perform work in accordance with State of [Wisconsin] and industry standards.

3.

Qualification of Installer:

4.

Company specializing in performing the work of this section with minimum three (3) years documented experience.

D.

In acceptance or rejection of installed work, the Architect or Engineer shall make no allowances for lack of skill on part of the installers.

1.

Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

All work shall be installed in a first class manner by State of Wisconsin licensed plumbers.

Qualification of Manufacturer:

Company specializing in manufacturing products specified in this section with a minimum of 10 years experience. Manufacturer shall conform to the ratings and certifications indicated.

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Equal products shall be of similar quality, be functionally similar, and have the controls specified. Where more than one type of product is specified in a particular section, the listed acceptable manufacturers may not have an equal product for every type of product specified.

Codes and regulations:

All plumbing installation shall meet the requirements of the State of Wisconsin Board of Health.

In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction.

2. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern when so directed by the Engineer.

E.

1. The following standards, referred hereafter by basic designation only, are imposed, as applicable to work in
2. each instance, and form a part of this specification to the extent indicated by the reference thereto:

Americans with Disabilities Act (ADA) of 1990, Accessibility Guidelines for Buildings and Facilities, 2010 edition.

3. ANSI - American National Standards Institute

F. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

1. ASME - American Society of Mechanical Engineers

ASTM - American Society for Testing and Materials

2. AWWA - American Water Works Association

a. DSPS - Department of Safety & Professional Services, Division of Industry, Wisconsin Administrative

3. Code

4. Plumbing, Current Edition

5. 2018 Wisconsin Commercial Building Code

6. International Code Council (ICC):

a. IBC - International Building Code, 2015 edition, and all referenced standards (Iowa)

b. IECC - International Energy Conservation Code, 2012 edition, and all referenced standards (Iowa)

7. IECC - International Energy Conservation Code, 2015 edition, and all referenced standards

a. National Fire Protection Association (NFPA):

b. NFPA 70 - National Electric Code (NEC), 2014 edition. (Iowa)

8. International Association of Plumbing and Mechanical Officials (IAPMO):

a. UPC: Uniform Plumbing Code, 2015 edition. (Iowa)

9. SDWA – Federal Safe Drinking Water Act

a. Reduction in Lead Drinking Water Act

10. All materials used in the drinking water system, including plumbing pipes, fittings, and fixtures, shall meet the requirements of the federal definition of “lead-free.” The definition requires that no more than 8-percent lead content means “not more than a weighted average of 0.25-percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fixtures, and fixtures.” Solder and flux are not to exceed 0.2-percent lead.

a. Exemptions include:

b. Applications that are exclusively used for non-potable systems; which includes pipes, pipe fittings, plumbing fixtures, and back-flow preventers in non-potable systems or uses where the water is not used for human consumption.

Toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves, service saddles, or water distribution main gate valves 2-inches in diameter or larger.

1. Lead-free products shall bear a certified mark by a nationally accredited certification body such as UL, NSF, IAPMO R&T, CSA, ICC-ES, WQA, Truesdail, or ETL that includes texts consisting of NSF-60-G, NSF pw-G, NSF-372, or low lead content.

2.

1.07

A.

B.

PERMITS

The Contractor shall obtain and pay for all construction permits required for Work of this section.

One (1) copy of all permits shall be provided to Owner.

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One (1) copy of all permits shall be maintained on site.

GUARANTEE

Section 01 70 00 – Execution and Closeout Requirements [01 77 00 Closeout Procedures]: Guarantee provisions.

C. All material and workmanship must be new and first class in every respect; the plumbing equipment and systems must be turned over to the Owner in complete working order and free from mechanical defects.

1.08

A. Contractor shall guarantee all labor and materials for one (1) year from the completion and acceptance of the plant and keep or place same in repair for said period, unless such defects are clearly the result of misuse by operator.

B.

C. Before final acceptance of work, the Contractor shall have the entire apparatus and system in complete and satisfactory operation and shall maintain same in satisfactory and continuous operation for a period of 10 days prior to the date of acceptance.

D. Contractor shall submit to the Engineer in triplicate, at the completion of work, a certified statement, signed by a principal of the firm, stating that the system has been fully installed and is operating within the intent of the plans and specifications and that all system components have been tested and adjusted. This statement

E. shall be submitted before the system is presented to the Owner for final inspection.

COORDINATION

1.09

A. Section 01 30 00 – Administrative Requirements [01 31 13 – Project Coordination]: Coordination provisions.

B. Cooperate and coordinate with other trades to assure that all systems in the plumbing work may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.

C.

D. Arrange work in neat, well organized manner with piping and similar services running parallel with primary lines of building construction and with minimum 7 foot overhead clearance. Provide maximum clearances wherever possible.

E. Locate equipment properly to provide easy access, and arrange entire plumbing work with adequate access for operation and maintenance.

1.10

A. Give right-of-way to piping which must slope for drainage.

B. SUBMITTALS

C. Section 01 33 00 - Submittal Procedures [Submittals]: Submittal provisions.

D. The Contractor shall be responsible for correction of work deemed necessary by the Engineer due to proceeding with the work without shop drawings that have the Engineers final approval.

1.

2. This Contractor will be responsible for all figures and dimensions shown on the shop drawings. Approval of shop drawings describing equipment that cannot fit in the space allotted does not relieve this Contractor from providing equipment that will meet the space requirements.

Shop drawings: include data on physical dimensions, gauges, materials of construction, and capacities.

Pipe Hangers and Supports: Design data, indicate pipe sizes, load carrying capacity of trapeze, multiple pipe, and riser support hangers.

Plumbing Fixtures and Equipment: Manufacturer's literature, include capacities, pump curves, equipment performance, and electrical characteristics.

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Mechanical Identification, including listing of wording, symbols, letter size and color coding; valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

Product Data:

Pipe Hangers and Supports: Submit manufacturers catalog data including load carrying capacity.

Valves: Submit manufacturers catalog information with valve data and ratings for each service.

3. Plumbing Piping Specialties: Submit manufacturers catalog information with sizes, capacities, sizes, and finishes.

Plumbing Drainage Specialties: Submit manufacturers catalog information with sizes, capacities, rough-in requirements, service sizes, and finishes.

E. Plumbing Supply Specialties: Submit manufacturers catalog information with sizes, capacities, rough-

1. in requirements, service sizes, and finishes.

2. Mechanical Insulation and Jackets: Product description, list of materials, and thickness for each

3. service or equipment scheduled and locations.

4. Mechanical Identification: Submit manufacturer's catalog literature for each product.

5.

6. Manufacturer Installation Instructions: Submit installation instructions for material and equipment.

7. Samples:

F. Mechanical Identification: two (2) tags, 1 1/2 inches in size; two (2) labels, 2-inch by 3/4-inch in size.

G.

1. DELIVERY, STORAGE, AND HANDLING

1.11

A. Section 01 60 00 – Product Requirements [Material and Equipment]: Product storage and handling provisions.

B. Accept equipment on site in factory packaging. Inspect for damage.

1.12 ENVIRONMENTAL REQUIREMENTS

A.

B. Do not install insulation and related products when ambient temperatures and conditions do not meet manufacturer's requirements.

1.13 Maintain temperature before, during, and after installation for minimum period of 24 hours.

A. HOUSEKEEPING AND CLEANUP

B.

Section 01 50 00 - Temporary Facilities and Controls [01 77 00 –Closeout Procedures]: Progress cleaning provisions.

1.14

A. Periodically as work progress and/or as directed by the Engineer, the Contractor shall remove waste materials from the building and leave the area of the work broom clean. Upon completion of work remove all tools,

B. scaffolding, broken and waste materials, etc., from the site.

C. CLOSEOUT SUBMITTALS

1.

2. Section 01 70 00 – Execution and Closeout Requirements [Project Closeout]: Closeout provisions.

Project Record Documents and As-Builts: Record actual location of equipment and fixtures including items remotely within walls or above ceilings, etc.

Operation and Maintenance Data and Instructions:

Submit manufacturer's descriptive literature, operating instructions, service instructions, installation instructions, maintenance and repair data, parts listing, warranties, and wiring diagrams.

Assemble two (2) complete sets. Prepare in bound copies complete with index tabs.

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Submit bound copies to Engineer for disbursement.

Test Results:

Submit the Certificate of Performance on the domestic water service, include results of laboratory analysis of water sample.

Submit all records and certifications approving testing requirements and a complete record of all testing that has been approved on the piping systems.

3. Warranties.

D. EXTRA MATERIALS

2. Section 01 70 00 – Execution and Closeout Requirements [01 77 00 Closeout Procedures]: Spare parts and maintenance provisions.

E. WARRANTY

1.15 A. Section 01 70 00 – Execution and Closeout Requirements [01 77 00 Closeout Procedures]: Warranty provisions.

1.16 A. Pumps: Furnish five (5) year manufacturer warranty.

B. Emergency Fixture Thermostatic Mixing Valve: Furnish 10-year manufacturer warranty on thermostat.

C. Commercial Water Heater: Furnish three (3) year manufacturer's warranty against tank leaks.

D. SPECIAL PROJECT CONDITIONS

1.17 A. Allowances:

1. Section 01 21 00 – Allowances.
2. Gas utility fee: $5000
3. The allowance amount shown is the invoice amount from the utility.
4. The plumbing contract will be adjusted up or down by change order by the amount listed for the allowance, less the actual cost of the utility fee. No additional compensation for mark-ups or handling will be allowed by the contractor. Any such costs shall be included in the bid.

B. Utility Coordination:

2. Be responsible for utility coordination on behalf of the Owner. Contact the Owner to determine
3. requirements, and from that, organize a meeting with the various system serving utilities, so that the

C. installation of the service can be done to coordinate with building construction.

1. Gas Utility: Company name. Contact name, phone number.
Water Utility: Municipality name. Contact name, phone number.

PART 2

Winterization and Spring Start-Up Provisions

2.01 Provide all necessary supplemental drain points, blow-outs, valves, etc., for ease of winterization operations, and to the greatest extent feasible, without the need for partial dismantling of the

A. plumbing system or fixtures.

1. a. PRODUCTS

PIPES AND TUBES

Sanitary Sewer Piping and Vent Piping:

Buried below the building and outside within 5 feet of the building:

Cast Iron Pipe: ASTM A74, service weight, hub and spigot with neoprene gaskets and caulked joints firmly packed with hemp or oakum or deep molten lead, minimum 1 inch deep.

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Cast Iron Pipe: CISPI 301, hubless, service weight, with mechanical push-on joints with neoprene gaskets conforming to ASTM C564.

Cast Iron Pipe: CISPI 301, hubless, service weight, with mechanical sleeve joints with rubber sealing sleeve conforming to ASTM C564 and stainless steel band assembly conforming to CISPI 310 or FM 1680.

Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2665, ASTM D3034 (SDR of 26 or less), or ASTM F891 (schedule 40 only) with PVC fittings and solvent weld joints complying to ASTM D2855. Primer shall conform to ASTM F656. Solvent shall conform to ASTM D2564 and be handled in accordance with ASTM F402.

Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2665, ASTM D3034 (SDR of 26 or less), or ASTM F891 (schedule 40 only) with PVC fittings and mechanical push-on joints complying to ASTM D3212. Mechanical joints shall be installed in accordance with manufacturer's instructions.

All piping within 50-feet of a well shall be pressure class rated.

Above ground inside the building:

Cast Iron Pipe: ASTM A74, service weight, hub and spigot with neoprene gaskets and caulked joints firmly packed with hemp or oakum or deep molten lead, minimum 1 inch deep, conforming to ASTM C564.

Cast Iron Pipe: CISPI 301, hubless, service weight, with mechanical push-on joints with neoprene gaskets conforming to ASTM C564.

Cast Iron Pipe: CISPI 301, hubless, service weight, with mechanical sleeve joints with rubber sealing sleeve conforming to ASTM C564 and stainless steel band assembly conforming to CISPI 310 or FM 1680.

Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2665, or ASTM F891 (schedule 40 only) with PVC fittings and solvent weld joints complying to ASTM D2855. Install in accordance with ASTM D2321. Primer shall conform to ASTM F656. Solvent shall conform to ASTM D2564 and be handled in accordance with ASTM F402.

Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2665, or ASTM F891 (schedule 40 only) with PVC fittings and mechanical push-on joints complying to ASTM D3212. Install in accordance with ASTM D2321. Mechanical joints shall be installed in accordance with manufacturer's instructions.

All exposed piping inside the building, within 7 feet of the floor, shall be cast iron, galvanized steel, or Schedule 80 PVC.

All piping exposed, not installed within wall, floor, or ceiling construction, in Corrosion or Chemical areas shall be corrosion-resistant or plastic.

Water Piping:

General:

All materials in contact with water shall be suitable for use with potable water.

All pipes, fittings, and other materials for water supply lines shall be made of a material that is "lead-free".

A water supply system shall be resistive to corrosive action and degrading action from the water being conveyed.

Plastic pipe shall be certified for potable water contact by nationally recognized listing agency.

Water distribution pipe shall have a minimum working pressure of 100 psig at 180 degrees F; except underground cold water distribution pipe shall have a minimum working pressure of 150 psig at 73.4 degrees F.

Joints between different materials shall be made with mechanical compression joints.

Buried below the building and outside within 5 feet of the building:

Copper Tubing: ASTM B42, annealed without fittings. Type K.

Ductile Iron Pipe: ASTM A377, AWWA C115/A21.15, AWWA C151/A21.51 with ductile iron fittings rubber gasket joints and 3/4-inch diameter rods.

Ductile Iron Pipe: ASTM A377, AWWA C115/A21.15, AWWA C151/A21.51 with mechanical push-on joints or mechanical compression type joints shall comply with AWWA C111/A21.11.

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Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2241, ASTM D2672, AWWA C900 with mechanical push-on joints and mechanical compression type joints. Flexible elastomeric seals shall conform to ASTM D3139.

Above ground inside the building:

Copper Tubing: ASTM B88, Type L, hard drawn, with cast brass or wrought copper fittings and Grade 95TA soldered joints. Joint surfaces shall be made in accordance with ASTM B828. Solder shall conform to ASTM B32. Flux shall be approved by NSF.

d. Copper Tubing: ASTM B88, Type L, hard drawn, with wrought copper fittings and mechanical joints. Mechanical joints shall be installed in accordance with manufacturer's instructions. Mechanical push-on joints and mechanical compression type joints which use flexible elastomeric seals shall be suitable for potable water.

3.

a. Ductile Iron Pipe: ASTM A377, AWWA C115/A21.15, AWWA C151/A21.51 with mechanical push-on joints or mechanical compression type joints shall comply with AWWA C111/A21.11.

b. Ductile Iron Pipe: ASTM A377, AWWA C115/A21.15, AWWA C151/A21.51 with threaded joints shall comply with ASME B1.20.1. Pipe compound or tape shall be used.

c. Chlorinated Poly Vinyl Chloride (CPVC) Pipe (SDR11 piping for water temperatures up to 180^{O}F): ASTM D2846 with CPVC fittings and solvent weld joints. Mechanical joints shall be

d. installed in accordance with manufacturer's instructions. Mechanical push-on type joints with use flexible elastomeric seals shall conform to ASTM D3139. Solvent cemented joints

e. shall be made in accordance with ASTM D2846 or ASTM F493. Solvent cement shall conform to ASTM F493 and handled in accordance with ASTM F402.

f. Polybutylene (PB) Pipe: ASTM D3309 with ASTM F845 PB, copper fittings with flared or heat fusion joints and mechanical compression type joints with copper compression rings. Flared joints shall be made in accordance with ASTM D3140. Heat fusion joints shall be made in accordance with ASTM D2657 and ASTM D3309. Flexible elastomeric seals shall conform to ASTM D3139.

g. Crosslinked Polyethylene (PEX) Tubing: ASTM F876 or ASTM F877 with joints in accordance with manufacturer's instructions.

h. All piping exposed, not installed within wall, floor, or ceiling construction, in Corrosion or Chemical areas shall be corrosion-resistant, or plastic.

i. All piping, exposed or concealed in all areas, except Hazardous areas, shall be copper.

2.02

A. VALVES

B. Valves must be trademarked on body with manufacturer's name or trademark and pressure rating.

C. Minimum design pressure of 200 psig and certified for water-oil-gas (WOG) operation.

D.

E. Valves installed in CPVC pipe may be of CPVC construction.

F. Valves in Hazardous areas shall be of CPVC or stainless steel construction.

1.

2. Valves installed in pipes with insulation shall be provided with extensions for the handles.

3.

G. Gas shut-off valves:

1. Ball valve: bronze body, threaded ends, stainless steel ball, full or conventional port, Teflon seat, blow-proof stem, two-piece construction.

2. UL listed for use as a gas shut-off.

3. Acceptable Manufacturers: American Valve, Red-White Valve Corp., or equal.

Gas Cocks:

Sizes 1/2 inch to 4 inches: DeZurik Fig. 425 gas valve, cast iron body, screwed or flanged ends, bronze bearings, bronze plug and resilient seal ring for bubble-tight shut-off to 175 psig working pressure.

UL approved for natural gas.

Acceptable manufacturers: Crane, DeZurik, Jenkins, Milwaukee, Nibco, and Walworth.

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Gate Valves:

Up to 2 inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, double wedge disc, soldered or threaded.

Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, solid wedge, flanged or grooved ends.

Acceptable Manufacturers: American Valve, Crane, FMC Crosby Valve, Red-White Valve Corp., or equal.

H. Globe Valves:

1. Up to 2 Inches: Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable
2. composition disc, solder or threaded ends, with back seating capacity.
3. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug type disc, flanged ends, renewable seat and disc.

Acceptable Manufacturers: American Valve, Crane, FMC Crosby Valve, Red-White Valve Corp., or

I. equal.

1.

2. Ball Valves:

3. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends.

Over 2 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals

J. and lever handle.

1. Acceptable Manufacturers: American Valve, Crane, FMC Crosby Valve, Red-White Valve Corp., or
2. equal.

3.

Thermoplastic Ball Valves

K. Thermoplastic ball valves, 6 inch and smaller, shall have full port, PVC SCH 80 body, ball and stem.

1. Valves shall be end entry, double union design with solvent weld socket in accordance with ANSI
2. B1.20.1 or flanged end connections.

3. Seats shall be PTFE and seals shall be Viton o-ring stem seals.

4. Provide hand lever operator with stops at the full open and full closed positions.

5. Valves shall be rated for the greater of 150 psi or 150 percent of working pressure.

L.

1. Plug Valves:

2.

3. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

Over 2 inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends.

Acceptable Manufacturers: American Valve, Crane, FMC Crosby Valve, Red-White Valve Corp., or

M. equal.

1.

2. Butterfly Valves:

3. Up To 2 inches: Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, [10-position lever handle.] [infinite position lever handle with memory stop.]

Over 2 inches: Iron body, chrome plated iron disc, resilient replaceable seat, wafer or lug ends,

N. extended neck, 10 position lever handle.

1.

2. Acceptable Manufacturers: American Valve, Crane, FMC Crosby Valve, Red-White Valve Corp., or

3. equal.

O.

1. Swing Check Valves:

Up to 2 inches: Bronze body and swing disc, solder or threaded ends.

2. Over 2 inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

Acceptable Manufacturers: American Valve, Crane, FMC Crosby Valve, Red-White Valve Corp., or equal.

Spring Loaded Check Valves:

Iron body, bronze trim with threaded, wafer or flanged ends and stainless steel spring with renewable composition disc.

Acceptable Manufacturers: American Valve, Crane, FMC Crosby Valve, Red-White Valve Corp., or equal.

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Relief Valves:

Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

Gas service: Stainless steel seat and disc.

Acceptable Manufacturers: Aquatrol, Kunkle Valve, or equal.

PIPING SPECIALTIES

P. Flanges, Unions, and Couplings:

1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.
3. Grooved and Shouldered Pipe End Couplings: Malleable iron housing, C-shape elastomer composition sealing gasket, steel bolts, nuts, and washers.

2.03

A. Thermometers:

1. Stem Type Thermometer: ASTM E1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish.
2. Size: 9 inchscale.
3. Window: Clear Lexan.

B. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.

1. Accuracy: [ASTM E77] 2 percent.
2. Calibration: Both degrees F and degrees C.
3.
4.
5. All specialties exposed in Chemical areas shall be type 316 stainless steel or corrosion-resistant.

C.

SUPPLY SPECIALTIES

2.04

A. Thermostatic Mixing Valves:

1. Emergency Station: Designed specifically for emergency fixtures with drench shower and/or eye/face wash.
2. Flow capacity of 3 to 44 gallons per minute (GPM).
3. Capable of delivering 20 gpm with no more than a 10 psi drop in pressure across valve.
4. Dial thermometer on outlet.
5. Mixing valve shall have bimetallic thermostat that senses incoming water temperature and automatically blend water to adjustable outlet set point temperature.
6. Built-in cold water by-pass, assuring cold water in event of loss of or interruption of the hot water supply or thermostat failure.
7. Positive shut-off of hot water supply when cold water supply is lost.
8. Vandal resistant temperature adjustment.
9. High temperature limit stop at 90° F.

B. Temperature range: 65°F to 90° F.

1. Maximum operating supply pressure: 125 psi.
2. Maximum inlet temperature: 180°F.
3. Warranty: Manufacturer's 1-year.
4.
5. Thermal Expansion Absorber (for Domestic Hot Water Heating System):
6. Drawn steel dome, anti-microbial (silver-ion) polypropylene liner, butyl diaphragm, turbulator inlet design, welded steel construction, welded air charge fitting with protective plastic cap.

Precharge: 40 PSI factory pre-set. Contractor shall adjust tank pressure prior to installation to meet system requirements.

Non-ASME rated. Designed for general use hot water systems.

ANSI/NSF 61 listed.

Maximum Working Pressure: 150 PSI.

Maximum Temperature: 200 degrees F.

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Size as recommended by manufacturer based on water heater temperature, water heater capacity, and water pressure.
Provide at storage type water heater inlet pipe after shut-off valve.
Therm-X-Trol by Amtrol Inc.
Acceptable Manufacturers: Amtrol, Armstrong, State, Watts Regulator, Wessels, Wheatley, or equal.

PIPE INSULATION

EPDM-Rubber: ASTM C534 Type I and II, ASTM D1056, flexible, closed-cell EPDM-rubber based elastomeric, tube and sheet, UV resistant, indoor/outdoor, mold and fungal growth resistant, paintable. Self-sealing acrylic adhesive closure and exterior (cellular fusion adhesive) tape shall be provided at all longitudinal joints; exterior tape shall be applied at butt joints.

2.05

Physical Properties:

A.

k Value: 0.245 at 75 degrees F (ASTM C518/C117)
Density: 3 to 6 psf
Service Temperature (continuous): -297^{O}F to 257^{O}F
Water Vapor Permeability: 0.03 perm (ASTM E96)

1.

Water Absorption (weight %): 0.2% (ASTM C209)

a.
b.
c.
d.
e.

Flame Spread/Smoked Developed Ratings (through 2" thickness): 25/50 (ASTM E84), self-extinguishing (ASTM D635)

Acceptable Products:

f.

Aerocel Stay-Seal with Protape (SSPT) by Aeroflex, 423-337-2493, www.aeroflexusa.com.

2.

a.

Provide manufacturer's rigid pipe supports (Aerofix), fabricated fitting covers (AeroFit), tape (Protape), and adhesive.

Finished Jackets:

B.

PVC Plastic: One piece molded type fitting covers and sheet material.

1.

a.
b.
c.
d.
e.
f.
g.

Thickness: [10] [20] [30 for outdoor installations] mil.
Tensile Strength and Modulus: 6,000 psi, 470,000 psi
Flexural Strength and Modulus: 11,600 psi, 460,000 psi
Surface Burning Characteristics: Flame spread - 25 or less, smoke development - 50 or less.
Connections: Brush on adhesive, or pressure sensitive color matching vinyl tape, or solvent welding adhesive.
Installation Locations: Indoor or outdoor.

C.

Color: Blue for water pipe, off-white for other applications.

D.

Composite piping insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) shall have ratings not exceeding flame spread index rating of 25 and a smoke developed index rating of 150 (test method ASTM E-84).

1.
2.
a.

1)

Schedule:

Installer's option where more than one type is indicated.
All Domestic Hot, Cold, and Tempered Water:
EPDM Rubber.
Schedule: Exposed and concealed:

i. Hot Water

Pipe Size	Thickness
1/2 inch to 2 inches	1 inch
2 1/2 inches and over	1 1/2 inches

b.

2.06

ii. Cold and Tempered Water

Pipe Size	Thickness
1/2 inch to 1 inch	1/2 inch
1 1/4 inch to 2 inches	3/4 inch
2 1/2 inches and over	1 inch

Finished Jacket, exposed areas: PVC

SLEEVES AND SEALS

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Sleeves for pipes through non-fire rated floors: 18 gage thick galvanized steel. Schedule 40 PVC at Corrosion or Chemical areas.

Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors: Steel pipe or 18 gage thick galvanized steel. Schedule 40 PVC at Corrosion or Chemical areas.

A. Sleeves shall be of sufficient length to pass through entire floor or wall construction, including plaster, finished floor, etc., as applicable. Sleeves through floors shall extend 1 inch above finished floor level.

B. All sleeves shall be of sufficient diameter such that the bare or insulated pipe, as applicable, with unbroken pipe covering or wrapping, where specified, can pass through and allow for expansion and contraction in all directions.

C. Uninsulated without mechanical sleeve seal: Sleeve shall be two pipe sizes larger than the pipe passing through; or provide a minimum of 1/2 inch clearance between inside of sleeve and outside of the pipe.

D. Uninsulated with mechanical sleeve seal: Sleeve shall be of sufficient size to allow for installation of mechanical sleeve seal around the pipe passing through.

1. Insulated: Sleeve shall be of adequate size to accommodate the full thickness of pipe covering, with clearance for packing and caulking.

2. Material for between sleeve and masonry or concrete (not cast-in-place) opening:

3. Non-shrink grout by BASF or equal.

E. Hydraulic cement.

1. Mechanical sleeve seals:

2. Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

F. Manufacturers: Thunderline Link-Seal, Inc., NMP Corp., or equal.

1. ESCUTCHEONS

2.07

A. 1 inch wide or of sufficient size to cover the sleeved opening and an inside diameter to fit snugly around pipe.

B. Finish shall be [chrome plated steel] [nickel plated steel] [stainless steel].

2.08

A. PIPE HANGERS AND SUPPORTS

1. Plumbing Piping - Drain, waste, vent, and domestic water:

2. Conform to ASME B31.9].

3. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

4. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

5. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.

6. Hangers for Hot Pipe Sizes 6 inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

7. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

8. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

9. Wall Support for Pipe Sizes to 3 inches: Cast iron hook. For insulated pipe, bracket shall allow for insulation to run continuous through bracket or have a single offset penetration so that insulation is continuous around bracket.

10. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp. For non-insulated pipe only.

11. Vertical Support: Steel riser clamp.

12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

Floor Support for Hot Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

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Floor Support for Hot Pipe Sizes 6 inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
Copper Pipe Support: Copper-plated, carbon-steel adjustable, ring.

With supporting stands, struts, rods, plates, brackets, and attachments as necessary.

Standard or heavy-duty grade.

13. All items in Corrosion or Chemical areas shall be Type 316 stainless steel, epoxy coated, plastic, or equal
14. chemical resistance.

B. Insulation shall be continuous through all hangers and supports, except vertical supports which shall provide
C. thermal break at pipe connection and a single penetration through the insulation. Hangers and supports shall
D. provide adequate offset from structure to allow the insulation and finished jacket to run through continuous.

E. Acceptable manufacturers: Cooper B-Line, Fee and Mason, Michigan Hanger Co., or equal.

Pipe Hanger Spacing:

F.

Pipe size:	max. hanger spacing	hanger rod diameter
1/2 to 1-1/4	6’	3/8”
1-1/2 to 2	10’	3/8”
2-1/2 to 3	10’	1/2”
4 to 6	10’	5/8”
8 to 12	14’	7/8”
14 and over	20’	1”
PVC (All Sizes)	6’	3/8”

G.

2.09 FIXTURES

A. See Plumbing Fixture and Equipment Schedule on Drawings for additional requirements.

B.

1. Emergency (Safety) Station:
a. Drench Shower with Eye/Face Wash – Chemical Resistant:
b.
c. Construction: All PVC or PVC-coated components.
Shower head: 10-inch diameter plastic.
d. Shower valve: 1-inch chrome plated stay-open ball valve. Valve shall be chrome plated brass ball with Teflon seals. Flow shall be 20 gallons per minute. Stainless steel actuating
e. arm and 29-inch stainless steel pull rod.
f. Spray head assembly: Four (4) spray heads with flip top dust cover, internal flow control
g. and filter.
h. Eye/Face Wash bowl: 11½-inch diameter ABS plastic.
i.
j. Eye/Face Wash Valve: 1/2-inch IPS chrome plated brass stay-open ball valve with flag
k. handle. Valve shall be chrome plated brass ball with Teflon seals.
l. Mounting: PVC floor flange.

2.10 Pipe and Fittings: Schedule 80 PVC.
Supply: 2-inch IPS weld top female inlet.

A. Waste: 2-inch IPS socket weld female outlet.

B. Sign: ANSI-compliant identification sign for wall mounting.

1. Warranty: Manufacturer’s 2-year

EQUIPMENT

See Plumbing Fixture and Equipment Schedule on Drawings for additional requirements.

Hybrid Electric Water Heater, Residential:
Hybrid electric water heater with self-contained heat pump integrated into tank design, using R134a refrigerant. Washable air filter.

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Design of water heater shall provide for “self-cleaning” of tank to reduce build up of sediment inside the tank.

Operating Modes: multiple modes of operation and electronic user interface panel with digital display. Hybrid mode to automatically switch between electric element and heat pump based on heat requirements.

Electrical System: 2400/60/1 with maximum 30 amp draw.

Energy Efficiency: 3.61 in efficiency mode, 3.24 in hybrid mode, and 0.93 in electric mode. With factory installed energy cut-off safety switch.

2. Tank: Welded steel pressure vessel; glass lined with an alkaline borosilicate composition that has been fused to steel by firing at temperatures of 1600 degrees-F, tank inspection port, with factory installed ASME rated temperature and pressure (T&P) relief valve. The outer jacket shall be a baked enamel finish and provided with a full-size control compartment for performance of service and maintenance through a hinged front panel and shall enclose the tank with non-CFC foam insulation.

3. Anode Rods: Unit shall have stainless steel core anode rod for electrolytic tank corrosion protection.

4. Electric heating elements shall be medium watt density with zinc-plated copper sheath. Each element shall be controlled by an individually mounted thermostat and high-temperature cutoff switch. Electrical junction box with heavy-duty terminal block shall be provided.

5. Unit shall be wired for simultaneous element operation.

6. The drain valve shall be located on the front for ease of service.

Maximum Hydrostatic Working Pressure: 150 PSI.

7. Underwriters Laboratories listed. Meet or exceed the thermal efficiency and/or standby loss requirements of the US Department of Energy and current edition of ASHRAE/IESNA 90.1.

8. Fully illustrated instruction manual shall be included.

9. Manufacturers: AO Smith, State Industries or equal.

10.

11. Sump Pumps:

C. Type: Vertical centrifugal, direct connected, simplex arrangement.

1. Construction: Cast iron volute casing with Bronzeopen non-clog impeller keyed to [stainless] steel shaft, cast iron pedestal, oil lubricated bronze sleeve bearings, flexible coupling to vertical, solid shaft ball bearing electric motor.

2. Sump: Existing.

3. Controls (Simplex): Float switch and separate pressure switch high level alarm with alarm bell.

4.

2.11

A. MECHANICAL IDENTIFICATION

B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

1. Pipe Tag Markers: Lettering shall be minimum of 1/2 inch in height.

2. Gas Service: Circle, minimum 1 1/2 inch diameter.

3. Non-Potable Water Service: Equilateral triangle shape with 4 inch sides and bearing the legend “water unsafe”.

Potable Water Service: Circle shape, 3 inch diameter, and bearing the legend “safe water”.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have a minimum sheet size with stainless steel spring fastener. Minimum width of 3 inches, to comply with State of Wisconsin Plumbing Code. Color and Lettering: Conform to ASME A13.1 and State of Wisconsin Plumbing Code.

1. Acceptable Manufacturer: Seton Nameplate Corporation, Kolbi Pipe Markers Co., or equal.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum width of 3 inches, to comply with State of Wisconsin Plumbing Code. Color and Lettering: Comply with ASME A13.1 and State of Wisconsin Plumbing Code. Directional arrow tape shall be used at each end of marker and shall run entirely around the pipe and adhere to itself.

1. Acceptable Manufacturer: Seton Nameplate Corporation, Kolbi Pipe Markers Co., or equal.

E. Banding Tape: Pressure sensitive vinyl with permanent adhesive.

Color:

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Non-potable water: Black
Width: 3” or 4” to provide for final 6-inch wide band.
Acceptable Manufacturer: Seton Nameplate Corporation, Kolbi Pipe Markers Co., or equal.

Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service, [detectable].

Valve Tags: minimum 1 1/2 inches diameter, lettering shall be a minimum of 1/2 inch in height.

a. Material:
2. Metal: Non-corrosive metal with raised or engraved letters.
3. Brass.

F. Plastic: Laminated three-layer plastic with engraved black letters on light background color.

G. Shape:

1. Gas Service: Square/diamond shape.
a. Non-Potable Water Service: Equilateral triangle shape.
b. Potable Water Service: Circle shape.
c.

2. Framed, typewritten directory under glass for all valves.
a.
b.
c.

H. All items in Corrosion or Chemical Area shall be Type 316 stainless steel, epoxy coated, plastic, or equal chemical resistance.

I. OTHER MATERIALS

2.12 Provide other materials, not specifically described but required for a complete and proper installation, as A. selected by the Contractor subject to the approval of the Engineer.

B. Formed steel channels:

1. Galvanized 12 gage thick steel with holes 1 1/2 inches on center.
2. Manufacturers: Allied Tube & Conduit Corp., B-Line Systems, Midland Ross Corp., Unistrut Corp., or equal.

C. Provide all supporting steel and related materials not indicated on structural drawings as required for the D. installation of equipment and materials, including angles, channels, and hangers.

E. Prime coat paint all supports.

F. Manufactured Equipment Pads: textured 3-inch thick reinforced plastic equipment pad, polypropylene or equal; complying with ASTM D2299; UV, weather, refrigerant, compressor oil, canine urine, and salt resistant. Pad shall extend a minimum of 1-inch beyond face of equipment.

PART 3

3.01 All items in Corrosion or Chemical area shall be Type 316 stainless steel, epoxy coated, plastic, or equal A. chemical resistance.

B. EXECUTION

JOB CONDITIONS

Section 01 30 00 - Administrative Requirements [01 31 13 - Project Coordination]: Coordination and project conditions.

Surface Conditions: Examine the areas and conditions under which work will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

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Cooperate as necessary with other trades in order that all work be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum access to each system. Coordinate openings and placement of sleeves and inserts in building construction.

C. Measurements:

1. Field measuring existing conditions.

2. Lay out work, properly locate all apparatus, pipe, fittings, fixtures, sleeves, etc. Adjust work, as necessary, to insure that work shall fit into the spaces that have been allotted for such work. Due regard shall be taken for the work of other trades.

D. Proceed as rapidly as the building construction will permit.

E. ELECTRICAL PROVISIONS

1. Contractor shall furnish complete list and location of equipment requiring electrical connections and necessary wiring diagrams to Division 26.

2. Division 26: All line voltage electrical wiring connections.

3.02 SYSTEM LAYOUT

A. Lay out the plumbing system in careful coordination with the Drawings; determine proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system.

3.03

B. Follow the general layout shown on the Drawings in all cases, except where other work may interfere.

C. Lay out pipes to fall within partition, wall, or roof cavities and to not require furring other that as shown on the Drawings, unless noted otherwise on drawings.

D. Schematics are shown for size requirements and arrangement only. Field conditions shall determine actual routes.

3.04 TRENCHING AND BACKFILLING

A. Perform trenching and backfilling associated with the work of this Section in strict accordance with the provisions of Division 31 of these Specifications.

B. Perform trenching and backfilling associated with the work of this Section.

C. Excavation of rock is expected for installation of underground piping. See Soils Field Investigation Report in Division 00 of this specification. Use of explosives is prohibited.

D. The Contractor shall notify all affected utility companies at least three consecutive working days preceding the construction to coordinate work regarding other utilities and to determine the location of gas, water, light, etc., conduit or service connection or any other subsurface structure that crosses or passes through the space occupied by the proposed work. Contractor shall make advance arrangements with the utility companies for any relocation or interfering utilities so as to not delay construction.

E. Interruptions of utility services which become necessary due to the work shall be coordinated with the Owner. If down time is limited by the Owner as to duration and time (weekend, nights, holidays), the Contractor shall perform the work during the designated period at no additional cost.

F. Excavation:

1. During excavation, material suitable for backfill shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted. Grading shall

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be done as necessary to prevent surface water from flowing into trenches and any water accumulated shall be removed by pumping or other approved method.

Sheeting and shoring shall be placed as necessary for the protection of the work and for the safety of personnel. Excavation shall be open cut.

Trench excavation: Trenches shall be of the necessary width for the proper laying of pipe and conform to State of Wisconsin regulations. The banks shall conform to OSHA requirements and the Contractor is responsible for all safety and requirements of said codes.

2. Care shall be taken not to over-excavate. The bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of pipe. Depressions for joints shall be dug after the trench bottom has been graded, and be only of such length, depth, and width as required for properly making of the joint. Stones shall be removed to avoid point bearing.

G. Except as specified for wet or other unstable material, over-depths shall be backfilled as and with materials specified for backfilling the lower portions of trenches.

1. Wet or unstable materials incapable of properly supporting the pipe shall be over-excavated to a depth to allow for the construction of stable pipe bedding at the proper grade.

2. The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not be less than 6-inches nor exceed 8-inches on either side of the pipe. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work.

3.

Backfill: Debris, frozen material, organic matter, unstable material, or stones greater than 8-inches in diameter shall not be suitable for backfill. Large clods and stones not exceeding 8-inches in diameter, when

H. allowed for use as backfill, shall not be placed within 2-feet of the top of the pipe. Backfill shall be of the following types:

Insitu Backfill Material:

1. a. Previously excavated soil free of organic debris, clay balls, and aggregate larger than 1-1/2 inches.

2. Imported (Trucked) Granular Backfill Material:

a. Sand, conforming to State of Wisconsin, Department of Transportation, Standard Specifications Subsection 209.2.2, Grade No. 1 Granular Backfill or well-graded sand and gravel conforming to Subsection 305.2.2.1 of said State Standard Specification 1-1/4 inch dense graded base with not more than 8-percent by weight passing a No. 200 sieve.

I.

1.

2. Bedding and backfilling:

3. Install piping promptly after trenching. Keep trenches open as short a time as practicable.

4. Under the building, install pipes on a 6 inch bed of damp sand. Backfill to bottom of slab with damp sand.

Outside the building, install underground piping on a 6 inch bed of damp sand. Backfill to within 12

3.05 inches of finish grade with damp sand. Backfill remainder with native soil.

A. Do not backfill until installation has been approved and until Project Record Documents have been properly annotated.

FLOOR, WALL, ROOF, AND CEILING OPENINGS

B.

All openings for work of this section shall be provided under other sections. Openings shall be made as necessary in ceiling, floors, walls, roof, etc., as required to permit the installation of Work specified or shown

3.06 on the Drawings. Openings shall be made with care to avoid damage which cannot be concealed when work is completed.

Provisions for openings and holes and clearances through walls, floors, and ceilings to be made in advance of construction of such parts of the building. The Contractor is responsible for the correct size and location of these openings.

EXISTING CEILING OPENINGS

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Existing unused openings in the existing precast concrete ceiling shall be sealed. Install foam insulation in the opening to fill the entire space. Once the foam has set up, cut back insulation to the face of the ceiling. Install a galvanized sheet metal cover over opening. The square or round cover shall be a minimum of 3-inches larger than opening and shall be fastened to existing precast concrete with corrosion resistant masonry screws.

A. Existing ceiling pipe penetrations shall have the space between the existing pipe and the edge of the opening in the existing precast concrete ceiling. Install foam insulation in the opening to fill the space around the pipe. Once the foam has set up, cut back insulation to the face of the ceiling. Install a two-piece galvanized sheet metal escutcheon cover around the pipe over the opening. The square or round cover shall be a minimum of 3-inches larger than opening and have a cut out for the pipe. Fasten the covers to existing precast concrete with corrosion resistant masonry screws.

B.

SERVICE CONNECTIONS

.

3.07 Water service to be installed into building under Division 33. Wall- Install sleeve in wall for service main and supported at wall, caulked and made watertight. Floor- Install sleeve around service main to 6 inch above

A. floor and 4 feet minimum below grade. Install pressure tank, connect to water service where it enters the

B. building, before any equipment or fixture connections and backflow preventer. Install pressure relieve valve at water service connection to pressure tank. Coordinate installation of pressure switch for well operation with Well Contractor. Install back flow preventer and sand strainer where applicable. Install pressure gauge after back flow preventer. Before commencing work check invert elevations required for water service connections and verify proper cover to avoid freezing. Verify water pressure at building service connection; if pressure exceeds 80 PSI, install water pressure reducing valve.

C. Install gas service complete with gas meter and regulators. Verify gas utility pressure at building service connection. Install regulators on each line serving gravity type appliances, sized in accordance with equipment. For pressures above 7 inch wg, use pressure regulators at system service entrance or at each piece of equipment.

3.08

A. INSTALLATION – PENETRATIONS AND SLEEVES

B. Provide and install sleeves wherever piping passes through floors, walls, partitions, ceilings, etc.

C. Sleeves shall be set and maintained in place during the progress of the work. Set sleeves in position in forms. Set sleeves in place before concrete is placed. Provide reinforcing around sleeves.

D.

E. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

F.

1. Sleeves shall be securely fastened in place.
2.

G. Extend sleeves through floors 1 inch above finished floor level, unless otherwise noted.

H. Exterior watertight entries:
Below-grade: Sleeve pipe and seal with mechanical sleeve seals or provide wall pipe.
Above-grade: Sleeve pipe and seal with caulk.

Where piping penetrates floor, ceiling, wall, etc., close off space between pipe and adjacent work with stuffing insulation, for penetrations through non-rated assemblies, and firestopping, for penetrations through rated assemblies, insulation to within 1/2 inch of surface face.

Caulk the space between the sleeve and pipe or pipe covering for all sleeves and penetrations not visible after finished installation or hidden behind covers.

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Section 07 92 00: Caulking of all sleeves and penetrations visible after finished installation.

Provide close fitting metal collar, escutcheon covers, or plates wherever piping or hanger rods are exposed to view and pass through floor, wall, ceiling, partitions, and similar locations. Hold escutcheons in place with set screw. Escutcheon not required around openings for insulated pipe if opening is not visible after insulation installation.

I. INSTALLATION - INSERTS

J. Install inserts for placement in concrete forms.

Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3.09 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

A. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

B. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut [above] [flush with top of] [recessed into and grouted flush with] slab.

C.

D.

E. INSTALLATION - PIPE

3.10 Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

A. Remove scale and dirt, on inside and outside piping before assembly.

B. Prepare piping connections to equipment with flanges or unions.

C.

3.11 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

E.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Thoroughly clean items before installation.

H. Bolt all equipment, isolators, hangers, and similar items securely in place.

I. Cut pipe accurately, and work into place without springing or forcing properly clearing window, doors, and other openings. Excessive cutting or other weakening of the building will not be permitted.

J.

K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

L. Sleeve pipe passing through partitions, walls and floors.

Install piping system allowing clearance for installation of insulation and access to valves and fittings.

Install piping, equipment, valves, and other items to permit access for maintenance. Relocate items as necessary to provide such access, and without additional cost to the Owner.

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Provide access doors where valves, clean outs, and fixtures or equipment requiring access for maintenance are located in wall or chases or above ceilings. Coordinate location of access doors with other trades as required.

Install identification on piping systems, including underground piping.

Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

M.

Make changes in directions with fittings; make changes in main sizes with eccentric reducing fittings.

N. Provide sufficient swing joint, ball joints, expansion loops, and devices necessary for a flexible piping system,

O. whether or not shown on the Drawings.

P. Support piping independently at pumps, coils, tanks, and similar locations so that weight of pipe will not be supported by the equipment.

Q.

Pipe Joints:

R. Copper Tubing:

Cut square, remove burrs, and clean inside of female filling to a bright finish.

S. Apply solder flux with brush to tubing.

1. Remove internal parts of solder-end valves prior to soldering.

a. Provide dielectric unions at points of connection of copper tubing to ferrous piping and

1) equipment.

2)

b. For joining copper tubing, use the following:

c. Water piping 3 inches and smaller: 95-5 solder;

1) Water piping larger than 3 inches: “Sil-fos” brazing;

2) Underground: “Si1-fos” brazing.

3)

2. Screwed Piping:

a. Deburr cuts.

1) Do not ream exceeding internal diameter of the pipe.

2) Thread to requirements of ANSI B2.1.

b.

c. Use Teflon tape on male thread prior to joining other services.

3. Use litharge and glycerin on joint prior to cleaning for air and oil piping.

a. Leaky Joints:

b. Remake with new material.

c. Remove leaking section and/or fitting as directed.

3.12 Do not use thread cement or sealant to tighten joint.

A.

B. INSTALLATION - VALVES

C. Install valves in water system so as to give complete regulation of apparatus, equipment, and fixtures.

1.

2.

3. Furnish and install where necessary for the proper control of piping flow and equipment operation control

4. valving required; as gate, angle, globe, and check valves.

5.

6.

7. Provide valves in at least the following locations:

In branches and/or headers of water piping serving a group of fixtures.

D. At each fixture.

On both sides of apparatus and equipment.

For shutoff of risers and branch mains.

For flushing and sterilizing the system.

Where shown on the Drawings.

As specified herein.

Install valves with stems upright or horizontal, not inverted.

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Install ball [gate] [or] [butterfly] valves for shut-off and to isolate equipment, part of systems, or vertical risers.

Install ball [globe] [or] [butterfly] valves for throttling, bypass, or manual flow control services.

Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

Install spring loaded check valves on discharge of pumps.

E.

Install [plug] valves for throttling service. Install non-lubricated plug valves only when shut-off or isolating valves are also installed.

F.

G.

Install 3/4 inch gate or ball drain valves at main shut-off valves,low points of piping,bases of vertical risers, andat equipment. [ipe to nearest drain.

H.

I.

Extend valve handles to above insulation surface.

J.

INSTALLATION - PIPING SPECIALTIES

K.

Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. [Install siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.

3.13

A.

Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

B.

Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

C.

D.

Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

E.

Provide drain and hose connection with valve on strainer blow down connection.

F.

G.

Install pressure gauges at water and gas service inlet inside building.

H.

Install thermometer on inlet(s) and outlet pipe for water heaters and mixing valves.

3.14

Install pressure gauge on inlet pipe at emergency stations.

A.

B.

INSTALLATION – SUPPLY PIPING AND SPECIALTIES

C.

Install water piping in accordance with ASME B31.9.

D.

Establish elevations of buried piping outside the building to obtain not less than six (6) feet of cover.

E.

F.

Water service installed under the building slab and foundation shall be continuous, without joints or fittings.

G.

Provide support for utility meters in accordance with requirements of utility companies.

Coordinate installation of water meter by utility.

Slope water piping upwards adequately in direction of flow and arrange to drain at low points, for complete drainage of system.

Install piping with straight side of eccentric fittings at top of pipe, unless noted otherwise.

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Install piping from relief valves, back-flow preventers, air vents, and other drains to nearest floor drain, open sight drain, or other acceptable discharge point. Terminate with a plain and unthreaded pipe 6 inches above the drain.

Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to [lavatories] [sinks] [washing machine outlets].

H. Install in upright position at the following locations:
   - all quick closing valves
   - isolated plumbing fixtures
   - supply headers at plumbing fixture groups

I. Locate and size as specified, locate in accordance with Plumbing and Drainage Institute Standard "P.D.I. WH-201."

1. Install water hammer arrestors behind access panels where installed within wall construction.

a.

b.

c.

2. Install flow controls in water circulating systems and at emergency stations [as indicated on Drawings] and specified herein.

3.

INSTALLATION - DRAINAGE PIPING AND SPECIALITIES

J.

Install bell and spigot pipe with bell end upstream.

3.15

Establish elevations of buried piping outside building to provide not less than four (4) feet of cover. Where appropriate depth of cover is not possible, insulate as required by the plumbing code.

A.

B.

Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum, unless noted otherwise. Maintain gradients.

C.

Floor drains, hub drains, trench drains, and catch basins shall be installed prior to placement of concrete slab. Install top of drain at elevation shown on the drawings; if top of drain elevation is not noted on drawings, floor drain shall be installed so that adjacent areas slope toward the drain at a maximum slope of 1 inch in 50 inches; unless noted otherwise.

D.

E.

Floor drains shall be so constructed with a P-trap and shall be provided with removable strainers, unless otherwise noted on drawings.

F.

G.

Drain lines shall be so constructed so that they may be cleaned and so that the drain inlet is accessible.

1.

2.

3.

Cleanouts:

4.

5.

6.

Secure the Architect's approval of locations for cleanouts in finished areas prior to installation.

Make all cleanouts accessible. Install with clearance at cleanout for rodding of drainage system.

Extend cleanouts to finished floor or wall surface.

H. Encase exterior cleanouts in concrete flush with grade.

I. Install floor cleanouts at elevation to accommodate finished floor.

Lubricate threaded cleanout plugs with mixture of graphite and linseed oil after pressure tests are made and approved.

J.

All vents must rise. No vent-to-vent connection allowed below floor, except for loop-vent construction.

K.

L.

Pipe the drains from drip pans and other similar locations to nearest floor drain, open sight drain, or other acceptable discharge point. Terminate with a plain and unthreaded pipe 6 inches above the drain.

Install piping penetrating roofed areas to maintain integrity of roof assembly. All pipes passing through the roof shall be flashed. Flashing shall be installed by Division 07 [13].

Install piping penetrating roofed areas to maintain integrity of roof assembly.

Vents shall extend not less than 8 inches nor more than 12 inches above finished roof level.

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All pipes passing through the roof shall be flashed. Flashing shall be installed by Division 07 .

INSTALLATION - PIPE HANGERS AND SUPPORTS

Insulation and vapor retarder jacket shall run continuous through supports, hangers, and brackets. Provide rigid supports or shields as necessary.

M. Support horizontal piping as scheduled.

3.16 Pipe hangers shall be installed according to recommendations of the pipe manufacturer and hanger manufacturer.

A. Space hangers and supports according to the schedule, unless shorter distances are required by other standards or standard industry practice and to prevent excessive pipe movement during normal operations.

B. Arrange supports to prevent excessive deflection and to avoid excessive bending stress.

C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

D. Insulation shall be continuous through hangers. Protect insulation with galvanized steel shields.

E. Place hangers within 12 inches of each horizontal elbow.

F. Use hangers with 1-1/2 inch minimum vertical adjustment.

G. Horizontal cast iron hubless pipe:

H.
1. Support pipe adjacent to each hub, on both sides and within 6 inches of, so that coupling will bear no weight.
2. Do not provide hangers on couplings.
3. 5 feet maximum spacing between hangers.
4. Provide hangers adequate to maintain alignment and to prevent sagging of the pipe.
5. Make adequate provision to prevent shearing and twisting of pipe and joint.

I. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub. Supports shall be secured to the piping and resting on the building structure. Provide at each floor, unless noted otherwise.

J. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

K. Support each pipe independently. Do not use wire for hanging or strapping pipes.

L. Support riser piping independently of connected horizontal piping.

M. Design hangers for pipe movement without disengagement of supported pipe.

N. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.17 Provide sway bracing on hangers longer than 18 inches.

A. Piping can be surface mounted to walls and ceilings, unless noted otherwise.

INSTALLATION – PIPING INSULATION AND FINISHED JACKETS

Insulate complete system of pipes for the following: hot, cold, and tempered domestic water piping and storm piping located in interior space of building, including all piping located inside walls, unless noted otherwise.

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Continue insulation vapor barrier through penetrations and hangers, brackets, and supports. Provide rigid supports or blocking or exterior shields as necessary to prevent crushing of insulation.

Locate insulation and cover seams in least visible locations.

Neatly finish insulation at supports, protrusions, and interruptions.

B. Install fiberglass insulated pipes conveying fluids below ambient temperature with vapor barrier jackets. Finish with glass cloth and vapor barrier adhesive.

C. For man made mineral fiber insulated pipes conveying fluids above ambient temperature, install standard jackets. Bevel and seal ends of insulation at equipment, flanges, and unions.

D.

E. Install insert between support shield and piping on piping 2 inches diameter or larger. Fabricate of cork or other high density insulating material suitable for temperature, not less than 6 inches long.

F.

INSTALLATION - FIXTURES

G.

Show no tool marks or threads on exposed plated, polished, or enameled connections from fixtures. Tape all finished surfaces to prevent damage during construction.

3.18

A. Set fixtures in proper alignment with respect to walls and floors.

B. Provide supplies in proper alignment with fixtures and with each other.

C.

Grout wall and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.

D.

E. Install each fixture with chrome plated rigid or flexible supplies with screwdriver stops, reducers, and escutcheons.

F. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

G.

H. Install sealant required for plumbing installation, which is concealed once fixture is in place.

I. Install piping penetrations in exterior horizontal areas to maintain integrity of water-proofing assembly. All piping penetrating these areas shall be flashed water-tight.

3.19

A. Section 07 92 00: All caulking exposed after finished installation for deck-mounted trim, self-rimming sinks installed in casework, wall mounted fixtures, etc.

B.

INSTALLATION – EQUIPMENT

C.

Show no tool marks or threads on exposed connections.

D.

Set equipment in proper alignment with respect to walls and floors.

E.

1. 2. Provide supplies in proper alignment with equipment and with each other.

3.

4. 5. Install water heaters in accordance to AGA, NSF, NFPA, and UL requirements. Coordinate with plumbing piping and related electrical work to achieve operating system.

Install the following heat exchanger accessories:

Wells for temperature regulator sensor at heated water outlet.
ASME rated pressure and temperature relief valve on heated water discharge.
ASME rated pressure relief valves from taps on heated waterside, set at 120 psi.
ASME rated pressure relief valve on water inlet on downstream side of control valve.
Thermometers and pressure gauge taps on water inlets and outlets.

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Clean and flush tanks after installation. Keep openings sealed until pipe connections are made.

On tanks, install drain at water inlet and outlet, thermometer with range of 40 to 200 degrees F, and ASME pressure relief valve suitable for maximum working pressure.

Install air vent and drain valves on connections of horizontal pump casings.

Install line size (2) check valves and shut-off valve on sump pump discharge.

F.

G. Install pumps with shaft length allowing sump pumps to be located minimum 24 inches below lowest invert into sump pit and minimum 6 inches clearance from bottom of sump pit.

H.

Install sealant required for plumbing installation.

I.

J. Install piping penetrations in exterior horizontal areas to maintain integrity of water-proofing assembly. All piping penetrating these areas shall be flashed water-tight.

K.

INSTALLATION - MECHANICAL IDENTIFICATION

L.

Install adequate marking of exposed accessible piping, per ANSI A13.1.

3.20

Install plastic nameplates with adhesive when mounting to metal equipment cabinets and screws when mounting to building materials.

A.

B.

Install plastic and metal tags with corrosion resistant metal chain.

C.

Valves:

D.

1. Tag all valves, except potable water fixture stop valves, with tags.
2. Install valve directory where directed.

E.

1. Pipes:
2. Install pipe markers on all pipes.
3. Install plastic pipe markers or plastic tape pipe markers on all pipes with canvas paintable jacket. Where plastic tape pipe markers are used, plastic tape direction arrow pipe markers shall be installed around the entire pipe at each end of the pipe marker. Do not install until after pipe has been painted.
4. Install per State of Wisconsin Plumbing Code and as follows: Space no more than 25 feet apart, with
   a. a minimum of one marker on each straight section of pipe, and at each side where the piping passes
   b. through a wall, floor, or roof.
   c. Color of bands shall comply with State of Wisconsin Plumbing Code:

F. Non-potable Water Pipe: yellow

G. Potable Water Pipe: green

Gas Pipe: Red

H.

1. Tag all non-potable water outlets with plastic or metal tags, per State of Wisconsin Plumbing Code.
2.

Tag all non-potable hose outlets with plastic nameplate with red background and white letters to read “Water Unsafe – Do Not Drink”.

Tag each Reduced Pressure Principle Backflow (RPPB) Preventer, per State of Wisconsin Plumbing Code.

Install metal or plastic tag to backflow preventer, shall be securely attached to the body of the RPPB. The tag shall be of sufficient size to convey the following required information: “Wisconsin Department of Commerce; Identification/Object Number _____; Cross Connection Control Assembly; Do Not Remove This Tag”. The department assigned identification number shall be printed in the blank area with a permanent, waterproof marker, or some other indelible visible method.

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Tag Shape: The upstream RPPB preventer shall be considered potable water. The downstream RPPB shall be considered non-potable water; except, at wastewater facilities, where the facility potable water service is provided with a backflow preventer at the water service entrance.

PAINTING

Section 09 91 00 [09 96 00]: Painting of piping, valves, and specialties, all exposed insulated and non-insulated piping and equipment, without factory finish or finished cover, shall be painted.

3.

Division 09: Requirements for painting of piping, valves, and specialties, all exposed insulated and non-insulated piping and equipment, without factory finish or finished cover, shall be painted.

3.21

Paint Color:

A. Gas Piping: Orange
Compressed Air Piping: Yellow

B. Domestic Drainage and Vent Piping: Match background

1. Touch-up all factory finishes damaged during construction.

a.

b.

DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

C.

Perform disinfection under the Engineer's observation. Notify the Engineer at least 48 hours prior to start of the disinfection process.

3.22

A.

Disinfecting of Domestic Water Systems:

B. Prior to starting, verify system is complete, flushed and clean.

1. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or
2. acid (hydrochloric).

3. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.

4. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.

5.

6. Maintain disinfectant in system for 24 hours.

7.

8. When final disinfectant residual tests less than 25 mg/L, repeat treatment.

Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.

C. Take samples no sooner than 24 hours after flushing, from [10] [5] [2] percent of outlets and from water entry, and analyze in accordance with AWWA C651.

D. Upon completion of disinfecting, secure and submit the Certificate of Performance, stating system capacity, disinfectant used, time and rate of disinfectant applied, and resultant residuals in ppm at completion.

E. When disinfection operation is completed, and after final flushing, secure an analysis by a laboratory approved by the Engineer, based on water samples from the system, showing test negative for coli-aerogene organisms. Provide a total plate count of less than 100 bacteria per cc, or equal to the control sample.

3.23

A.

If analysis results are not satisfactory, repeat the disinfection procedures and retest until specified standards are achieved.

B.

C. TESTING AND ADJUSTING

Section 01 70 00 - Execution and Closeout Requirements: Testing and adjusting provisions.

Contractor shall notify any inspectors required to observe test, when test is ready to be performed. Contractor shall advise A/E field representative that notification has been given.

All equipment required for testing, including fittings for additional openings, shall be provided by Contractor. Provide all openings inside and outside the building as required. Contractor shall provide all personnel required for testing. Contractor shall pay the cost of all required tests and retests and inspections if required.

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Tests shall be witnessed and approved by Owner's representatives and A/E field representative. Contractor shall certify in writing the time, date, name, and title of person approving test. This shall also include the description and what portion of the system has been approved. Person approving test shall sign certification.

A complete record shall be maintained of all testing that has been approved, and shall be made available at the job site to all authorities concerned.

D. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the A/E Field Representative before final payment is made.

E. Test drainage piping in accordance with local code requirements.

F. Water test entire drainage system (sanitary and vent system) by sections if necessary, with a minimum of 10 foot head for two hours without loss of water. If weather makes water test impractical, use air test with 10 inches of mercury column pressure and no loss of pressure for at least 15 minutes.

G.

H. Test supply piping in accordance with local code requirements.

I. Water test entire domestic water systems, by sections if necessary, before connecting fixtures, with hydrostatic pressure of 100 PSI without loss of pressure for at least two hours.

J. Test [oil] [natural gas] [LPG] piping in accordance with [NFPA 31] [NFPA 54] [NFPA 58].

K. Notify A/E in advance regarding time and date of all tests.

L.

M. Defective work or material shall be replaced or repaired, as necessary, and the inspection and test repeated. Repairs shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

N. Adjust the system to optimum standards of operation.

3.24 CLOSEOUT OPERATIONS

A.

B. Section 01 70 00 - Execution and Closeout Requirements: Closeout provisions.

1. Closeout Equipment/System Operations: Sequence operations properly so that work of the project will not be
2. damaged or endangered. Coordinate with seasonal requirements.

C. Adjust and correct operations as required for proper performance.
Clean each system: After all equipment and fixtures have been proven operational, carefully clean all accessible parts, thoroughly removing all traces of dirt, oil, grease, and foreign substances.

D. Instruction: Upon completion of the installation, but before final acceptance of the system, the Contractor

E. shall instruct the Owner (Owner's personnel) on the proper operation and maintenance of all parts of the system.

F.

3.25 Guarantee.

A.

1. Extra Materials.
2.
3.
4. Record Drawings.

SCHEDULE OF MECHANICAL IDENTIFICATION

Piping:

Sanitary Sewer: "Sanitary Drain" or "Drain" or "Sanitary Sewer" or "Sanitary Waste" or "Waste"
Sanitary Vent: "Plumbing Vent" or "Sanitary Vent" or "Vent"
Potable Water, Cold: "Domestic Cold Water" or "Potable Water" or "City Water" or "Cold Water"
Potable Water, Hot: "Domestic Hot Water" or "Hot Water"

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Potable Water, Tempered: “Tempered Water”
Non-Potable Water: “Non-Potable Water”
Natural Gas: “Natural Gas” or “Gas”

Equipment: Match tags as indicated on drawings and schedules.
Water Heater:
Mixing Valve:
Sump Pump:

END OF SECTION

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SECTION 23 00 00

HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
   1. Exhaust fans, motors.
   2. Unit heaters, vent pipes, hoods, brackets.
   3.
   4. Controls: Low-voltage wiring, conduit, relays, time clocks, thermostats, dampers, damper operators, switches, etc.
   5. Air Distribution: Ductwork, insulation, duct accessories, louvers, diffusers, registers, grilles, etc.
   6. Gas piping
   7. Refrigeration piping, specialties, valves.
   8. Related accessories.
   9. Sealing of ductwork.
   10. Testing, adjusting, and balancing.
   11. Caulking of penetrations and openings.

1.02 WORK OF OTHER SECTIONS

A. Openings for work in walls, floor, roof, ceiling, etc., required by this section shall be provided under other sections. Location and size of these openings shall be the responsibility of this Contractor.

B. Division 03 - Concrete.

C. Division 04 - Masonry.

D. Division 06 - Woods, Plastics, and Composites.

E. Division 07 - Thermal and Moisture Protection.

F. Section 07 92 00 - Joint Sealants: Sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters exposed after finished installation.

G. Division 09 - Finishes.

H. Section 09 91 00 - Painting [09 96 00 - High Performance Coatings]: Painting of conduit, insulation, ductwork, accessories, etc.

I. Division 26 - Electrical: Electrical line voltage wiring (100 volts and greater) connections. Equipment starters and disconnects not provided under this Section.

1.03 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 0l of these Specifications.

B. Division 05 - Metals: Equipment structural supports, anchors, etc.

C. Section 07 92 00 - Joint Sealers: Sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters.

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D. Section 07 92 00 - Joint Sealants: Requirements for sealing of exterior and interior floor, wall, ceiling, and roof penetrations concealed after finished installation.

E. Division 26 - Electrical: Execution requirements for electric connections specified by this section.

F. Division 26 – Electrical: Requirements for low voltage (under 100 volts) wiring, conduit, etc. Requirements for equipment starters and disconnects provided under this Section.

1.04 GENERAL PROVISIONS

A. Everything essential for the completion of the work implied to be covered by these Specifications to make the system ready for normal and proper operation must be furnished and installed by the Contractor. Accordingly, any omission from either the plans or the Specifications, or both, of details necessary for the proper installation and operation of the System shall not relieve the Contractor from furnishing such detail in full and proper manner.

B. The Drawings show various details indicating the general arrangement of the heating and ventilating work, sizes, locations of units, etc., the said plans with figures, lettering, etc., shall be considered a part of these Specifications and no charge or alternation shall be made in either case, unless ordered by the Engineer.

C. In addition to the heating and ventilating plans, see General Plans of the building, heating and ventilating work appearing on the latter plans will be part of this contract unless especially specified to be done by other contractors, as well as, the said work detailed on the heating and ventilating plans.

D. “Chemical Area” indicated on the Drawing shall define materials to be used in the area designated as described herein or on the Drawings. Miscellaneous materials not specifically scheduled or specified and used in this space shall be resistant to corrosion from the chemical contained in the room under non-immersion, non-splash, or non-spray service.

1.05 QUALITY ASSURANCE

A. Section 01 40 00 - Quality Requirements: Quality provisions.

B. Perform work in accordance with State of Wisconsin and industry standards.

C. Qualification of Installer:
   1. Company specializing in performing the work of this section with minimum three (3) years documented experience.
   2. For the actual fabrication, installation, and testing, adjusting, and balancing of heating and ventilating work, use only thoroughly trained and experience workers completely familiar with the items required and manufacturer’s is current recommended methods of installation.
   3. In acceptance or rejection of installed work, the Architect or Engineer shall make no allowance for lack of skill on part of the workers.

D. Qualification of Manufacturer:
   1. Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.
   2. Equal products shall be of similar quality, be functionally similar, and have the controls specified. Where more than one type of product is specified in a particular section, the listed acceptable manufacturers may not have an equal product for every type of product specified.

E. Codes and Regulations:
   1. In addition to complying with the specified requirements, comply with pertinent regulations of State or local governmental agencies having jurisdiction, including building codes and local ordinances.
   2. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern when so directed by the Engineer.

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F. Report Forms: Testing, adjusting, and balancing - AABC MN-1 National Standards for Total System Balance forms, forms prepared following ASHRAE 111, or NEBB forms.

G. The following standards, referred hereafter by basic designation only, are imposed, as applicable to work in each instance, and form a part of this specification to the extent indicated by the reference thereto:
1. AABC - Associated Air Balance Council
2. Americans with Disabilities Act (ADA) of 1990, Accessibility Guidelines for Buildings and Facilities, 2010 edition.
3. ARI - Air Conditioning and Refrigeration Institute
4. AMCA - Air Movement and Control Association International, Inc.
   a. AMCA 500-D – Laboratory Methods for Testing Dampers for Ratings
   b. AMCA 511 – Certified Ratings Program for Air Control Devices
5. ANSI - American National Standards Institute
   a. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
   a. ASHRAE Standard 62 – Ventilation for Acceptable Indoor Air Quality
7. ASME - American Society of Mechanical Engineers
8. ASTM - American Society of Testing and Materials
   a. ASTM C1363-97 – Thermal performance test in accordance with Architectural Testing Laboratories (ATI)
9. DSPS - Department of Safety & Professional Services, Division of Industry Services, Wisconsin Administrative Code, 2018 Wisconsin Commercial Building Code
10. International Code Council:
   a. IBC - International Building Code, 2015 edition, and all referenced standards (Wisconsin)
   b. IECC - International Energy Conservation Code, 2015 edition, and all referenced standards (Wisconsin)
   c. IMC - International Mechanical Code, 2015 edition, and all referenced standards (Wisconsin)
   d. IBC - International Building Code, 2015 edition, and all referenced standards (Iowa)
   e. IECC - International Energy Conservation Code, 2012 edition, and all referenced standards (Iowa)
   f. IMC – International Mechanical Code, 2021 edition, and all referenced standards (Iowa)
11. MCA - Mechanical Contractors Association
12. MSS - Manufacturers Standardized Society
13. NEC - National Electric Code
   a. NFPA 70 - National Electric Code (NEC), 2020 edition. (Iowa)
14. NEMA - National Electrical Manufacturers Association
15. NFPA - National Fire Protection Association
16. SMACNA - Sheet Metal and Air Conditioning Contractors National Association

1.06 PERMITS

A. The Contractor shall obtain and pay for all construction permits required for Work of this section.

B. One (1) copy of all permits shall be provided to Owner.

C. One (1) copy of all permits shall be maintained on site.

1.07 GUARANTEE

A. Section 01 70 00 - Execution and Closeout Requirements : Guarantee provisions.

B. All material and workmanship must be new and first class in every respect; the heating, ventilating and air conditioning equipment must be turned over to the owner in complete working order and free from mechanical defects.

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C. The system must be guaranteed to operate noiselessly and to the satisfaction of the Owner and to supply and exhaust quantities of air shown on plans.

D. Before final acceptance of the work, the Contractor shall have the entire apparatus and system in complete and satisfactory operation and shall maintain same in satisfactory and continuous operation for a period of ten (10) days prior to the date of acceptance; fuel to be furnished by Owner.

E. The Contractor shall submit to the Engineer in triplicate, at the completion of his work, a certified statement, signed by a principal of the firm, stating that the system has been fully installed and is operating within the intent of the plans and specifications and that all system components have been tested and adjusted. This statement shall be submitted before the system is presented the Owner for final inspection.

1.08 COORDINATION

A. Section 01 30 00 - Administrative Requirements : Coordination provisions.

B. Cooperate and coordinate with other trades to assure that all systems in the work of this section may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.

C. Arrange heating and ventilating work in neat, well organized manner with piping and similar services running parallel with primary lines of building construction, and with minimum 7 foot overhead clearance. Provide maximum clearances wherever possible.

D. Locate operating and control equipment properly to provide easy access, and arrange entire heating and ventilating work with adequate access for operation and maintenance.

E. Give right-of-way to piping that must slope for drainage.

1.09 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures [Submittals]: Submittal provisions.

B. Contractor shall be responsible for correction of work deemed necessary by the Engineer due to proceeding with the work without shop drawings that have the Engineer's final approval.

C. Contractor will be responsible for all figures and dimensions. Approval of shop drawings describing equipment that cannot fit in the space allotted does not relieve the Contractor from providing equipment that will meet the space requirements.

D. Shop Drawings: Include data on physical dimensions, gauges, materials of construction and capacities.
   1. Hangers and Supports: Design data, indicate sizes and load carrying capacity.
   2. Refrigerant Condensing Units: Indicate piping system layout.
   3. Controls: Indicate operating data, system drawings, piping and wiring diagrams, and written detailed operational description of system.
      a. List connected data points, including connected control unit and input device.
      b. Label with settings, adjustable range of control and limits. Include written description of control sequence.
      c. Include description and sequence of operation of operating, user, and application software.
   4. Mechanical Identification: Submit schedule of labels.
   5. Incomplete drawings will not be approved.

E. Product Data:
   1. Hangers and Supports: Manufacturer's catalog data including load carrying capacity.
   2. Valves: Manufacturer's catalog information with valve data and ratings for each service.
   3. Louvers, diffusers, grilles, registers: Manufacturer's catalog information with sizes, capacities, rough-in requirements, and finishes.

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4. Piping Specialties: Product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
5. Pipe Expansion Products: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
6. HVAC Equipment: Submit dimensions, connections, arrangement, accessories, capacities, and finishes.
7. Refrigerant Condensing Units: Submit capacities, schematic layout of system, piping and electrical connections, sound data, and controls.
8. Air Distribution: Submit sizes, capacities, materials, and connections to other work. Submit catalog performance ratings, construction, electric and duct connections, flashing and dimensions for fans and exhausters.
9. Controls: Submit description and engineering data for each control system component. Submit data for each system component and software module.
10. PVC Coated Ductwork: Submit manufacturer's catalog information.
11. Mechanical Insulation and Finished Jackets: Product description, list of materials, and thickness for each service or equipment scheduled and locations.
12. Mechanical Identification: Submit description, dimensions, and materials.

F. Manufacturer Installation Instructions: Submit for all material and equipment.

G. Controls: Submit diagram and sequence. Include description of components and their operation.

H. Wiring Diagrams: Submit for all equipment.

I. Samples:
1. Mechanical Identification: Two (2) tags, 1 1/2 inch in size.

J. Draft Reports: Testing, adjusting, and balancing - submit for review prior to final acceptance.

K. Test Reports: Testing, adjusting, and balancing - submit prior to final acceptance and for inclusion in operating and maintenance manuals. Assemble in soft cover, letter size, 3-ring binder, with table of contents page and tabs, and cover identification. Include reduced scale drawings with air outlets and equipment identified with data sheets, and indicating thermostat locations.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements [Material and Equipment]: Product storage and handling provisions.

B. Accept equipment on site in factory packaging. Inspect for damage.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation and related products when ambient temperatures and conditions are not meeting manufacturer's requirements.

B. Maintain temperature before, during, and after installation for a minimum period of 24 hours.

1.12 HOUSEKEEPING AND CLEANUP

A. Periodically as work progresses and/or as directed by the Engineer, the Contractor shall remove waste materials from the building and leave the area of the work broom clean. Upon completion of work, remove all tools, scaffolding, broken and waste materials, etc., from the site.

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1.13 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Spare parts and maintenance provisions.

B. Provide two (2) sets of extra filters for each filter section.

C. Provide one (1) extra belt for each belt driven motor.

1.14 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Maintenance service provisions.

B. Furnish service and maintenance of equipment, accessories, and controls for one (1) year from Date of Substantial Completion.

C. Provide two (2) service calls within the first year, one (1) at the end of heating season prior to commencement of cooling season and one (1) prior commencement of heating season. Coordinate service calls dates with Owner, set preliminary dates at Date of Substantial Completion.

D. Include systemic examination, adjustment, and lubrication of unit, including controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.

E. Perform work without removing units from service during building normal occupied hours.

F. Provide emergency call back service during working hours for this maintenance period.

G. Maintain locally, near place of the work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.

H. Perform maintenance work using competent and qualified personnel under supervision [and direct employ] of manufacturer or original installer.

I. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

1.15 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Warranty provisions.

B. Heat Exchangers and Refrigeration Compressors: Furnish five (5) year warranty.

C. Kynar/Hylar (70% PVFD) Finish on Fans, Louvers, and Accessories: Furnish manufacturer's 10-year paint warranty.

1.16 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Submittal provisions.

B. Project Record Documents and As-Builts: Record actual location of equipment, ductwork, and controls including thermostats remotely located from equipment in pipes, ducts, and walls.

C. Operation and Maintenance Data and Instructions:

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1. Assembly two (2) complete sets. Prepare in bound copies complete with index tabs.
2. Submit bound copies to Engineer for distribution.
3. Controls:
    a. Systems descriptions, set points, and controls settings and adjustments.
    b. Inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
    c. Interconnection wiring diagrams complete field installed systems with identified and numbered system components and devices.
4. Equipment: Submit for each piece of equipment. Submit manufacturer's descriptive literature, operating instructions, service instructions, installation instructions, maintenance and repair data, parts listing, warranties, and piping and wiring diagrams.

D. Warranties.

PART 2 PRODUCTS

2.01 ELECTRICAL PROVISIONS

A. Contractor shall consult with the Division 26 before ordering electrical motors, to ascertain correct electrical current characteristics.

B. Motors: Comply with applicable provisions of the National Electrical Code, NEMA Standards, and Division 26 of these Specifications, and as follows, unless otherwise indicated.
1. Phases and Current: up to 1/3 HP, capacitor-start, 120 volt, 60 cycle single-phase; 1/2 HP and larger, squirrel-cage induction NEMA rated 460 volt, three phase, 60 cycle. Provide 2 separate windings on 2 speed three-phase motors. Coordinate with actual current characteristics; refer to Division 26.
2. High Efficiency Motors: All motors 1 HP and larger shall be high efficiency motors meeting or exceeding values test in accordance with IEEE Standards 112, Method B procedures as stated in NEMA MG 1-12.53a.
3. Integral Thermal Overload: on all motors less than 1/2 HP.
4. Service Factor: 1.15 for three-phase; 1.35 for single-phase.
5. Construction: General purpose, continuous duty.
6. Frames: NEMA Standard for horsepower specified.
7. Overload Protection: Built-in thermal, with internal sensing device for stopping motor, and for signaling where indicated.
8. Type: Motors in airstream shall be totally enclosed; all others shall be open drip-proof; unless noted otherwise.

C. Starters:
1. Where starters are indicated to be an integral part of equipment provided by this Section, they shall meet requirements of Division 26 and shall be connected under Division 26.
2. Where an MCC is provided under Division 26, all starters not provided integral with equipment shall be furnished and installed under Division 26.
3. Where an MCC is NOT provided under Division 26 OR an MCC without motor starters is shown as being provided under Division 26, all starters not provided integral with equipment shall be furnished and installed under this Section, they shall meet requirements of Division 26 and shall be connected under Division 26.

D. Disconnects:
1. Where disconnects are provided as an integral part of equipment provided by Division 23 or where they are furnished standard for field installation for equipment provided by Division 23, they shall meet requirements of Division 26 and shall be connected under Division 26.
2. All disconnects not integral with equipment shall be furnished by Division 23, they shall meet the requirements of Division 26 and shall be installed and connected under Division 26.
3.

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E. General Wiring: Comply with applicable provisions of Division 26 Section.

2.02 SLEEVES

A. Sleeves for pipes through non-fire rated floors: 18 gage thick galvanized steel.

B. Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves shall be of sufficient length to pass through entire floor or wall construction, including plaster, finished floor, etc., as applicable. Sleeves through floors shall extend 1 inch above finished floor level.

D. All sleeves shall be of sufficient diameter such that the bare or insulated duct or pipe, as applicable, with unbroken covering, where specified, can pass through and allow for expansion and contraction in all directions.
   1. Uninsulated: Provide sleeves two inches larger than the duct or two pipe sizes larger than the pipe passing through; or provide a minimum of 1/2 inch clearance between inside of sleeve and outside of the duct or pipe.
   2. Insulated: Provide sleeves of adequate size to accommodate the full thickness of covering, with clearance for packing and caulking.

E. Mechanical sleeve seals:
   1. Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
   2. Manufacturers: Thunderline Link-Seal, Inc., NMP Corp., or equal.

2.03 ESCUTCHEONS

A. 1 inch wide or of sufficient size to cover the sleeved opening and an inside diameter to fit snugly around pipe.

B. 1-1/2-inch wide and an inside dimension to fit snugly around duct.

C. Finish shall be chrome-plated steel.

2.04 FANS

A. Furnish fans in the size, capacity, and type as scheduled on the drawings. See Schedule on Drawings for additional requirements.

B. Fans shall be quiet operating and vibration free.

C. Fans shall be UL Listed and CSA approved.

D. The fan shall bear the AMCA Certified Ratings Seal for both sound and air performance.

E. Fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number for future identification.

F. Fan shall comply with OSHA guideline 1926.300 – General Requirements for Machine Guarding.

G. A general duty, internal wiring pigtail (flexible metal conduit) shall be provided by the fan manufacturer.

H. Direct Drive Motors option, where scheduled:
   1. Motor to be an electronic commutation (EC) motor specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors.

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Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted on the motor or by a 0-10 VDC signal. Motor shall be a minimum of 85% efficient at all speeds.

2. Greenheck VG or as approved by manufacturer of fan.

I. Centrifugal Upblast Exhaust Fans:

1. Spun aluminum upblast centrifugal type.
   a. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
   b. The fan exterior housing, curb cap, windband, motor compartment housing, and motor cover shall be constructed of heavy gauge aluminum. Housing shall have a rigid internal support structure. Windband shall be one-piece spun aluminum construction and maintain original material thickness throughout the housing. Windband to include an integral rolled bead for strength. Curb cap base shall be fully welded to windband for leak proof construction; tack welding, bolting, and caulking are not permitted. Curb cap shall have integral deep spun venture and pre-punched mounting holes for curb alignment. Drain trough shall allow for one-point drainage of water and contaminates.
   c. Drive frame assemblies shall be constructed of heavy-gauge steel and mounted on vibration isolators.
   d. Fresh air for motor cooling shall be drawn into the motor compartment free of discharge contaminants. Motors shall be readily accessible for maintenance. Breather tube shall be sized for fresh motor cooling and designed to allow wiring to run through it.
   e. Vibration isolation shall be provided and be double studded true isolators, no metal to metal contact, and be sized to match the weight of the fan.
   f. A disconnect switch shall be factory installed and wired from the fan motor to a junction box within the motor compartment.
2. Direct Driven:
   a. Motors shall be mounted out of the airstream on vibration isolators.
   b. A conduit chase shall be provided through the curb cap to the motor compartment for ease of electrical wiring.
   c. Greenheck Model CUE.
3. Roof Mounting:
   a. Roof Curb:
      1) Designed for non-insulated roof decks.
      2) Type appropriate for pitched roof installation. See Drawings for roof pitch.
      3) Galvanized 18 gauge steel, welded construction, with 1 inch, 3 pound density, insulation.
      4) Finish: Same as fan, unless noted otherwise.
      5) Greenheck Model GPFP.
   b.
4. Sidewall Mounting:
   a. A leakproof fan housing shall be constructed with a one-piece windband with an integral rolled bead for added strength. Fan shall be provided with a mounting plate, which is attached and sealed to the wall prior to locating the entire unit.
5. Birdscreen: Stainless steel
6. Finish: Kynar/Hylar (70% PVFD), unless noted otherwise. Color to be selected by Architect from manufacturer's standard colors, minimum of 12. [Mill.]

J. Centrifugal Inline Fan:

1. Duct mounted supply or exhaust fan shall be of the centrifugal direct driven in-line type.
2. The fan housing shall be of the square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars.

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3. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.
4. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
5. Motors shall be readily accessible for maintenance.
6. Direct Drive:
    a. Motors shall be permanently lubricated and carefully matched to the fan loads.
    b. A NEMA 1 disconnect switch shall be provided as standard, except with explosion resistant motors, where disconnects are optional. Factory wiring shall be provided from motor to the handy box.
    c. Greenheck SQ.

2.05 GAS-FIRED UNIT HEATERS

A. Furnish unit in the size and capacity as scheduled on the drawings. See Schedule on Drawings for additional requirements.

B. All electrical components shall carry UL, ETL, or CSA listing.

C. CSA certified as having 80% thermal efficiency.

D. Conform to the latest ANSI Standards for safe operation.

E. Factory assembled, piped, wired and tested.

F. Separated Combustion Tubular Unit Heater:
1. Cabinetry and casework shall be 20-gauge material with baked enamel finish.
2. Heat exchanger shall consist of 20-gauge aluminized steel tubes.
3. Burners shall be “inshot” design. 321 stainless steel burner box.
4. Direct spark ignition with integrated control and combination gas valve.
5. Flame rectification shall be independent of the spark igniter.
6. Efficiency: 81%
7. Direct spark ignition. Single stage gas valve. High limit switch. Air pressure switch.
8. Warranty: Manufacturer’s standard 10-year warranty on heat exchanger, flue collector, and burners to be free from defects in materials and workmanship.
9. Concentric vent kit appropriate for installation location by unit manufacturer.
10. Hoods.
11. Sterling Model GG or Modine HDS.

G. Gas-Fired Duct Duct Furnace:
1. Separated combustion indoor unit.
2. Unit shall have 80% minimum efficiency.
3. AGA and CGA certified as 80% efficiency.
4. The unit shall have a factory mounted power exhauster.
5. The unit shall include two (2) factory supplied vent caps for both the combustion air supply and flue product exhaust or with a concentric vent kit and one (1) factory supplied vent cap.
6. Construction:
    a. Casing shall be 20 gauge bonderized steel finished in baked enamel.
7. Electronic spark ignition.
8. The gas pressure shall be between 6-7” WC.
9. The unit gas controls shall be provided with the following: Modulating gas controls capable of modulating the gas flow between 40% and 100% full fire. Firing rate shall be controlled by room thermostat.
10. Heat exchanger and burner:

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a. Heat Exchanger: 20 gauge tubes with 18 gauge headers.
b. Burner: Individually removable, die-formed with stainless steel port protectors.

11. Duct Furnace:
a. Heat exchanger and burner:
1) Heat Exchanger: type 409 stainless steel.
2) Burner: same material as the heat exchanger.
b. Modine DFS.

H. Acceptable manufacturers: Modine, Reznor, Sterling, or equal.

2.06 GAS DETECTORS

A. Detectors:
1. Electrochemical or solid state sensor.
2. Factory calibrated.
3. Power loss fail-safe mode.
4. Digital display.
5. Built in self test.

B. Carbon monoxide detector and transmitter.
1. Audible alarm on high CO levels and send signal to make-up air and exhaust control.
2. Set low level alert at 35 ppm.
3. Mount CO sensor(s) on wall, approximately 60” AFF, or as recommended by manufacturer.

C. Nitrogen dioxide detector and transmitter.
1. Audible alarm on high NO_2 levels and send signal to make-up air and exhaust control.
2. Set low level alert at 1 ppm.
3. Mount NO2 sensor(s) on ceiling, or as recommended by manufacturer.

D. Verify with the manufacturer the maximum floor area coverage for each detector/sensor. The entire installation location shall be provided with the quantity of detector/sensor(s) required for full coverage.

E. Acceptable manufacturers: Brasch or equal.

2.07 TIMERS

A. Programmable timer.
1. Time-of-day, single channel electronic time control.
2. Duration: Minimum 5 minutes
3. Duty Cycling: Minimum 12 on/off events per 24 hour period.
4. MSA 3R non-metallic enclosure with clear-view cover.
5. Control shall provide 7-day power outage carry-over. Digital display. “On” or “Off” or “OVR” display to indicate current status. Control shall have manual override that remains in effect until overridden again or until next setpoint is reached.
6. UL and CSA listed.
7. EC70001-PC by Paragon.

B. Acceptable manufacturers: Paragon Electrical Products or equal.

2.08 GAS VENTS

A. Type: Type B double wall gas vent or as required by manufacturer or code.

B. Fabrication: Inner pipe of sheet aluminum [stainless steel], and outer pipe of galvanized sheet steel [stainless steel], tested in compliance with UL 441.

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C. Vent Dampers: Electrically actuated, same size as draft hood collar, constructed of stainless steel or galvanized steel, with corrosion-resistant components, in compliance with ANSI Z21.66.

2.09 NATURAL GAS PIPING AND ACCESSORIES:

A. Piping and tubing shall have a minimum working pressure of 150 psig.

B. Buried below the building and outside within 5 feet of building:
   1. By gas utility.
   2. Steel Pipe: ASTM A53, Schedule 40 black with polyethylene jacket and welded joints.
      a. Piping shall be coated and wrapped with a coal tar primer, two (2) coats coal tar enamel with minimum thickness of 3/32 inch and wrapped in Kraft paper.
      b. Pre-wrapped piping equal to X-Tru PVC coated pipe wrap with PVC Scotch wrap tape joints and fitting may be used in lieu of field coating.
   3. Polyethylene Pipe: ASTM D2513, SDR 11.5, with socket type fittings and fusion welded joints.
   4. Materials and installation shall conform to AWWA C203 requirements.

C. Above ground inside the building:
   1. Steel Pipe: ASTM A53, Schedule 40 black, with malleable iron or forged steel fittings, screwed or welded. Threaded joints shall comply with ASME B1.20.1.
   2. Equipment Connections:
      a. Steel tubing: ASTM A254 or ASTM A539.
      b. Corrugated stainless steel tubing: Tested and listed in compliance with the construction, installation, and performance requirements of ANSI/AGA LC 1.
      c. Tubing joints: Shall be made with approved gas tubing fittings or brazed with a material having a melting point in excess of 1,000^{o} F. Brazing alloys shall not contain more than 0.05% phosphorus.

D. Gas shut-off valves:
   1. Ball valve: bronze body, threaded ends, stainless steel ball, full or conventional port, Teflon seat, blow-proof stem, two-piece construction.
   2. UL listed for use as a gas shut-off.
   3. Acceptable Manufacturers: American Valve, Red-White Valve Corp., or equal.

E. Gas Cocks:
   1. Sizes 1/2 inch to 4 inches: DeZurik Fig. 425 gas valve, cast iron body, screwed or flanged ends, bronze bearings, bronze plug and resilient seal ring for bubble-tight shut-off to 175 psig working pressure.
   2. UL approved for natural gas.
   3. Acceptable manufacturers: Crane, DeZurik, Jenkins, Milwaukee, Nibco, and Walworth.

F. Flexible Connectors:
   1. Corrugated stainless steel hose with single layer of [stainless steel] exterior braiding, minimum 12 inches long with copper tube ends; for maximum working pressure 300 psig.
   2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

G. Pressure Gages:
   1. Gas Pressure Gauge
      a. Trerice No. 660 with 4-1/2 inch face, bronze bushing movement.
   2. Acceptable manufacturers: Kunkle, Taylor, Trerice, or equal.

H. Gas Regulators:
   1. Sizes 3/4 inch to 2 inch: Quick reacting with internal relief for overpressure protection, self-operated regulation with cast iron body, relief, spring steel case, and Nitrile diaphragm.

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2. Regulators shall reduce gas supply line (PSIG) pressure to equipment operating pressure (W.C.). Verify supply line pressure with Gas Utility. Verify equipment operating pressure with manufacturer.
3. Regulator shall have vent limiter. Regulator shall be certified for vent limiter use. Indoor installation only.
4. Gas regulators shall be sized for pressure and flow requirements for all of the equipment it serves.
5. Acceptable manufacturers: Fisher, Leslie, Maxitrol, Nibco and Spence.

2.10 REFRIGERANT PIPING

A. Comply with manufacturer's written installation instructions and as required for warranty.

B. Comply with local building codes.

C. Provide all items for a complete and functional system, including, but not limited to: valves; flanges, unions, couplings; strainers; moisture and liquid indicators; strainers; check valves; pressure relief valves; filter dryers; solenoid valves; expansion valves; receivers; flexible connectors; etc.

D. Pipe Hangers and Supports:
1. Hangers for pipe sizes 1/2 to 1 1/2 inch: Carbon steel, adjustable swivel, split ring.
2. Hangers for cold pipe sizes 2 inches and over: Carbon steel, adjustable, clevis.
3. Hangers for hot pipe sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
4. Multiple or trapeze hangers for pipe sizes to 4 inches: Steel channels with welded spacers and hanger rods.
5. Wall support for pipe sizes to 3 inches: Cast iron hoods.
6. Wall support for pipes sizes 4 inches and over: Steel channels with welded spacers and hanger rods, cast iron roll and stand.
7. Vertical support: Steel riser clamp.
8. Floor support for cold pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Floor support for hot pipe sizes to 4 inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
10. Copper pipe support: Copper-plated, carbon steel ring.

E. Pipes and Tubes:
1. Copper tubing: ASTM B280, Type ACR hard drawn or annealed, wrought copper fittings, silver/phosphorus/copper alloy brazed joints.
2. Copper tubing to 7/8 inch OD: ASTM B88 (ASTM B88M), Type 'K', annealed, cast copper fittings, flared joints.
3. Steel pipe: ASTM A53, Schedule 40, black steel, forged steel welding type fittings, welded joints.

F. Valves:
1. Gate Valves:
   a. Up to 2 inches: Bronze body, bronze trim, non-rising stem, hand wheel, inside screw, double wedge disc, soldered or threaded.
   b. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, solid wedge, flanged or grooved ends.
2. Globe Valves:
   a. Up to 2 Inches: Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable composition disc, solder or threaded ends, with back seating capacity.
   b. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug type disc, flanged ends, renewable seat and disc.
3. Ball Valves:
   a. Up to 2 inches: Bronze or stainless steel one piece body, chrome plated brass ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends.
   b. Over 2 inches: Cast steel flanged body, chrome plated steel ball, Teflon seat and stuffing box seals and lever handle.

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4. Plug Valves:
    a. Up to 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.
    b. Over 2 inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends.
5. Butterfly Valves:
    a. Up To 2 inches: Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, [10-position lever handle.] [infinite position lever handle with memory stop.]
    b. Over 2 inches: Iron body, chrome plated iron disc, resilient replaceable seat, wafer or lug ends, extended neck, 10 position lever handle.
6. Swing Check Valves:
    a. Up to 2 inches: Bronze body and swing disc, solder or threaded ends.
    b. Over 2 inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.
7. Spring Loaded Check Valves:
    a. Iron body, bronze trim with threaded, wafer or flanged ends and stainless steel spring with renewable composition disc

G. Specialties:
1. Flanges, Unions, and Couplings:
    a. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
    b. Grooved and Shouldered Pipe End Couplings: Malleable iron housing, C-shape elastomer composition sealing gasket, steel bolts, nuts, and washers.
    c. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
2. Moisture and Liquid Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator and plastic cap.
3. Diaphragm Packless Valves: UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and hand wheel, stainless steel spring, nylon seat disc, solder or flared ends.
4. Packed Angle Valves: Forged brass [or nickel plated forged steel], forged brass seal caps with copper gasket, rising stem and seat, molded stem packing, solder or flared ends.
5. Packed Ball Valves: Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals.
6. Straight Line or Angle Line Type Strainers: Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass.
7. Straight Line, Non-Cleanable Type Strainers: Steel shell, copper plated fittings and stainless steel wire screen.
8. Globe Type Check Valves: Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc.
9. Straight Through Type Check Valves: Brass body and disc, phosphor bronze or stainless steel spring, neoprene seat.
10. Straight Through or Angle Type Pressure Relief Valves: Brass body and disc, neoprene seat, factory sealed and ASME stamped.
11. Replaceable Cartridge Angle Type Filter Dryers: UL listed brass shell and bronze cap, perforated brass shell and molded desiccant filter core.
12. Permanent Straight Through Type Filter Dryers: UL listed, steel shell with molded desiccant filter core.
13. Solenoid Valves:
    a. Valve: Pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly, with flared, solder, or threaded ends. Furnish stem allowing manual operation in case of coil failure.
    b. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box.
14. Expansion Valves:

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a. Angle or Straight Through Type: Brass body, internal or external equalizer, adjustable super heat setting, replaceable inlet strainer, with replaceable capillary tube and remote sensing bulb well.
b. Selection: Select for maximum load at design operating pressure and minimum 10 degrees F super heat.

15. Receivers: UL listed, steel, with taps for inlet, outlet, and pressure relief valve.
16. Flexible Connectors: Corrugated bronze hose with single layer of exterior braiding, minimum 9 inches long with copper tube ends.

2.11 DUCTWORK

A. Materials:

1. Galvanized Steel Sheet: ASTM A653 Galvanized steel sheet of lock-forming quality. Galvanized coating tube 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90.
2. Polyvinylchloride Coated Steel Sheet: Hot-dipped galvanized steel sheet with prime coat and a polyvinyl chloride film on both sides. Thickness of coating to be a minimum of 4 mils on each side.
   a. Where any duct surface is scratched, marred, or otherwise damaged, paint with PVC aerosol spray.
   b. Couplings shall be slip-join construction with a minimum 2 inches insertion length. Seal all couplings with sealant as specified.
3. Aluminum Ducts: Aluminum sheet, alloy 3003-H14.
4. PVC Ductwork (Chemical Building Only):
   a. Polyvinyl Chloride (PVC) Schedule 80 iron pipe size (IPS) pressure pipe. Material shall be Type I, Grade I Polyvinyl Chloride compound with a cell classification of 12454 per ASTM D1784, approved by NSF International for use with potable water (NSF Std 61). Manufactured in accordance with ASTM D1785. Belled-end pipe shall meet dimensional requirements of ASTM D2672. Pipe shall meet the requirements of NSF Standard 14 and CSA Standard B137.3 and shall bear the mark of these Listing agencies. Pipe shall have Flame Spread rating of 0-25 when tested in accordance with CAN/ULC-S102-2-M88 or equal. Manufactured by an ISO9001 certified manufacturer. Joints shall be solvent-cemented, flanged, unions, or roll grooved couplings.
   b. Polyvinyl Chloride (PVC) SDR Series iron pipe size (IPS) pressure pipe. Material shall be Type I, Grade I Polyvinyl Chloride compound with a cell classification of 12454 per ASTM D1784. Manufactured in accordance with ASTM D2241. Belled-end pipe shall meet dimensional requirements of ASTM D2672. Manufactured by an ISO9001 certified manufacturer. Joints shall be solvent-cemented, flanged, unions, or roll grooved couplings.
5. Sealant (Mastic): Non-hardening, water-based, water resistant, fire resistive, used alone or with tape. UL 181A-M listed / UL 181B-M listed. Suitable for field painting.
6. Duct Joint Sealing Tape: Pressure sensitive duct joint sealer, UL-181B-FX listed, 2.0-mil annealed aluminum foil coated tape, for flexible and sheet metal ducts. Suitable for field painting.
7. Ductwork located in Corrosion and Chemical areas or exposed to air from Corrosion or Chemical areas shall be PVC coated or PVC.
8.

B. Metal Ductwork:

1. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible; except as indicated on Drawings.
2. Construct T's, bends, and elbows with radius of 1 1/2 times the width of the duct on centerline. Where not possible, furnish turning vanes.
3. Increase duct sizes gradually, not exceeding 30 degrees divergence and 45 degrees convergence.

C. Duct Accessories:

1. Volume Control Dampers:
   a. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

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b. Fabricate splitter dampers of material duct gauge to 24 inches size in each direction, and two gages heavier for larger sizes. Secure with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod.
c. Fabricate single blade dampers for duct sizes to 12 inches by 30 inches.
d. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes of 8 inches by 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
e. Except in round ductwork 12 inches and smaller, furnish end bearings.
f. Furnish locking, indicating quadrant regulators on single and multi-blade dampers. Where width exceeds 30 inches, furnish regulator at both ends.

2. Turning Devices and Extractors:
a. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.
b. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap.

3. Flexible Duct Connections:
a. UL listed fire-retardant neoprene coated woven glass fiber to NFPA 90A, approximately 3 inches wide, crimped into metal edging strip.

4. Duct Access Doors:
a. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
b. Access doors smaller than 12 inches square secured with sash locks. Access doors with sheet metal screw fasteners are not acceptable.

5. Back-draft Dampers:
a. Gravity back-draft dampers size 18 inches by 18 inches or smaller, furnished with air moving equipment, furnish of air moving equipment manufacturer's standard construction.
b. Fabricate multi-blade, parallel action gravity balanced back-draft dampers of galvanized steel, or extruded aluminum, with center pivoted blades, with sealed edges, linked together, steel ball bearings, and plated steel pivot pin.

2.12 AIR INLETS AND OUTLETS

A. Furnish inlets and outlets in the type, size, thickness, free area, and static pressure as scheduled on the drawings. See Schedule on Drawings for additional requirements.

B. Exterior Louver:
1. Furnish louver in the size, thickness, free area, and type as scheduled on the drawings.
2. Factory-assembled louver section shall be designed to withstand wind loadings of 25 PSI (100 MPH wind equivalent). Louver frames, mullions, and section joints shall be adequately supported from the building structure to withstand this same wind loading.
3. Louver performance data shall be licensed under the AMCA Certified Ratings Program and shall bear the AMCA Certified Ratings Seal. This certified performance data shall include airflow pressure loss and water penetration.
4. 3030Stationary Non-Drainable Louver with J-Style Blades, 4-inch deep:
a. Design shall incorporate stationary horizontal blades, sloped sill, and high free area.
b. Louvers shall be fabricated from 6063-T5 aluminum extrusions of 0.30 in nominal wall thickness.
c. Blades shall be positioned at 37° and 45° angles on approximate 4-inch centers.
d. Greenheck Model ESJ-401.
5. 30Extended sill.
6. Finish: Kynar 500/Hylar 5000 (70% PVDF), unless noted otherwise. Color shall be selected by Architect from manufacturer's standard colors, minimum of 12 [mill].
7. Options – see Schedules on Drawings:
a. Clip angles
b. Flanged frame
c. Glazing adaptor

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8. Acceptable manufacturers: Aerolite, Arrow United, Cesco, Greenheck, Pottorff, Ruskin, United Enertech, or equal.

C. Supply, Return, Intake, and Exhaust
1. Louvered grilles:
a. Frame: Surface mount border with countersunk screw holes.
b. Finish: Baked enamel - white.
c. Exhaust, Fixed Blades, 3/4-inch spacing:
1) Blades parallel to floor or long direction.
2) Construction: Steel.
a) Price 530 series.
d. Finish: Powder coat or liquid spray coat for corrosion protection.
2. Acceptable Manufacturers: Krueger, Metal Aire, Nailor Industries, Price, Titus, or equal.

2.13 ACTUATED DAMPERS

A. Furnish damper in size, thickness, static pressure, and type as scheduled on drawings. See Schedule on Drawings for additional requirements.

B. All dampers shall be of low leakage design with linkages out of the airstream.

C. Thermally Broken, Insulated Type:
1. Ratings:
a. Dampers to be designed for operation in temperatures ranging between –70 degrees F and 200 degrees F.
b. Air leakage through a 48 inch by 48 inch damper shall not exceed 3-cfm per square foot against 1-inch water gauge or 8-cfm per square foot against 4-inches water gauge differential static pressure at standard air. Standard air leakage data shall be certified under the AMCA certified ratings program and the IECC requirements.
c. Pressure drop of a fully open 48 inch by 48 inch damper shall not exceed 0.03 inch water gauge at 1000 fpm.
d. Damper shall have a maximum velocity rating of 4000-fpm.
e. Damper shall bear the AMCA Certified Ratings Seal for air leakage performance.
2. Frame: Extruded aluminum (6063T5)
a. Damper frame shall be aluminum formed into 5-inch deep by 1-inch hat channel. (ICD-44).
b. Quick connection damper frame shall be aluminum formed into a 4-inch by 1-inch structural hat channel with 0.125-inch minimum wall thickness. (ICD-45).
c. Optional frame types:
1) Channel frame (ICD-45): aluminum formed 5-inch by 1¼-inch structural hat channel.
3. Blades: Extruded aluminum (6063T5) profiles, internally insulated with non-CFC, expanded polyurethane foam and thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.
a. Damper blades shall be heavy gauge extruded aluminum airfoil shape with metal blade to blade overlap. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper.
b. Blade orientation shall be horizontal, and operation shall be parallel or opposed.
c. Polyurethane foam shall fill the airfoil blade cavity. Ends of blade shall have a thermal break to isolate the transfer of heat/cold through the aluminum material from one side of the blade to the other.
d. Blades for chemical areas shall have factory corrosion resistant coating.
4. Blade Stops: Each blade stop (at top and bottom of damper frame) shall occupy no more than ½-inch of the damper opening area to allow for maximum free area and to minimize pressure loss across the damper.
5. Seals:
a. Blade Edge: Silicone blade seals shall be mechanically fastened to each blade.

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b. Jamb Seal:
1) ICD-45: Silicone.

6. Linkage:
a. Concealed in frame out of the airstream, plated steel material. Optional stainless steel.
7. Axles: Minimum 1/2-inch diameter plated steel. Optional stainless steel. Removable control shaft shall extend 6-inches beyond the damper frame.
8. Bearings: Dual bearing with acetal inner sleeve, flanged outer bearing resulting in no metal-to-metal or metal-to-plastic contact.
9. Finish: Mill aluminum is standard for non-corrosive areas. Corrosive areas shall have corrosion resistant finish
10. Mounting: Either vertical or horizontal.
11. Options: Low leakage, thermal insulation shall be provided from the factory upon request.
12. Factory Tests: factory cycle damper and actuator assembly to assure proper operation.
13. Greenheck ICD-44 (thermally broken blades) or Greenheck ICD-45 (thermally broken blades and frame).
14. Acceptable Manufacturers: AlumaVent, Arrow, Greenheck, Ruskin, Tamco, United Enertech, or Ventex. No substitutions.

D. Coating: Chemical resistant coating on dampers in Chemical areas or exposed to air exhausted from Chemical areas.

2.14 PIPE INSULATION

A. Flexible closed cell type as recommended and/or provided unit manufacturer. May be provided as kit with refrigerant piping.

B. Cellular Foam: ASTM C534; flexible, cellular elastomeric, molded or sheet.
1. k (ksi) Value: 0.27 at 75 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor retarder adhesive.

C. Finished Jackets:
1. PVC Plastic: One piece molded type fitting covers and sheet material, off-white color.
a. Thickness: 20 mil, 30 mil for exterior applications.
b. Connections: Brush on welding adhesive.
2. Aluminum: 0.025 inch thick sheet, embossed finish, with longitudinal slip joints and 2 inch laps.
3. Aluminum Cladding: flexible, fabric reinforced insulation cladding, self adhesive, mold inhibited, UL Listed, zero permeability. 13-ply material, aluminum.
a. VentureClad 1579CW-E by Venture Tape, 800-343-1076, www.venturetape.com
4. Fabricated Line Set Cover: PVC. Standard professional grade, durable and UV and weather-resistant; indoor and outdoor. Minimum 3-inch wide, designed to cover line set, wiring, and drainage lines for split air-conditioning systems. Material shall be easily cut for custom configuration and proper fit.
a. Wall cover, coupler, elbow, end cap, mounting hardware, etc.
b. Color: White or brown, paintable. Satin finish.
c. Hide-A-Line Tubing by Breezzone, Fortress by Rectorseal, Cover Guard, or equal.

D. Schedule:
1. Installer's option where more than one type is indicated.
2. Refrigerant Suction:
a. Man Made Mineral Fiber Insulation or Cellular Foam Insulation
b. Thickness as recommended by manufacturer for cold applications. Verify service temperature with unit manufacturer.
c. Jacket: PVC plastic, exterior only with fiberglass insulation.
3. Refrigerant Hot Gas:
a. Man Made Mineral Fiber Insulation or Cellular Foam Insulation

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b. Thickness as recommended by manufacturer for hot applications. Verify service temperature with unit manufacturer.
c. Jacket: PVC plastic, exterior only with fiberglass insulation.

E. Acceptable Manufacturers: Johns Manville, Owens Corning, Pittsburgh Corning Corp., or equal.

2.15 DUCTWORK INSULATION

A. EPDM-Rubber: ASTM C534 Type I and II, ASTM D1056, flexible, closed-cell EPDM-rubber based elastomeric, tube and sheet, UV resistant, indoor/outdoor, mold and fungal growth resistant, paintable.
1. Physical Properties:
a. k Value: 0.245 at 75 degrees F (ASTM C518/C117)
b. Service Temperature (continuous): -297^{O}F to 300^{O}F
c. Water Vapor Permeability: 0.03 perm (ASTM E96)
d. Water Absorption (weight %): 0.2% (ASTM C209)
e. Flame Spread/Smoke Developed Ratings: 25/50, self-extinguishing
2. Acceptable Products:
a. Aerocel by Aeroflex, 423-337-2493, www.aeroflexusa.com

B. Finished Jackets:
1. Aluminum: 0.025-inch thick sheet, embossed finish, with longitudinal slip joints and 2 inch laps.
2. Aluminum Cladding: flexible, fabric reinforced insulation cladding, self-adhesive, mold inhibited, UL Listed, zero permeability. 13-ply material, aluminum.
a. VentureClad 1579CW-E by Venture Tape, 800-343-1076, www.venturetape.com

C. Schedule:
1. Installer's option where more than one type is indicated.
2. All Ductwork:
a. Interior:
1) Insulation: EPDM Rubber: 1 inches thick.
2) Finished Jacket: None
b. Exterior:
1) Insulation: EPDM Rubber: 1 inches thick.
2) Finished Jacket: Aluminum

2.16 PROGRAMMABLE THERMOSTATS

A. Electric solid state microcomputer based room thermostat with remote sensor.
1. Automatic switching from heating to cooling (with modulating heating).
2. Preferential rate control to minimize overshoot and deviation from setpoint.
3. Fan to run continuous during all occupied periods.
4. Override of unoccupied period for timed period from one to four hours.
5. Short cycle protection.
6. Programming based on weekdays, Saturday and Sunday (7-day).
7. Set-up for occupied/unoccupied periods for each day.
8. Selection features including degree F display, 24-hour clock, remote sensor, fan on-auto.
9. Battery replacement without program loss.
10. Thermostat display:
a. Time of day.
b. Actual room temperature.
c. Actual outdoor temperature.
d. Programmed temperature.
e. Programmed time.
f. Duration of timed override.
g. Day of week.
h. System mode indication: heating, occupied, unoccupied, off.

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2.17 CONTROLS

A. Contractor shall be responsible for all automatic electric controls for HVAC equipment as indicated on the Drawings and as described herein.

B. Furnish all motorized dampers, protected relays, interlocks, and transformers as required. Contractor shall mount same in suitable control panels, occupied space, or on equipment as required, specified herein, or shown on drawings. Furnish low voltage relays as required for all fans and motors automatically controlled.

C. Furnish necessary wiring diagrams and be responsible for obtaining proper working installation. Furnish all multi-speed switches and control apparatus.

D. Damper Operators:
   1. Furnish and install commercial quality damper actuators for all dampers requiring operators.
   2. Actuator type, which meet requirements of operation described in the sequence of control.
   3. Furnish proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to seal against maximum system pressures.
   4. Electric Operators: Adjustable stroke motor with spring, having oil immersed gear train.
   5. Acceptable Manufacturer: Belimo. Quick acting type where scheduled.

E. Damper actuators and controls installed in Chemical Areas or exposed to air exhausted from Chemical Areas shall be installed in a NEMA 3R Plastic Enclosure .

F. Damper actuators and controls installed in wash-down areas subject to frequent wetting or mounted exterior to the building shell shall be installed in a NEMA 4 box.

G. Controls located inside the building shall be installed in a NEMA 1 box, unless noted otherwise.

H. Thermostats:
   1. Electric Line Voltage Thermostats:
      a. Snap acting, single pole, single throw, automatic reset switch tripping when thermostat sensed across on 12 inches of bulb length is equal to or below set point.
      b. Where thermostats are used for use with gas unit heaters, they shall be capable of 2 stage heating.

2.18 FLASHING AND TRIM

A. Provide all opening trim as shown on drawings and as required for a complete and weather-tight installation.

2.19 MECHANICAL IDENTIFICATION

A. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have a minimum sheet size with stainless steel spring fastener. Minimum width of 3 inches, to comply with State of Wisconsin Plumbing Code. Color and Lettering: Conform to ASME A13.1 and State of Wisconsin Plumbing Code.
   1. Acceptable Manufacturers: Marking Services Incorporated, Seton Nameplate Corporation, or equal.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum width of 3 inches, to comply with State of Wisconsin Plumbing Code. Color and Lettering: Comply with ASME A13.1 and State of Wisconsin Plumbing Code.
   1. Acceptable Manufacturers: Marking Services Incorporated, Seton Nameplate Corporation, or equal.

D. Valve Tags: Circle shape, minimum 1 1/2 inches diameter, lettering shall be a minimum of 1/2 inch in height.
   1. Material:
      a. Metal: Non-corrosive metal with raised or engraved letters.

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b. Brass.
c. Plastic: Laminated three-layer plastic with engraved black letters on light background color.

1) Acceptable Manufacturers: Marking Services Incorporated, Seton Nameplate Corporation, or equal.

E. Framed, typewritten directory under glass for all valves.

F. All items in Hazardous, Corrosion or Chemical areas shall be Type 316 stainless steel, epoxy coated, plastic, or equal chemical resistance.

2.20 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

B. Formed steel channels:
1. Galvanized 12 gage thick steel with holes 1 1/2 inches on center.
2. Manufacturers: Allied Tube & Conduit Corp., B-Line Systems, Midland Ross Corp., Unistrut Corp., or equal.

C. Provide all supporting steel and related materials not indicated on structural drawings as required for the installation of equipment and materials, including angles, channels, beams and hangers.

D. Prime coat paint all supports.

E. All items in Hazardous areas shall be stainless steel.

F. All items in Corrosion and Chemical areas shall be Type 316 stainless steel, epoxy coated, plastic or equal chemical/corrosion resistance.

PART 3 EXECUTION

3.01 JOB CONDITIONS

A. Section 01 30 00 - Administrative Requirements [01 31 13 - Project Coordination]: Coordination and project conditions.

B. Surface Conditions: Examine the areas and conditions under which the work of this section will be preformed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

C. Cooperate as necessary with other trades in order that all system the work may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum access to each system.

D. Measurements:
1. Field measure existing conditions.
2. Lay out work, properly locate all apparatus, piping, ductwork, equipment, etc. Adjust work, as necessary, to insure that work shall fit into the spaces that have been allotted for such work. Due regard shall be taken for the work of other trades.

E. Proceed as rapidly as the building construction will permit.

F. Start of work means acceptance of existing conditions.

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3.02 ELECTRICAL PROVISIONS

A. Control Wiring:
   1. Exposed low voltage (less than 100 volts) control wiring in connection with work of this section shall be provided and installed under this section in strict accordance with the applicable sections of Division 26.
   2. All control wiring shall be less than 100 volts, unless noted otherwise. If Contractor opts to install control wiring of 100 volts or over, Contractor shall contract with a certified electrical contractor for its installation under this section in strict accordance with the applicable sections of Division 26.

B. Division 26: All line voltage (100 volts and greater) electrical wiring connections. Certain equipment connections have been assumed to be over 100 volts, see Electrical Drawings for equipment and locations.

C. Furnish complete list and location of equipment requiring electrical connections and necessary wiring diagrams to Division 26.

3.03 INSTALLATION - GENERAL

A. Locations: Install all equipment in the locations shown on the drawings, except where specifically otherwise approved on the job by the Owner.
   1. Install all thermostats, switches, and timers 4 feet 0 inch above finished floor.

B. All equipment, as called for on the drawings and herein specified, shall be installed in strict accordance with manufacturer's recommendations.

C. Interferences: Avoid interference with structure, and with work of other trades, preserving adequate headroom and clearing all doors and passage ways.

D. Inspection: Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

E. Section 07 92 00: Caulking around the exterior perimeter of exterior equipment and where called for on the drawings in areas visible after finished construction.

F. General: All valves, volume dampers, equipment, and accessories shall be installed to permit access to equipment for maintenance, servicing, or repairs. Relocation of piping, ducts, or equipment to accomplish equipment access shall be completed by the Contractor, at no additional cost to the Owner.

G. Provide access panels in ductwork at all dampers not accessible from open end of duct.

H. Provide access doors where equipment is located in chases or inaccessible locations. Access panels shall be furnished by the Contractor and installed by the specific trade responsible for the material in which the access panels are installed.

3.04 FLOOR, WALL, ROOF, AND CEILING OPENINGS

A. All openings for work of this section shall be provided under other sections. Openings shall be made as necessary in ceiling, floors, walls, etc., as required to permit the installation of Work specified or shown on the Drawings. Openings shall be made with care to avoid damage which cannot be concealed when work is completed.

B. Provisions for openings and holes and clearances through walls, floors, and ceilings to be made in advance of construction of such parts of the building. Contractor is responsible for the correct size and location of these openings.

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3.05 INSTALLATION - SLEEVES

A. Provide and install sleeves wherever ductwork or piping passes through floors, walls, partitions, etc.

B. Sleeves shall be set and maintained in place during the progress of the work. Set sleeves in position in forms. Set sleeves in place before concrete is placed. Provide reinforcing around sleeves.

C. Sleeves shall be securely fastened in place.

D. Extend sleeves through floors 1 inch above finished floor level.

E. Exterior watertight entries:
   1. Above-grade: Sleeve pipe and seal with caulk.

F. Where duct penetrates wet well, close off space between pipe and sleeve with mechanical sleeve seals.

G. Where ductwork penetrates floor, close off space between sleeve and duct with insulation to within 1/2 inch of top of sleeve. Caulk the space between the sleeve and duct per Section 07 92 00.

H. Where ductwork or piping penetrates floor, ceiling, or wall, close off space between duct or pipe and adjacent work with stuffing, for penetrations through non-rated assemblies, and firestopping, for penetrations through rated assemblies, insulation to within 1/2 inch of wall face.

I. Caulk the space between the sleeve and duct or pipe for all sleeves and penetrations not visible after finished installation at non-rated assemblies.

J. Section 07 92 00: Caulking of all sleeves and penetrations visible after finished installation.

K.

L. Provide close fitting metal collar, escutcheon cover, or plate wherever piping or hanger rods are exposed to view and pass through floor, wall, ceiling, partition, or similar locations. Hold escutcheons in place with set screw.

M. Provide close fitting metal collar wherever duct is exposed to view and passes through ceiling. Hold escutcheons in place with screws.

3.06 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Where concrete slabs from finished ceiling, locate inserts flush with slab surface.

D. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.07 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1 1/2-inch minimum vertical adjustment.

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E. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

F. Support riser piping independently of connected horizontal piping.

G. For copper piping, provide sheet lead packing between hanger or support and piping.

H. Design hangers for pipe movement without disengagement of supported pipe.

I. Prime coat exposed steel hangers and supports. Hangers and supports located in suspended ceiling spaces are not considered exposed.

J. Pipe Hanger Spacing Schedule:

Pipe size:	max. hanger spacing	hanger rod diameter
1/2 to 1-1/4	6’	3/8”
1-1/2 to 2	10’	3/8”
2-1/2 to 3	10’	1/2”

3.08 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping wherever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance to hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Install piping system allowing clearance for insulation and access to valves and fittings.

H. Install identification on piping system including underground piping.

3.09 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install gate, ball, or butterfly valves for shut-off and to isolate equipment.

C. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

3.10 INSTALLATION - FUEL PIPING

A. Install natural gas piping in accordance with NFPA 54.

B. Provide clearance for installation of insulation and access to valves and fittings.

C. Establish elevations of buried piping outside building to provide not less than one (1) foot of cover.

D. Provide support for utility meters in accordance with requirements of utility company.

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E. Pipe vents from gas pressure reducing valves, regulators, and relief vents to outdoors and terminate in weatherproof hood with bug screen.

F. Coated and wrapped gas piping shall be checked with an approved electrical flow detector set to place a minimum of 6,000 volts across the coating film and all defects found shall be repaired.

G. Underfloor piping shall be installed within Schedule 40 PVC conduit at least two pipe sizes larger than gas piping. Conduit shall extend 1 inch above floor.

H. Coordinate relocation of existing gas service and reconnection to existing facility gas piping to avoid interruption of Owners operations.

3.11 INSTALLATION - REFRIGERANT PIPING

A. Install refrigerant piping in accordance with ASME B31.5.

B. Arrange refrigeration piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.4 percent in direction of flow.

C. Flood refrigerant piping system with nitrogen when brazing.

D. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

E. Install line size liquid indicators in main liquid line leaving condenser. When system contains a receiver, install in liquid line leaving receiver.

F. Install line size strainer upstream of each automatic valve. Where multiple expansion valves with integral strainers are used install single main liquid line strainer.

G. On steel piping systems, install strainer in suction line.

H. Install shut-off valve on each side of strainer.

I. Install permanent filter-dryers in low temperature systems and systems using hermetic compressors.

J. Install replaceable cartridge filter-dryers with three-way bypass assembly to allow isolation of dryers for servicing.

K. Install filter-dryers in liquid line adjacent to receivers and for each solenoid valve.

L. Install solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.

M. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

N. Install refrigerant charging valve connections in liquid line between receiver shut-off valve and expansion valve.

O. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft, near compressor connections.

P. Connect inlet and outlet of condensing units and refrigerant condensers to piping.

Q. Fully charge completed system with refrigerant after testing.

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R. Provide electrical connection to solenoid valves.

S. Test refrigeration system in accordance with ASME B31.5.

T. Pressure test system with nitrogen to 200 psig. Test to no leakage.

3.12 INSTALLATION - REFRIGERANT CONDENSING UNITS

A. Install units on rubber in shear or spring isolators.

B. Put system into operation and test equipment performance. Furnish cooling season startup, and winter season shutdown for first year of operation.

3.13 INSTALLATION - DUCTWORK

A. Examination:
1. Verify sizes of equipment connections before fabricating transitions
2. Verify ducts and equipment installation is ready for accessories.
3. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangements.

B. Installation:
1. Install in accordance with State of Wisconsin and Industry Standards.
2. Metal Ducts: Install in accordance with SMACNA Duct Construction Standards - Metal and Flexible.
3. Connect flexible ducts to metal ducts with liquid adhesive plus sheet metal screws.
4. Use crimp joints with or without bead for joining round duct sizes to 8 inches and smaller with crimp in direction of airflow.
5. All ductwork joints shall be sealed, including longitudinal joints. Sealing shall be in compliance with SMACNA Duct Construction Standards and meet requirements of the State of Wisconsin Commercial Mechanical and Energy Conservation Codes.
6. Install flexible connections immediately adjacent to fans and motorized equipment. Install flexible connections specified between fan inlet and discharge ductwork. Prevent flexible connectors being in tension while running.
7. Install back-draft dampers on discharge of exhaust fans, except where actuated dampers are installed, and as indicated on Drawings.
8. Prevent passage of unfiltered air around filters by installing felt, rubber, or neoprene gaskets.
9. Cut openings in ductwork to accommodate thermometers and controllers. Cut pitot tube openings for testing of systems, complete with metal can with spring device or screw to eliminate against air leakage.
10. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities. Apply duct insulation.
11. Connect diffusers to low pressure ducts with 5 feet maximum length of flexible duct. Hold in place with strap or clamp. Flexible duct shall not deflect more than 3 inches.
12. During construction install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
13. Install duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, and elsewhere as indicated on Drawings. Install minimum 8 inch by 8 inch size for hand access, 18 inch by 18 inch for shoulder access.
14. Support terminal units individually from structure. Do not support from adjacent ductwork. Install with minimum of 5 feet of 2 inch thick lined ductwork downstream of unit.
15. Install balancing dampers on duct take-off to diffusers and grilles and registers and louvers, regardless of whether dampers are specified as part of the diffuser, louver, or grille and register assembly.
16. Do not operate fans until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.
17. Paint ductwork visible behind air outlets and inlets matte black in accordance with Section 09 91 00.

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18. Exterior of all non-insulated ductwork and non-finished jacket of insulated ductwork installed exposed within building shall be painted under Division 09.

3.14 INSTALLATION - FANS

A. Install fans with resilient mountings and flexible electrical leads.

B. Install sheaves required for final air balance. Speed controls may be used on direct drive motors for final air balance. Duct mounted balancing dampers may also be used where speed controls and sheave replacement is impractical.

C. Install safety screen where fan inlet or outlet is exposed.

D. Install fans with access to adjustable blade axial fan wheels for varying blade angle setting. Adjust blades for varying range of volume and pressure.

3.15 INSTALLATION - GAS VENTS

A. Install concentric vent kit, as required by manufacturer and as indicated on drawings, as close to the exterior wall as practical.

B. Install vent pipes continuously from appliance to exterior of building.

C. Maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories for complete installation.

D. Install vent dampers, locating close to draft hood collar, and secured to breeching.

E. Completely insulate combustion air intake vent, flue vent, and concentric vent kit to discharge point from building.

F. Install exterior hood per manufacturer's written instructions. Maintain minimum clearances to doors, windows, and intake louvers, and to roof overhang. Maintain minimum distance above roof surface.

3.16 INSTALLATION - FUEL-FIRED HEATERS

A. Install make-up air units from vibration isolators.

B. Install flexible duct connections on inlet and outlet of fuel-fired air units.

C. Install control wiring between unit and remotely mounted control components and thermostats.

3.17 INSTALLATION – CONTROL DAMPERS

A. Install dampers in accordance with manufacturer's Installation Instructions.

B. Dampers must be accessible to allow inspection, adjustment, and replacement of components. The sheet metal contractor shall furnish any access doors or removable section of duct in ductwork or plenums required to provide this access. The general contractor shall furnish any access doors required in walls, ceilings, or other general building construction.

C. Install dampers square and free from racking.

D. The installing contractor shall provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure.

E. Do not compress or stretch the damper frame into the duct or opening.

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F. Attach multiple damper section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required.

G. Handle dampers using the frame or sleeve. Do not lift or move dampers using blades, actuator or jackshaft.

H. Install connections to electric actuators per Division 26.

3.18 INSTALLATION - CONTROLS

A. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

B. Install panels and other hardware in position on permanent walls not subject to excessive vibration.

3.19 TESTING, ADJUSTING, AND BALANCING

A. Examination:
1. Before starting work, verify systems are complete and operable.
2. Report defects, deficiencies, or abnormal conditions in mechanical systems preventing system balance.
3. Beginning of work means acceptance of existing conditions.

B. Installation Tolerances:
1. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent for return and exhaust systems.
2. Air Outlets and Inlets: Adjust to within plus or minus 10 percent of design.
3. Positive, negative, or neutral system design relationship shall be maintained during final balance of system.

C. Air System Procedure:
1. Adjust air handling and distribution systems to deliver design supply, return, and exhaust air quantities within previously stated tolerances.
2. Make air quantity measurements in ducts by traverse of entire cross sectional area of duct.
3. Measure air quantities at air inlets and outlets.
4. Use volume control devices to regulate air quantities only to extent those adjustments do not create objectionable air motion or sound levels. Change volume using dampers mounted in ducts.
5. Vary total system air quantities by adjustment of fan speeds. Provide drive changes to accomplish system air flow, speed controls may be used on direct drive motors where allowed by manufacturer. Vary branch air quantities by damper regulation.
6. Measure static pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Allow for pressure drop equivalent to 50 percent loading of filters.
7. Adjust automatic outside air, return air, and exhaust dampers for design conditions.
8. Measure temperature conditions across outside air, return air, and exhaust air dampers to check leakage.
9. At modulating damper locations, take measurements and balance at extreme conditions.

D. Field Quality Control:
1. Verify recorded data represents actually measured or observed conditions.
2. Permanently mark settings of valves, dampers, or other adjustment devices. Set and lock memory stops.

3.20 MECHANICAL IDENTIFICATION

A. Install adequate marking of exposed accessible HVAC equipment, ductwork and control devices, per ANSI A13.1.

B. Install plastic nameplates with adhesive.

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C. Install tags with corrosion resistant metal chain.

D. Equipment:
   1. Identify all major HVAC equipment with plastic nameplates minimum 1 1/2 inches high. Lettering size and plate length to be sufficient to convey adequate information at each location. Minimum length: 4 inches. Minimum lettering height: 3/8 inch.
   2. Control Equipment: 1 1/2 inch by 4 inch plastic nameplates with 1/4 inch high lettering.

E. Valves:
   1. Tag all valves with tags.
   2. Install valve directory where directed.

F. Piping: Plastic pipe markers or plastic tape pipe markers. Space no farther than 15 feet apart, with a minimum of one marker on each straight section of pipe.

3.21 PAINTING

A. Section 09 91 00 [09 96 00]: Painting of concealed ductwork where indicated and exposed piping, ductwork, and equipment, without factory finish or finished cover.

B. Touch-up all factory finishes damaged during construction.

3.22 CLEANING

A. Equipment: After the equipment has been started and proved operational, carefully clean all accessible parts of each piece of equipment, thoroughly removing all traces of dirt, oil, grease, and other foreign substances.

B. High efficiency furnaces must not operate without adequate filters to prevent plugging secondary coils. Contractor is responsible for cleaning secondary coil, if necessary, prior to turning over to Owner.

3.23 LUBRICATION

A. Upon completion of the work and before turning over to the Owner, clean and lubricate all bearings, except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacturer.

B. Contractor is responsible for maintaining lubrication of all mechanical equipment under his contract until work is accepted by the Owner.

C. Furnish a chart with each piece of equipment listed, itemizing location for lubricant required and recommended periods of lubrication. Incorporate chart in Instruction Manual.

3.24 INSTRUCTIONS

A. Instruct Owner's representative in the operation and maintenance of all mechanical systems.

B. Assemble two (2) complete sets of manufacturer's printed operating and maintenance instructions for all mechanical equipment installed under the contract. Prepare in bound copies with index tabs. Information must include parts list and wiring diagrams. Submit to Engineer for presentation to the Owner.

3.25 CLOSEOUT OPERATIONS

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Closeout provisions.

B. Closeout Equipment/System Operations: Sequence operations properly so that work of the project will not be damaged or endangered. Coordinate with seasonal requirements.

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1. Operate each item of equipment and each item in a test run of appropriate duration with the Owner's operating personnel present to demonstrate sustained, satisfactory performance.
2. Adjust and correct operations as required for proper performance.
3. Clean and lubricate each system, and replace dirty filters, especially worn belts and parts and similar expendable items of the work.

C. Instruction, O&M: Instruct Owner or Owner's personnel in the proper operation and maintenance of the HVAC systems. Train personnel in the setting and scheduling of programmable thermostats for occupied/unoccupied periods.

D. Service Organization: At time of substantial completion, Contractor shall provide Owner with a listing of qualified service organizations, including addresses and telephone numbers, for each piece of major equipment.

E. Turn-Over of Operations: At time of substantial completion, turn over the prime responsibility for operation of HVAC equipment and systems to the Owner's operating personnel. However, during the guarantee period, provide an operating engineer, who is completely familiar with work, to consult with and continue training the Owner's personnel on an as-needed basis.

F. Extra Materials.

G. Record Drawings.

3.26 SEQUENCE OF OPERATION

A. Building 08 – Administration Building:
1. Garage 05-116/05-117:
a. Written Description:
1) Ventilation: System operation shall be controlled by a thermostat, CO/NOX sensor, and occupancy switch.
2) Heating: Heating systems shall be controlled by thermostats.
b. 05-T-1: Interlock system controller with heater 30-GDH-1, 05-SF-1, and 05-EF-1 and associated dampers.
1) Remote wall mounted programmable type.
2) Programmed schedule to meet the Wisconsin Mechanical Code ventilation of 5 hours per every 24 hours of operation.
c. CO/NOx Sensor
1) Sensor shall be set at the following values
a) CO: 35 PPM
b) NOx: 1 PPM
2) When either of these values is met or exceeded, the garage ventilation system shall be activated and operate until the values fall below the sensor deadband.
d. Occupancy Sensor:
1) When the Occupancy Sensor is activated, the garage ventilation system shall be activated and operated until the sensor is no longer activated (minimum 15 minute run time, adj, after activation).
e. 05-EF-1: Interlock control with damper 05-D-1 and damper 05-D-2.
1) Fan ON/OFF shall be by system activation from one of the three methods above.
2) When the system is activated, fan shall turn on and dampers shall open.
3) When switch is turned off, fan shall turn off and dampers shall close.
f. 05-SF-1: Interlock control with damper 05-D-1 and damper 05-D-2.
1) Fan ON/OFF shall be by system activation from one of the three methods above.
2) When the system is activated, fan shall turn on and dampers shall open.
3) When switch is turned off, fan shall turn off and dampers shall close.
g. 05-GDH-1: Control with thermostat 05-T-1 and local controller.

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1) When the inlet air temperature is lower than the supply air temperature setpoint, the unit shall turn on and modulate to maintain the supply air temperature.
2) When the inlet air temperature is higher than the supply air temperature setpoint, the unit shall not run.

h. Dampers:
1) 05-D-1: Interlock with fan 05-EF-1
a) Two-position actuator with NEMA 1 enclosure. Spring open, power closed.
b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.
c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.
2) 05-D-2: Interlock with fan 05-SF-1
a) Two-position actuator with NEMA 1 enclosure. Spring open, power closed.
b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.
c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.

i. Gas Unit Heater Control: Control with local associated thermostat.
1) When thermostat calls for heating, unit shall be activated.
2) When thermostat is satisfied, unit shall be deactivated.
3) Thermostat shall be remote wall mounted heating type thermostat acceptable to unit manufacturer.
4) Set points: minimum 40 degrees F; maximum 75 degrees F.
5) Range: 3 to 5 degrees F.

2. Garage 05-118
a. Gas Unit Heater Control: Control with local associated thermostat.
1) When thermostat calls for heating, unit shall be activated.
2) When thermostat is satisfied, unit shall be deactivated.
3) Thermostat shall be remote wall mounted heating type thermostat acceptable to unit manufacturer.
4) Set points: minimum 40 degrees F; maximum 75 degrees F.
5) Range: 3 to 5 degrees F.

3. Lab 05-105
a. Maintain existing control for new exhaust fan.

4. Toilet 05-106
a. Maintain existing control for new exhaust fan.

B. Building 30 – Chemical Building:
1. Chemical Building:
a. Written Description:
1) Ventilation: System operation shall be controlled by a manual switch.
2) Heating: Existing systems shall be controlled by existing thermostats.

b. 30-EF-1: Interlock control with damper 30-D-1 and damper 30-D-2.
1) Fan ON/OFF shall be by manual switch provided by Division 26.
2) When switch is turned on, fan shall turn on and dampers shall open.
3) When switch is turned off, fan shall turn off and dampers shall close.

c. 30-GUH-1: Control with thermostat 30-T-1.
1) When thermostat calls for heating, unit shall be activated.
2) When thermostat is satisfied, unit shall be deactivated.

d. Existing electric unit heaters: Control with existing thermostats.
1) Fan and heating sequence shall match existing.

e. Dampers:
1) 30-D-1: Interlock with fan 30-EF-1
a) Two-position actuator with NEMA 3R enclosure. Spring open, power closed.
b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.

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c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.

2) 30-D-2: Interlock with fan 30-EF-1
   a) Two-position actuator with NEMA 4X enclosure. Spring open, power closed.
   b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.
   c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.

3.27 SCHEDULE OF MECHANICAL IDENTIFICATION

A. Identification shall be mounted on equipment or on wall directly above controls, unless noted otherwise.

B. Identification shall match unit tags as called out on drawings and drawing schedules.

END OF SECTION

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SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. COMMON WORK RESULTS FOR ELECTRICAL.

B. Common Work Results for Electrical shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
   1. Common Work Results for Electrical, Lump Sum. When so provided, payment for Common Work Results for Electrical shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
   2. Common Work Results for Electrical, Inclusive. When no quantity is provided, Common Work Results for Electrical shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable electrical systems as indicated on the drawings and as specified herein.

B. Design Requirements:
   1. The table included in this section under Hardware Design Requirements specifies the usage requirements for the hardware and equipment specified in the following sections:
      a. Section 26 05 29 Hangers and Supports for Electrical Systems.
      b. Section 26 05 34 Conduit.
      c. Section 26 05 35 Boxes.

C. Electrical Work Specified Elsewhere:
   1. Every attempt has been made to indicate in these specifications and drawings all work required under Division 26. However, there may be additional specific requirements in the specifications, drawings, or addenda of other trades which pertain to the work of this trade, and any such requirements are hereby made a part of the requirements for this trade.

D. Design Intent:
   1. The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.
   2. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or Drawings, the Contractor shall furnish the item, system, or workmanship that is the highest quality, largest, or most closely fits the design intent.

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3. Refer to the General Conditions of the Contract for further clarification of Design Intent.
4. The details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
5. All sizes as given are minimum except as noted.
6. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to inspections, tests and approval from the commencement until the acceptance of the completed work.
7. Electrical requirements for equipment are based on design data. It shall be the responsibility of the Contractor to verify actual requirements with the provider of the equipment and adjust electrical installation based upon actual requirements.

E. Substitution of Materials:
1. Refer to General Conditions of the Contract.
2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the specified performance from the system into which these items are placed.

F. Continuity Of Existing Services And Systems:
1. No outages shall be permitted on existing systems except at the time and during the interval specified by the Owner and the Engineer. Any outage must be scheduled when the interruption causes the least interference with normal schedules and routines. No extra costs will be paid to the Contractor for such outages that must occur outside of regular weekly working hours.
2. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

1.05 RELATED SECTIONS

A. Common Work Results for Electrical are applicable to all Division 26 sections.

1.06 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submittal Requirements for Division 26 Shop Drawings:
1. Submit individual shop drawings for each section requiring submittal.
2. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents.
3. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered or controlled equipment.
4. Clearly notate any exceptions taken to these specifications.
5. Do not release equipment for construction until submittal has been reviewed.
6. Failure to comply with these requirements does not relieve the Contractor of responsibility for meeting the project schedule.

C. Review of shop drawings constitutes acceptance of general design only and will not release the Contractor for fulfilling the terms and intent of the contract documents.

D. Costs of Review of Shop Drawing Submittals. The Owner shall be responsible for the cost of Engineer's review of shop drawing submittals. However, if shop drawings for any individual part of the work are rejected or returned to the Contractor for additional information, all cost for subsequent shop drawing review shall be borne by the Contractor.

E. Shop Drawings shall be prepared and submitted for the following work:
1. Lighting - See Fixture Schedule on drawings.
2. Section 26 05 19 - Building Wire and Cable.
3. Section 26 05 29 - Hangers and Supports for Electrical Systems.

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4. Section 26 05 34 - Conduit for Electrical Systems.
5. Section 26 05 35 - Boxes for Electrical Systems.
6. Section 26 05 41 - Wiring Devices.
7. Section 26 05 75 - Electrical Systems Analysis.
8. Section 26 24 16 - Panelboards.
9. Section 26 28 19 - Enclosed Switches.
10. Section 26 43 00 - Surge Protection Devices.
11. Section 26 90 00 - Process Instrumentation & Control.

1.07 FACTORY TESTING

A. Refer to the requirements the individual technical sections.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submittal Requirements for Division 26 Operation & Maintenance Manuals and Instructions:
1. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:
a. Copies of as-built submittals.
b. Wiring diagrams for electrically powered or controlled equipment.
c. Records of tests performed to certify compliance with system requirements.
d. Certificates of inspection by regulatory agencies.
e. Parts lists for manufactured equipment.
f. Preventive maintenance recommendations.
g. Warranties.
h. Additional information as indicated in the technical specification sections.
i. Test Reports and Demonstration Log:
1) Permanently record checks and tests and demonstrations.
2) Submit copy of complete testing or demonstration report no later than 30 days after testing or demonstration is complete.

C. Operation & Maintenance Manuals and Instructions shall be prepared and submitted for the following equipment:
1. Section 26 24 16 - Panelboards.
2. Section 26 90 00 - Process Instrumentation & Control.

1.09 QUALITY ASSURANCE

A. All work and materials shall conform to or exceed in every detail the applicable rules and requirements of the Wisconsin State Electrical Code Volumes 1 and 2, the National Electrical Code (ANSI/NFPA 70), other applicable National Fire Protection Association standards, the National Electrical Safety Code, and present manufacturing standards (including NEMA).

B. All work shall be performed under the direction of a State of Wisconsin Licensed Master Electrician.

C. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled.

D. The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:
1. Underwriters Laboratories Inc.
2. Electrical Testing Laboratories, Inc.

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E. Certificates And Inspections:
1. Refer to the General Conditions of the Contract.
2. Obtain and pay for all required inspections including but not limited to state or local electrical inspections and fuel tank inspections. Deliver original inspection certificates to the Engineer.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

1.11 DESIGN REQUIREMENTS

A. The following table specifies the usage requirements for the hardware and equipment specified in the following sections:
1. Section 26 05 29 Hangers and Supports for Electrical Systems.
2. Section 26 05 34 Conduit for Electrical Systems.
3. Section 26 05 35 Boxes for Electrical Systems.

HARDWARE USAGE REQUIREMENTS

ATMOSPHERE	CONSTRUCTION	CONDUIT	HARDWARE	BOXES	KEY NOTES
General, Dry, Existing Construction	Exposed	RMCS/RMCA	Galv.	NEMA 1	
General, Damp, Existing Construction	Exposed	RMCS/RMCA	SS	NEMA 4	
General, Wet, Existing Construction	Exposed	RMCS/RMCA	SS	NEMA 4	2
Corrosive, Damp, Existing Construction	Exposed	RNC	SS	NEMA 4X	
Hazardous (CII, D2), Damp, Existing Construction	Exposed	RMCS	SS	NEMA 4X	
Underground, Wet, Existing Construction	Direct-Buried	RNC	N/A	N/A	1

GENERAL NOTES:

1. "General, Wet, Existing Construction" environment classification shall be applied to exterior above grade spaces and assumed for any unlisted space and for all spaces depicted where no environment classification schedule is present on the plans. Clarification on required environment classifications for these spaces shall be obtained from engineer prior to conduit installation.

KEY NOTES:

1. Provide RMCS conduit for low voltage shielded wiring and Intrinsically Safe circuits.
2. Applies to all exterior above-grade conduits, except conduits in hazardous areas, and extending one foot below grade.

PART 2 PRODUCTS

2.01 ACCESS PANELS AND DOORS

A. Lay-in Ceilings:
1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration are sufficient; no additional access provisions are required unless specifically indicated.

B. Drywall and Plaster Walls and Ceilings:
1. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers and similar wet areas, concealed hinges, screwdriver operated cam latch for general application, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needed service; minimum size is 12 x 12 inch.

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2.02 SEALING AND FIRE-STOPPING

A. Refer to Architectural requirements.

B. Sealing and fire stopping of sleeves/openings between conduits, cable trays, wire ways, troughs, cable bus, bus duct, etc. and the structural or partition opening shall be the responsibility of the Contractor whose work penetrates the opening. Individuals skilled in such work shall perform the sealing and fire stopping.

C. Whenever possible, avoid penetrations of fire and smoke rated partitions. When they cannot be avoided, verify that sufficient space is available for the penetration to be effectively fire and smoke stopped.

D. Manufacturers:
   1. 3M, STI/SpecSeal, Tremco, or approved equal.
   2. The same manufacturer shall provide all fire stopping systems.
   3. The Contractor will be responsible for selecting the appropriate UL tested fire stop system for each application required on the project.

E. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

F. Contractor shall use fire stop putty, caulk sealant, intumescent wrap strips, intumescent fire stop collars, fire stop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

2.03 NON-RATED PENETRATIONS

A. Conduit Penetrations Through Below Grade Walls:
   1. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated conduit and the cored opening or a water-stop type wall sleeve.

B. Conduit and Cable Tray Penetrations:
   1. At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. The Contractor shall obtain from the appropriate trades and review shop drawings for all equipment requiring electrical connections.

B. Field verify all measurements. Do not base electrical installation or equipment locations on the contract drawings.

C. Identify conflicts with the work of other trades prior to installation of electrical system.

D. Electrical installation shall be based upon shop drawing requirements and field verified measurements. Adjust electrical system installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept electrical equipment on site. Inspect for damage.

B. Protect electrical equipment from weather, corrosion, and entrance of debris.

3.03 INSTALLATION

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A. Excavation And Backfill:
   1. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with other sections of this specification.

B. Concrete Work:
   1. Coordinate the quantity and location of all cast-in-place concrete work with the architectural drawings.
   2. All cast-in-place concrete will be performed by the General Contractor unless noted otherwise. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

C. Cutting And Patching:
   1. Cutting and patching shall be performed in accordance with the requirements for architectural work. Refer to other sections of these specifications.

D. Building Access:
   1. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this Contractor, restore any opening to its original condition after the apparatus has been brought into the building.

E. Equipment Access:
   1. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish access doors and arrange for installation bt appropriate trades.

F. Working Clearances:
   1. Minimum installed equipment working clearances as required by the NEC shall be maintained.
   2. Minimum required dedicated electrical equipment space as required by the NEC shall be maintained.
   3. Coordinate these requirements with the work of other trades.
   4. Identify conflicts with working space requirements prior to installation of equipment.

G. Coordination:
   1. Cooperate with other trades in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the Owner. The Contractor shall check location of electrical outlets with respect to other installations before installing.
   2. Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, light fixtures, panel boards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.
   3. Coordinate all work prior to installation. Any installed work that is not coordinated and that interferes with the work of another trade shall be removed or relocated at no additional cost to the Owner.
   4. Verify the integrity of fire or smoke ratings where penetrations are required.

H. Sleeves:
   1. Process Equipment Areas:
      a. New poured concrete construction: cast in place, Schedule 40, PVC sleeve.
      b. All other construction: core drill sleeve openings large enough to insert Schedule 40 PVC sleeve and grout around the sleeve.
      c. Floor penetrations:
         1) Extend top of sleeve two inches above the floor.
         2) Where installation of sleeve in floor is not practical, provide two inch deep housekeeping pad extending three inches around cast in place conduits.
   2. Non-Process Equipment Areas:
      a. Hollow walls: Schedule 40, PVC sleeves, grout around sleeve in masonry construction.

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b. All other Areas: core drill sleeve openings large enough to insert Schedule 40 PVC sleeve and utilize the core drilled opening as the sleeve.

3. Conduit Support:
   a. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to the floor structure.

I. Sealing And Firestopping:
1. Fire and/or Smoke Penetrations:
   a. Install approved product in accordance with the manufacturer's instructions where a pipe (i.e. cable tray, bus, cable bus, conduit, wire way, trough, etc.) penetrates a fire rated surface.
   b. Where fire stop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Fire stop mortar alone is not adequate to support any substantial weight.
2. Non-Rated Surfaces:
   a. When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approved type of material.
   b. Install escutcheons or floor/ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.
   c. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the conduit and tighten in place, in accordance with the manufacturer's instructions.
   d. At interior partitions, conduit penetrations are required to be sealed for all areas. Apply sealant to both sides of the penetration in such a manner that the annular space between the conduit sleeve and the conduit is completely filled.

J. Housekeeping and Clean-up.
1. On a daily basis, clean up and remove all debris and rubbish resulting from work and repair all damage to new and existing equipment resulting from work.
2. Remove all tools, excess material, and unused equipment from the site when job is complete.

K. General Inspection and Cleaning of Electrical Equipment.
1. Inspect for physical damage and abnormal mechanical or electrical conditions.
2. Any item found to be out of tolerance, or in any other way defective as a result of the required testing, shall be reported to the Engineer. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.
3. Compare equipment nameplate information with the Contract Drawings and report any discrepancies.
4. Verify proper auxiliary device operation and indicators.
5. Check tightness of accessible bolted electrical joints. Use torque wrench method.
6. Make a close examination of equipment and remove any shipping brackets, insulation, packing, etc. that may not have been removed during original installation.
7. Make a close examination of equipment and remove any dirt or other forms of debris that may have collected in existing equipment or in new equipment during installation.
8. Vacuum inside of panelboards, switchboards, switchgear, transformer core and coils, horizontal and vertical busducts, MCC's, control panels, and any other similar equipment.
9. Clean All Equipment:
   a. Loosen attached particles and vacuum them away.
   b. Remove any remaining packing material adhesives with suitable cleaning solution.
   c. Touch-up factory applied finishes damaged during installation using manufacturer approved means to match original finish.

3.04 TESTING AND START-UP SERVICES

A. Megger Testing
1. Insulation System - Perform the following on all existing to remain motor branch-circuit conductors on variable frequency drive motor control applications, or where indicated on the plans, to insure

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integrity of the cable insulation system. Reconnect existing motor branch-circuit conductors which pass Megger Testing. Any extension of the existing conductors for termination in the new motor controller equipment shall be incidental to the project. Refer to Section 01 21 00 Allowances - Motor Branch-Circuit Conductor Replacement.

2. Visually inspect visible portion of cables for observable defects.
3. Ensure all solid-state devices are disconnected from the system prior to Megger testing. Typical solid-state devices, but not all-inclusive, would be Meters, trip units with voltage sensing, and TVSS units. Isolate cables by opening breakers. Megger testing through equipment like motors or transformers will produce erroneous readings.
4. Perform insulation-resistance tests on each line and load cable, phase-to-phase, phase-to-ground, phase-to-neutral, and neutral-to-ground in each conduit. Megger at 1000 VDC for 600 volt cable and 500 VDC for 300 volt cable for one minute.
5. Insulation resistance shall be above 100 ohms and preferably above one megaohm.
6. Ensure cable termination connections are tight after testing.

B. Refer to the individual technical sections for additional requirements.

3.05 TRAINING

A. Refer to the requirements the individual technical sections.

END OF SECTION

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SECTION 26 05 05
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Minor Electrical Demolition.
   1. Minor Electrical Demolition shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Minor Electrical Demolition, Lump Sum. When so provided, payment for Minor Electrical Demolition shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Minor Electrical Demolition, Inclusive. When no quantity is provided, Minor Electrical Demolition shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.

1.04 DESCRIPTION OF WORK

A. Furnish labor and materials to demolish and remodel existing electrical systems as indicated on the drawings and as specified herein.

B. Design Intent:
   1. Every effort has been made to identify major demolition and remodeling work required as part of this project. There may, however be minor work items not specifically identified for demolition or remodeling.
   2. The Contractor shall thoroughly review the demolition drawings and shall include work associated with demolition and remodeling of minor items such as receptacles, exit lights, and control stations affected by the work shown on the demolition drawings.
   3. Because of the demolition and remodeling work required as part of this project, the Contractor is required to investigate the extent of work on site prior to bidding. Failure to perform this investigation will not relieve the Contractor of responsibility for demolition and remodeling of the minor work items described.

C. Construction Methods:
   1. Where detailed construction methods are identified for demolition and remodeling of electrical equipment (for example, methods for implementing service change), it is not intended that the methods proposed be the only acceptable methods for completing the work. The Contractor is encouraged to investigate and propose alternate methods which simplify the work.
   2. Alternate methods shall be reviewed by the Engineer prior to commencing the work.
   3. Only alternate methods which adequately accomplish the goals of the specified methods will be allowed.

1.05 RELATED SECTIONS

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A. Architectural, structural, equipment, and mechanical demolition work as indicated on the drawings is related to electrical demolition and remodeling, but is not included under the scope of this section.

1.06 SUBMITTALS - NOT USED

1.07 FACTORY TESTING - NOT USED

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.09 QUALITY ASSURANCE

A. All materials and labor required under this section shall be compatible with existing equipment and conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base electrical installation or equipment locations on the contract drawings.

B. Verify all circuiting arrangements.

C. Verify that abandoned wiring and equipment serve only abandoned facilities.

D. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Engineer before disturbing existing installation.

E. The Contractor shall review demolition drawings and existing conditions for the extent of demolition work required.

F. Commencement of demolition work indicates that Contractor accepts existing conditions and fully comprehends the extent of demolition work.

3.02 DELIVERY, STORAGE, AND HANDLING- NOT USED

3.03 PREPARATION

A. Identify existing electrical equipment which is to be removed.

B. Identify existing electrical equipment which is to remain but will be affected by demolition or new construction work.

C. Identify existing equipment which is to be removed and which the Owner wishes to retain. Owner shall have first right to all removed equipment not specifically being re-used. If Owner retains equipment, Contractor shall transport to designated storage facility located on site. If Owner refuses equipment, Contractor shall be responsible for disposal.

D. Identify damaged or inoperable existing equipment prior to performing work.

E. Maintain access to existing electrical installations, which are to remain active.

F. Utilize materials and methods compatible with existing electrical installations. Verify existing requirements for compatibility.

3.04 GENERAL DEMOLITION OF ELECTRICAL WORK

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A. Demolition of Electrical Work, Structure Modified:
   1. This paragraph defines requirements for electrical demolition where the surfaces or areas containing the work are to be removed.
   2. Disconnect electrical equipment which is to be removed.
   3. Remove surface mounted and free-standing electrical equipment.
   4. Remove existing wiring to source of supply.
   5. Remove surface mounted conduits and raceways.
   6. Disconnect concealed conduits from equipment which is to remain.
   7. Concealed conduits may be removed with structure which is to be removed.
   8. Transport Owner retained equipment to on-site location as directed by Owner.
   9. Dispose of all other removed equipment.

B. Demolition of Electrical Work, Structure Not Modified:
   1. This paragraph defines requirements for electrical demolition where the surfaces or areas containing the work are to remain.
   2. Disconnect electrical equipment which is to be removed.
   3. Remove surface mounted and free-standing electrical equipment.
   4. Remove existing wiring to source of supply.
   5. Remove surface mounted conduits and raceways.
   6. Concealed conduit which is abandoned shall be cut flush with walls and floors. Patch surfaces to match existing finish.
   7. Transport Owner retained equipment to on-site location as directed by Owner.
   8. Dispose of all other removed equipment.

3.05 GENERAL REMODELING OF ELECTRICAL WORK

A. Reconnection of Electrical Equipment.
   1. This paragraph defines requirements for electrical remodeling where the conduit and/or conductors connecting existing equipment must be replaced because of remodeling work in the area.
   2. Thoroughly investigate existing wiring and conduit to determine requirements for reconnection.
   3. Provide temporary wiring and connections to maintain existing systems in service during construction. Minimize and coordinate necessary outages with the Owner. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
   4. Install new conduit and/or wiring as indicated to maintain existing operational characteristics or to provide new operational characteristics.
   5. Demolish abandoned conduit and wiring as described above.
   6. Remove temporary work upon completion of the permanent work.

B. Relocation of Electrical Equipment.
   1. This paragraph defines requirements for electrical remodeling where the existing equipment must be removed and re-installed in a new location and new conduit and conductors must be provided to reconnect the equipment.
   2. Thoroughly investigate existing wiring and conduit to determine requirements for reconnection.
   3. Provide temporary wiring and connections to maintain existing systems in service during construction. Minimize and coordinate necessary outages with the Owner. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
   4. Remove equipment which is to be relocated.
   5. Install equipment in designated new location.
   6. Install new conduit and wiring as indicated to maintain existing operational characteristics or to provide new operational characteristics.
   7. Demolish abandoned conduit and wiring as described above.
   8. Remove temporary work upon completion of the permanent work.

3.06 PROJECT SPECIFIC SEQUENCE OF CONSTRUCTION

A. A proposed construction phasing sequence is identified in Division 01 of these specifications.

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B. The Electrical Contractor must note the critical nature of the timing for the work involved in this project and coordinate appropriately with his equipment suppliers.

C. In particular, the requirements for shop drawing submittals, approvals, and equipment deliveries are critical to the successful completion of the project work.

D. Portions of the Electrical Work specified herein directly impact the general construction work and must be completed prior to commencement of work in areas of the plant in order to maintain operation of the facility. Refer to the suggested sequence of construction identified on the overall one-line diagram.

3.07 CLEANING, PATCHING, AND REPAIR

A. Repair existing construction and finishes damaged during demolition and remodeling work. Refer to architectural specifications for patching requirements. Any damaged construction shall be repaired to match the finished, surrounding surfaces.

B. Clean and repair existing materials and equipment, which remain or are to be reused.

C. Clean exposed surfaces and check tightness of electrical connections.

D. Replace electrical equipment damaged during construction.

E. Remove construction debris from all electrical enclosures.

3.08 TESTING AND START-UP SERVICES - NOT USED

3.09 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 19
BUILDING WIRE AND CABLE

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Building Wire and Cable:
   1. Building Wire and Cable shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Building Wire and Cable, Lump Sum. When so provided, payment for Building Wire and Cable shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Building Wire and Cable, Inclusive. When no quantity is provided, Building Wire and Cable shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. ASTM International, originally known as the American Society for Testing and Materials, Specifications and Standards, current edition:
      a. ASTM B800-05 Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes-Annealed and Intermediate Tempers.
      b. ASTM B801-99 Standard Specification for Concentric-Lay- Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation.
   3. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
   4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.
      a. U.L. 44 - Rubber-Insulated Wires and Cables.
      b. U.L. 50 - Enclosures for Electrical Equipment.
      c. U.L. 83 - Thermoplastic-Insulated Wires.
      d. U.L. 514B - Conduit, Tubing, and Cable Fittings.
      e. U.L. 758 - 105 degree C Appliance Wiring Materials.
      f. U.L. 854 - Service Entrance Cables.
      g. U.L. 1063 - Machine-Tool Wires and Cables.
      h. U.L. 1277 - Type TC Power and Control Tray Cables.
      i. U.L. 1569 - Metal-Clad Cables.
      j. UL 1581 - Vertical Tray.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable wire and cable systems as indicated on the drawings and as specified herein.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. The following information shall be submitted specifically for wire and cable:
   1. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.

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2. Clearly identify the types of wire and cable proposed.

1.06 QUALITY ASSURANCE

A. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

B. Wire and cable manufacturers shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development and production in accordance with ISO 9001.

C. All materials, equipment, and parts shall be new and unused of current manufacture.

D. Contractor shall be responsible for providing all necessary accessories required for a complete and operable system.

PART 2 PRODUCTS

2.01 WIRE AND CABLE - GENERAL PURPOSE (600V, COPPER)

A. Manufacturer: Contractor option.

B. General:
1. THWN/THHN general purpose building wire insulated with polyvinyl chloride (PVC) and covered with protective sheath of nylon intended for lighting and power circuits at 600 volts or less, in residential, commercial and industrial buildings.
2. The wire shall be suitable for 90 degree C maximum continuous conductor temperature in dry locations and 75 degree C in wet locations and listed by Underwriters Laboratories for use in accordance with the National Electrical Code.

C. Conductors:
1. Class B or Class C stranded, annealed uncoated copper per UL Standard 83 or 1063.

D. Insulation:
1. Each conductor shall be insulated with PVC and sheathed with nylon complying with the requirements of UL Standard 83 for Types THHN/THWN and UL Standard 1063 for Type MTW and CSA C22.2 No. 75 for T90 Nylon.
2. Types THWN/THHN shall comply with the optional Gasoline and Oil Resistant rating of UL Standard 83. The insulation shall also comply with UL requirements for 105 degree C Appliance Wiring Material.
3. The average thickness of PVC insulation, for a given conductor size, shall be as specified in UL Standard 83 for Types THWN or THHN. The minimum thickness at any point, of the PVC insulation, shall be not less than 90 percent of the specified average thickness.
4. The minimum thickness at any point of the nylon sheath shall be as specified in UL Standard 83 for Types THWN or THHN.
5. The PVC insulation shall be applied tightly to the conductor and shall be free-stripping.

E. Identification:
1. The wire shall be identified by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, type designations and optional ratings. The wire shall also be identified as C(UL) Type T90 Nylon or TWN75, FT1.

F. Tests:
1. Wire shall be tested in accordance with the requirements of UL Standard 83 for Types THWN or THHN wire and for the optional Gasoline and Oil Resistant listings; as Type MTW to UL Standard 1063 (stranded items); as AWM to UL Standard 758 (stranded items); and as C(UL) Type T90 Nylon or TWN75.

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G. Usage:
1. General use power wiring, minimum size No.12 AWG.
2. General use control wiring, minimum size No.14 AWG.

2.02 WIRE AND CABLE - UNDERGROUND IN CONDUIT OR DUCTBANK (600V)

A. General:
1. XHHW-2 or RHH, cross linked polyethylene insulated cables for use in circuits not exceeding 600 volts. Cables listed by UL and recognized for underground use in wet locations at a maximum continuous conductor temperature of 90°C in accordance with Article 338 of the National Electric Code.
2. UL listed as Type RHH or RHW-2 for general purpose wiring applications at maximum continuous conductor temperature of 90°C in dry locations (RHH) or 90°C in wet or dry locations (RHW-2).
3. Installed in air, conduit, or other recognized raceways in accordance with Article 310 of the National Electric Code.

B. Conductors:
1. Conductors shall be Class B stranded annealed uncoated copper per UL Standard 854 and 44.
2. A suitable separator over the conductor may be used at the option of the manufacturer.

C. Insulation:
1. Each conductor shall be insulated by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, and type designations.

D. Tests:
1. Wire shall be tested in accordance with the requirements of UL Standard 8654 for Type USE-2, UL Standard 44 for Types XHHW-2, RHW-2 or RHH.

E. Usage:
1. Underground power wiring, minimum size No. 12 AWG.

2.03 SHIELDED POWER CABLE (600V)

A. Manufacturer: Contractor option.

B. General:
1. Three conductor type TC Tray Cable insulated with cross linked polyethylene and PVC jacket overall, for use on circuits rated 600 volts and 90 degree C maximum continuous conductor temperature in wet or dry locations.
2. Cables approved for installation in cable trays in accordance with the NEC and for installation in air, in ducts or conduits, in tray or trough, in open wiring or direct buried.

C. Conductors:
1. Shall be Class B stranded uncoated soft copper.
2. Suitable separator over the conductor may be used at the option of the manufacturer.
3. Three phase conductors shall be cabled together with a Class B stranded, uncoated copper grounding conductor and suitable non-hygroscopic fillers to make round.
4. Length of lay shall not exceed 35 times the phase conductor diameter.
5. The grounding conductor shall comply with the requirements of UL Standard 1277.
6. The cable assembly shall be covered with a copper tape shield with drain wire, applied with a 10 percent minimum lap.

D. Insulation:
1. Each phase conductor shall be insulated with chemically cross linked polyethylene, meeting Type XHHW-2 requirements of Underwriters Laboratories.
2. The average thickness of insulation shall be as specified in UL Standard 44 for Type XHHW-2 conductors. The minimum thickness at any point shall be not less than 90 percent of the specified average thickness.

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3. The insulated phase conductors shall be black in color and shall be printed with the numerals "1", "2", and "3" on their surface.
4. Each cable shall have a PVC protective jacket applied over the taped assembly. The jacket shall meet the Sunlight Resistant requirements of UL Standard 1277.
5. The average jacket thickness shall be in accordance with UL Standard 1277. The minimum thickness at any point shall be not less than 80 percent of the specified average thickness.

E. Identification:
1. Cables shall be identified by means of surface ink printing indicating manufacturer, number of conductors, size, voltage rating, and required UL information.

F. Tests:
1. Individual conductors and completed cables shall be tested in accordance with UL requirements for Type TC Power Control Tray Cables having XHHW-2 conductors.
2. Cables shall be capable of passing the ribbon burner cable tray flame test requirements of UL and IEEE.

G. Usage:
1. Power wiring for motor loads controlled by adjustable frequency drives, where so indicated on the drawings.

2.04 SHIELDED INSTRUMENTATION CABLE (300V)

A. Manufacturer: CONTRACTOR option.

B. General:
1. Power limited tray cable - two conductor, No.16 AWG (7x24) bare copper, PVC insulation, overall shield with No.18 AWG (7x26) tinned copper drain wire, PVC jacket with nylon ripcord.

C. Electrical Characteristics:
1. Max. Operating voltage: 300Vrms.
2. Conductor DC resistance at 20 deg. C: 3.7 Ohms/1000 ft.
3. Shield DC resistance at 20 degrees C: 5.1 Ohms/1000 ft.
4. Capacitance between conductors at 1 kHz: 61 pF/ft.
5. Capacitance between conductor and shield at 1 kHz: 114 pF/ft.
6. Inductance: 0.19 uH/ft.

D. Physical Characteristics:
1. Temperature rating: -30 to 105 degrees C.
2. Insulation material: PVC.
3. Average insulation thickness: 0.016-in.
4. Jacket material: Sun resistant PVC.
5. Jacket thickness: 0.037-in. nominal.
6. Shield: Aluminum/Polyester, 100 percent coverage.
7. Overall lay length: 2-in. (6 twists/ft).
8. Maximum pulling tension: 94 lbs.
9. Minimum bend radius: 2.6-in.
10. Flame resistance: UL 1581 vertical tray.

E. Usage:
1. Instrumentation cable.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base electrical installation or equipment locations on the contract drawings.

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B. Identify conflicts with the work of other trades prior to installation of electrical system.

C. Adjust electrical system installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept electrical equipment on site. Inspect for damage.

B. Protect electrical equipment from weather, corrosion, and entrance of debris.

3.03 INSTALLATION

A. Pre-Installation:
1. Verify that interior of building has been protected from weather.
2. Verify that mechanical work likely to damage wire has been completed.
3. Completely and thoroughly swab raceway prior to installation.
4. Verify that field measurements are as shown on drawings.
5. Wire and cable routing shown on drawings is approximate unless dimensioned. Route wire and cable to satisfy project conditions.
6. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.
7. Determine required separation between cable and other work.
8. Determine cable routing to avoid interference with other work.
9. Any single conduit or raceway utilized for a feeder circuit shall contain only power conductors of a single feeder circuit. Do not combine feeder circuits without engineer's written approval.
10. Contract drawings indicate individual homerun equipment connections.
11. Contractor may combine branch circuits of common types in single conduits provided the following conditions are met:
    a. NEC requirements for conductor de-rating are satisfied.
    b. Conduit fill does not exceed thirty percent. Ten percent fill shall be reserved for future use.
12. No more than eight 24VDC analog circuits may be combined in a single conduit unless specifically stated otherwise on the drawings.

B. Conductor Sizing:
1. Conductor sizes are based on copper unless otherwise noted.
2. Use conductor not smaller than No.12 AWG for power and lighting circuits.
3. Use No.10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.
4. Where circuit wiring length exceeds length identified on the feeder schedule, increase wire size as needed to maintain a maximum voltage drop of three percent.
5. Use conductor not smaller than No.14 AWG for control circuits.
6. Unless shown otherwise on the contract drawings, power wiring shall be No.12 AWG.

C. Wire Pulling:
1. Pull all conductors into raceway at same time.
2. No.4 AWG and larger wire and power cables shall lubricated with pulling lubricant to reduce pulling tension and abrasion damage. The lubricant shall be water or wax based containing no oils or greases that may adversely affect cable jackets.
3. The minimum bend radius and maximum pulling tension ratings of the wire and cable shall not be exceeded.

D. Splices and Terminations:
1. Splices and terminations shall not be made within raceways.
2. Clean conductor surfaces before splicing or terminating.
3. Make splices, taps, and terminations to carry full amp capacity of conductors with no perceptible temperature rise.
4. Insulated spring wire connectors may be used to splice 120V power circuits.
5. Control, communication, and data transmission wire and cable shall not be spliced.

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6. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
7. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
8. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

E. Motors:
1. Motor wiring to motors less than 10 horsepower shall be spliced and terminated with fully insulated crimp-on end cap with a layer of self- vulcanizing rubber tape, followed by five layers of vinyl electrical tape. “SkotchLocks” and similar devices shall not be used.
2. Motor wiring to motors 10 horsepower or larger shall be spliced and terminated with crimp-on ring terminal lugs, brass nuts, bolts and washers with a layer of self-vulcanizing rubber tape, followed by five layers of vinyl electrical tape. “SkotchLocks” and similar devices shall not be used.

F. Unshielded power cables:
1. Unshielded power cables shall be spliced and terminated with crimp-on ring terminal lugs, brass nuts, bolts and washers with a layer of self- vulcanizing rubber tape, followed by five layers of vinyl electrical tape. “SkotchLocks” and similar devices shall not be used.

3.04 TESTING AND START-UP SERVICES

A. Inspect wire for physical damage and proper connection.

B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

C. Verify continuity of each conductor.

D. Feeder or branch circuits with ampacity greater than 100 amperes shall be tested after installation to measure insulation resistance of each conductor.

E. All equipment shall be disconnected and the wire ends shall be cleaned and dried.

F. Connect Megohmeter between conductor and a grounded point in the enclosure and energize until the reading stabilizes.

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Grounding and Bonding for Electrical Systems:
   1. Grounding and Bonding for Electrical Systems shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Grounding and Bonding for Electrical Systems, Lump Sum. When so provided, payment for Grounding and Bonding for Electrical Systems shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Grounding and Bonding for Electrical Systems, Inclusive. When no quantity is provided, Grounding and Bonding for Electrical Systems shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
      b. ANSI/NFPA 99 - Health Care Facilities.
   2. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
   3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition.
   4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.
   5. Institute of Electrical and Electronics Engineers (IEEE), Specifications and Standards, current edition:
      a. IEEE 837 - Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable grounding and bonding systems as indicated on the drawings and as specified herein.

1.05 RELATED SECTIONS - NOT USED

1.06 SUBMITTALS - NOT USED

1.07 FACTORY TESTING - NOT USED

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.09 QUALITY ASSURANCE

A. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms. Additional grounding electrodes shall be used to satisfy ground resistance requirements where required by earth conditions.

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PART 2 PRODUCTS

2.01 ROD ELECTRODE

A. Material: Copper-clad steel.

B. Diameter: 3/4-inch minimum.

C. Length: 10-feet minimum. Rod shall be driven at least 9.5-feet deep.

D. Use one or more ground rods to obtain the minimum specified ground resistance. This applies to manholes, padmount switches, transformers, service entrances, and all other equipment requiring a supplemental grounding electrode. Minimum of three ground rods shall be used to ground the service entrance as indicated on plans.

2.02 MECHANICAL CONNECTORS

A. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lockwashers shall be made of silicon bronze and supplied as a part of the connector body and shall be of the two bolt type.

B. Split bolt connector types are not allowed.

C. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.03 COMPRESSION CONNECTORS

A. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99 percent.

B. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

C. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.

D. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.

E. Each connector shall be factory filled with an oxide-inhibiting compound.

2.04 EXOTHERMIC CONNECTIONS

A. Select the appropriate kit for specific types, sizes, and combinations of conductors and other items to be connected. Field personnel shall be trained in execution of welds.

2.05 WIRE

A. Material: Stranded copper (aluminum not permitted).

B. Grounding Electrode Conductor: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger.

C. Manhole and Vault Bonding: No. 4/0 minimum.

D. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used on the same facility.

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PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base electrical installation or equipment locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical system.

C. Adjust electrical system installation to satisfy field requirements.

3.02 INSTALLATION

A. General:
1. Verify that final backfill and compaction has been completed before driving rod electrodes.
2. Install products in accordance with manufacturer instructions.
3. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.
4. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.
5. Attach grounds permanently before permanent building service is energized.
6. Install rod electrodes at locations indicated or as required by local code, whichever requires the most rods. Install additional rod electrodes as required to achieve specified resistance to ground.
7. Connect grounding electrode conductor and reinforcing steel in foundation footing. Bond steel together.
8. Bond all conductive components to meet Regulatory Requirements.
9. Bond together metal siding not attached to grounded structure; bond to ground.
10. All separate ground wires shall be enclosed in rigid galvanized steel conduit and bonded at both ends to the rigid galvanized steel conduit with an approved fitting.

B. Less than 600 volt system grounding:
1. Supplementary Grounding Electrode: Use driven ground rod on exterior of building.
2. Copper grounding electrode conductor shall be sized as indicated or as required by NEC, whichever is larger and shall be extended from secondary service system neutral to street side of water meter, building steel, ground rod, and any concrete encased electrodes. Bonding jumper shall be installed around water meter. Install conductor in separate rigid conduit. Bond conduit as described above.
3. Receptacle Grounding: All receptacles installed shall have a separate grounding contact.
4. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.
5. Bond together each metallic raceway, pipe, duct and other metal objects.
6. Equipment Grounding Conductor: Separate, insulated green conductor shall be installed within each raceway and cable tray, sized per NEC or as indicated in the contract documents whichever is larger. Terminate each end on suitable lug, bus, enclosure or bushing, per NEC. Install a ground wire from each device to the respective enclosure.

3.03 TESTING AND START-UP SERVICES

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

3.04 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Hangers and Supports for Electrical Systems:
   1. Hangers and Supports for Electrical Systems shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Hangers and Supports for Electrical Systems, Lump Sum. When so provided, payment for Hangers and Supports for Electrical Systems shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Hangers and Supports for Electrical Systems, Inclusive. When no quantity is provided, Hangers and Supports for Electrical Systems shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American Iron and Steel Institute (AISI), Specifications and Standards, current edition.
   2. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   3. American Society for Testing and Materials (ASTM), Specifications and Standards, current edition:
      a. ASTM A653 - General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process.
      b. ASTM A1011 - Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Ally and High-Strength Low Alloy with Improved Formability (Formerly ASTM A570).
      c. ASTM F1136 - Standard Specification for Chromium/Zinc Corrosion Protective Coatings for Fasteners.
      d. ASTM A907 - Standard Specification for Steel, Sheet, and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled, Structural Quality.
      e. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
   4. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
      b. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT).
   5. Metal Framing Manufacturers Association (MFMA), Specifications and Standards, current edition.

1.04 DESCRIPTION OF WORK

A. Furnish and install supporting devices as indicated on the drawings, scheduled in Section 26 05 00, and as specified herein.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. The following information shall be submitted specifically for supporting devices:
   1. Submit outline drawings and dimensions for equipment support racks.

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1.06 QUALITY ASSURANCE

A. Bolted framing channels and fittings shall have the manufacturers name, part number, and material heat code identification number stamped in the part itself for identification. Material certification sheets and test reports must be made available by the manufacturer upon request.

B. Stainless steel bolted framing parts shall be stamped to identify the material. Material certification sheets and test reports must be made available by the manufacturer upon request.

C. All materials, equipment, and parts shall be new and unused of current manufacture.

D. Contractor shall be responsible for providing all necessary accessories required for a complete and operable system.

PART 2 PRODUCTS

2.01 STRUT, CHANNELS, AND CONNECTORS

A. Manufacturers:
   1. Cooper B-Line, Inc.
   2. or equal.

B. General:
   1. Strut shall be 1-5/8-inches wide in varying heights and welded combinations as required to meet load capacities and designs indicated on the drawings.

C. Materials and Finish:
   1. Electro-Galvanized Steel: Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 and shall be Electro- galvanized after fabrication in accordance with ASTM B633.
   2. Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33, and hot-dip galvanized after fabrication in accordance with ASTM A123. All hardware shall be stainless steel Type 304 or chromium zinc ASTM F1136 Gr. 3. All hot-dip galvanized after fabrication products must be returned to point of manufacture after coating for inspection and removal of all sharp burrs.
   3. Stainless Steel: All strut, fittings and hardware shall be made of AISI Type 304 stainless steel.

2.02 ANCHORS AND FASTENERS

A. Concrete and Structural Elements: Use stainless steel precast insert system, expansion anchors and preset inserts.

B. Steel Structural Elements: Use stainless steel beam clamps.

C. Concrete Surfaces: Use stainless steel self-drilling anchors and expansion anchors.

D. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.

E. Solid Masonry Walls: Use stainless steel expansion anchors and preset inserts.

F. Sheet Metal: Use stainless steel sheet metal screws.

G. Wood: Use stainless steel wood screws.

H. All other fasteners: stainless steel screws, suitable for the required usage.

2.03 HARDWARE

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A. Conduit and equipment supports, clamps, and other miscellaneous materials shall be constructed of the following materials as scheduled in Section 26 05 00.
   1. Steel.
   2. Zinc plated steel.
   3. Galvanized, malleable iron.
   4. PVC coated, galvanized, malleable iron.
   5. Stainless steel.
   6. PVC.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base locations and dimensions on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Adjust equipment support rack installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept supporting devices on site. Inspect for damage.

B. Protect supporting devices from corrosion and damage. Do not install damaged materials.

3.03 INSTALLATION

A. General:
   1. Furnish and install supports and fasteners for all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.
   2. Thoroughly clean and remove construction debris from installation.

B. Strut Channel:
   1. Install strut in accordance with MFMA-102 "Guidelines for the Use of Metal Framing"; in accordance with equipment manufacturer's recommendations, and with recognized industry practices.
   2. Fabricate supports from channel. Rigidly weld members or use hexagon head bolts to present a neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
   3. File and de-bur cut ends of galvanized support channel and spray paint with cold galvanized paint to prevent rusting.
   4. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

C. Anchors and Fasteners:
   1. Provide anchors, fasteners, and supports in accordance with NECA "Standard Practices for Good Workmanship in Electrical Contracting".
   2. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit.
   3. Do not use spring steel clips and anchors.
   4. Do not use powder-actuated anchors.
   5. Obtain permission from Engineer before drilling or cutting structural members.
   6. Install surface-mounted cabinets and panelboards with minimum of four anchors.
   7. Use channel supports to stand cabinets and panelboards 1-5/8-inch off interior or exterior surfaces of exterior walls.
   8. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using anchors and fasteners.
   9. Install free-standing electrical equipment on 3-inch concrete pads unless indicated otherwise on the drawings.
   10. Use threaded rod, minimum size 3/8-inch, for supports where indicated on the drawings.

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11. Install products in accordance with manufacturer instructions.

END OF SECTION

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SECTION 26 05 34
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Conduit:
1. Conduit shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
   a. Conduit, Lump Sum. When so provided, payment for Conduit shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
   b. Conduit, Inclusive. When no quantity is provided, Conduit shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
   a. ANSI C80.1 - Electrical Rigid Steel Conduit (ERSC).
   b. ANSI C80.3 - Steel Electrical Metallic Tubing (EMT).
   c. ANSI C80.5 - Electrical Rigid Aluminum Conduit (ERAC).
   d. NFPA 70 - National Electrical Code.
2. American Society for Testing and Materials (ASTM), Specifications and Standards, current edition:
   a. ASTM F2160 - Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter.
   b. ASTM D2239 - Polyethylene (PE) Plastic Pipe (SIDR) Based on Controlled Inside Diameter.
   c. ASTM D3035 - Polyethylene (PE) Plastic Pipe (SDR) Based on Controlled Outside Diameter.
   d. ASTM D3350 - Polyethylene Plastics Pipe and Fittings Materials.
3. National Electrical Contractors Association (NECA), current edition.
   a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
   b. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT).
4. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
   a. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
   b. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association.
   c. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association.
   d. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association.
   e. NEMA TC 7 - Smooth Wall Coilable Polyethylene Electrical Plastic Conduit.
5. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.
   a. UL 1 - Standard for Flexible Metal Conduit.
   b. UL 6 - Electrical Rigid Metal Conduit - Steel.
   c. UL 6A - Standard for Electrical Rigid Metal Conduit - Aluminum and Stainless Steel.
   d. UL 651A Type EB and A Rigid PVC Conduit and HDPE conduit.
   e. UL 651B Continuous Length HDPE.
   f. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit.
   g. UL 2239 - Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable.

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1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable conduit system as indicated on the drawings, scheduled in Section 26 05 00, and as specified herein.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for conduit:
   1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Clearly identify the types of conduit and fittings proposed.

1.06 FACTORY TESTING - NOT USED

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY - NOT USED

1.10 EXTRA MATERIALS - NOT USED

PART 2 PRODUCTS

2.01 GALVANIZED RIGID METAL CONDUIT (TYPE RMCS)

A. Manufacturer: Contractor option.

B. Conduit:
   1. Impact and crush resistant mild steel tube with an accurate circular cross section, a uniform wall thickness, a defect free interior surface, and a continuous welded seam.
   2. Interior and exterior surfaces thoroughly and evenly coated with zinc using the hot-dip galvanizing process.
   3. Top-coated with a compatible organic layer to inhibit white rust and increase corrosion resistance.
   4. Factory cut threads, 0.75-inch taper per foot, protected after cutting with an application of molten zinc.

C. Conduit Bodies:
   1. Ferrous metal construction electro-galvanized inside and out and coated with aluminum acrylic paint.
   2. Tapered, threaded hubs with integral bushing.
   3. Stainless steel hardware.
   4. Cover constructed of same material with solid gasket.

D. Fittings:

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1. Ferrous metal construction electro-galvanized inside and out.
2. Components critical to performance such as set screws, split rings, and locknuts constructed of hardened steel or adequately designed to ensure positive bonds.

2.02 RIGID ALUMINUM CONDUIT (TYPE RMCA)

A. Manufacturer: Contractor option.

B. Conduit:
1. Heavy wall tube manufactured of 6063 aluminum alloy in temper designation T-1 with an accurate circular cross section, a uniform wall thickness and a defect free interior surface.
2. Factory cut threads, 0.75-inch taper per foot.

C. Conduit Bodies:
1. Copper free aluminum construction coated with aluminum acrylic paint.
2. Tapered, threaded hubs with integral bushing.
3. Stainless steel hardware.
4. Cover constructed of same material with solid gasket.

D. Fittings:
1. Copper free aluminum construction.
2. Components critical to performance such as setscrews, split rings, and locknuts are adequately designed to ensure positive bonds.

2.03 RIGID NON-METALLIC CONDUIT (TYPE RNC)

A. Manufacturer:
1. Carlon.
2. Champion.
3. Or equal.

B. PVC Conduit:
1. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
2. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-2.
3. The conduit and fittings shall be homogeneous plastic material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections, which could mar conductors or cables.
4. Conduit, fittings and cement shall be produced by the same manufacturer to assure system integrity.
5. Schedule 80 non-metallic conduit shall be used in locations subject to physical damage. Schedule 40 non-metallic conduit may be used in all other locations.

C. Fiberglass Conduit:
1. Epoxy based resin system using an anhydride curing agent.
2. Temperature Rating: -60 to 250 degrees F.
3. Above grade rated: Halogen free additive for flame spread and smoke control.
4. Coefficient of Friction: .38.
5. Ultraviolet inhibitor: Carbon Black.
6. No Conductor Burn Through.
7. Conduits and fittings to be joined with an interference joint and epoxy adhesive creating a concrete and watertight connection.
8. Integral bell and spigot.
9. Dimensions: Iron Pipe Size (IPS).

D. Conduit Bodies - PVC:
1. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.

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2. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.
3. Stainless steel hardware.
4. Cover constructed of same material with solid gasket.

E. Fittings - PVC:
1. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
2. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.

F. Fittings - Fiberglass.
1. Coupling and adapters shall be of the same material, thickness, and construction as the conduit.
2. Epoxy adhesive for joining conduits and fittings shall be supplied by the same manufacturer as the conduit and fittings.
3. Temperature Rating: -60 to 250 degrees F.
4. Coefficient of Friction: .38.
5. No Conductor Burn Through.

2.04 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (TYPE LFMC)

A. Manufacturer: CONTRACTOR option.

B. Usage:
1. Use in conjunction with galvanized rigid metal conduit.
2. Use in conjunction with PVC coated galvanized rigid metal conduit.
3. Use in conjunction with rigid aluminum conduit.

C. Conduit:
1. Single strip, helically wound, galvanized steel core inside and outside with smooth interior surface with sunlight resistant thermoplastic jacket suitable for ambient environmental conditions conforming to applicable UL Standards.
2. Jacket shall be positively locked to core to prevent sleeving.
3. All runs of flexible conduit shall be as short as practicable, of the same size as the conduit it extends and with enough slack to reduce the effects of expansion and vibration.

D. Fittings:
1. Where used in conjunction with galvanized rigid metal conduit, connectors shall be malleable iron or steel, electro zinc plated, with insulated throat and taper threaded hub.
2. Where used in conjunction with PVC coated galvanized rigid metal or rigid aluminum conduit connectors shall be malleable iron or steel, electro zinc plated and PVC coated, with insulated throat and taper threaded hub.
3. Particular attention shall be given to maintaining ground bond and firm support through flexible connections.
4. All fittings shall be liquid tight.

2.05 LIQUIDTIGHT FLEXIBLE NON-METALLIC CONDUIT (TYPE LFNC)

A. Manufacturer:
1. Carlon Carflex.
2. Or equal.

B. Usage:
1. Use in conjunction with rigid nonmetallic PVC conduit.

C. Conduit:
1. Conduit shall have a smooth inner surface with integral reinforcement within the conduit wall.
2. Conduit shall be designated as a Type LFNC-B (or FNMC-B), listed to UL standard UL1660 and suitable for use at conduit temperatures of 80 degrees C (dry), 60 degrees C (wet and oil resistant).

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3. Conduit shall be flame resistant and when used with listed fittings, approved for the installation of electrical conductors.
4. Conduit shall be installed in accordance with applicable sections of the NEC and/or local electrical codes.
5. Conduit shall be marked OUTDOOR for outdoor applications exposed to sunlight and weathering conditions and marked DIRECT BURIAL for direct burial applications.
6. The National Evaluation Service, Inc shall evaluate conduit for installation within a three-hour or less fire-resistive floor/ceiling and two-hour fire- resistive wall construction.

D. Fittings:
1. Molded from high strength, chemical resistant, glass filled thermoplastic.
2. Fittings shall be listed for the use with liquid tight flexible nonmetallic conduit and shall be marked LFNC-B (FNMC-B).
3. Fittings uses for direct burial applications shall be listed for wet locations.
4. Particular attention shall be given to maintaining ground bond and firm support through flexible connections.
5. All fittings shall be liquid tight.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. The Contractor shall obtain from the appropriate trades and review shop drawings for all equipment requiring electrical connections. Conduit rough-in shall be based upon shop drawing requirements.

B. The Contractor shall be responsible for coordinating conduit location and rough-in with actual equipment conditions and requirements.

C. Field verify all measurements. Do not base conduit rough-in or equipment locations on the contract drawings.

D. Identify conflicts with the work of other trades prior to installation of electrical equipment and conduit work.

E. Adjust conduit system installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris.

C. Store conduit above grade. Protect from environment with suitable covering.

D. Protect PVC conduit from sunlight.

3.03 INSTALLATION

A. General:
1. Install conduit in accordance with NECA "Standard Practices for Good Workmanship in Electrical Contracting", all requirements of the NEC, and manufacturer recommended practices.
2. Arrange conduit to maintain headroom and present neat appearance.
3. Design raceway systems to minimize the number of fittings, couplings, kicks, and offsets.
4. Raceways located above lowest floor level:
   a. Route conduit parallel and perpendicular to walls.
   b. All raceways shall be level and straight.
   c. Vertical conduits shall be plumb.
5. Raceways located in or under lowest level floor:
   a. Route conduit in and under slab from point-to-point.

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b. Do not cross conduits in slab.

6. Do not use flexible conduit in place of bends, conduit bodies, or expansion fittings.
7. Flexible conduit shall be used at all equipment terminations. Maximum length of 24-inches unless specifically allowed otherwise by Engineer based upon field conditions.
8. Do not use cords for equipment connections unless specifically allowed otherwise by Engineer based upon field conditions.

B. Raceway sizing:
1. Size raceways as indicated on drawings.
2. Where raceways sizes are not indicated on drawings, size in accordance with NEC requirements. Minimum size 3/4-inch.
3. Exposed conduit runs not longer than 10-feet in length and terminating at a single device may be 1/2-inch unless prohibited by NEC.

C. Raceway Installation:
1. Maintain adequate clearance between conduit and piping.
2. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
3. Cut conduit square using saw or pipe cutter; de-burr cut ends.
4. Bring conduit to shoulder of fittings; fasten securely.
5. Use conduit hubs to fasten conduit to NEMA 4X and NEMA 12 boxes.
6. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic factory elbows for bends in metal conduit larger than 2-inch size.
7. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
8. Suitable pull string shall be installed in each empty conduit, sleeves and nipples excepted.
9. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
10. Remove all debris and moisture from raceways prior to installing conductors.
11. Ground and bond conduit under provisions of Section 26 05 26.
12. Identify conduit under provisions of Section 26 05 53.
13. Install plastic coated conduit in accordance with manufacturer's instructions. All 90 degree bends shall be manufactured elbows. Touch-up PVC coating after installation.
14. All field cut threads shall be coated with Thomas & Betts Kopr-Shield prior to assembly.

D. Structural Coordination:
1. Suitable fittings, designed and listed for the purpose, shall be used to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.
2. Install conduit to preserve fire resistance rating of partitions and other elements.
3. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.
4. Where conduit passes between areas subject to variable temperatures, seal conduits to prevent air interchange and condensation formation. Use conduit fitting specifically manufactured for this purpose.

E. Raceway Support:
1. General:
   a. Arrange supports to prevent misalignment during wiring installation.
   b. Do not permanently support conduit with wire or perforated pipe straps.
   c. Remove wire used for temporary supports.
   d. Do not attach conduit to ceiling support wires.
   e. Channel, rod, and hardware shall comply with the requirements of Section 26 05 29.
2. Hardware:
   a. Construct conduit support rack with channel and rod to support conduits not supported from structure.
   b. Support conduit with channel anchored to structure when conduit offset from structure is required.
   c. Secure conduits to channel with pipe straps.
   d. Support conduit from structure when conduit offset from structure is not required.

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e. Secure conduits directly to structure with one-hole strap and conduit spacer.

F. Conduit Separation:

1. Separate conduit systems shall be used for the following circuit categories:
   a. 120-volt power circuits.
   b. 480-volt power circuits.
   c. 120-volt control circuits.
   d. 24 VDC analog control circuits.
   e. Intrinsically safe control circuits.
   f. UTP control cables.
   g. Manufacturer supplied cables (for example, magnetic flow meter cables).
   h. Radio frequency coaxial cables (for example, antenna cables).
2. The contract drawings show individual homerun equipment connections. The Contractor may combine circuits of common types (as identified above) into single conduits provided the following conditions are met:
   a. NEC requirements for conductor de-rating are satisfied.
   b. Conduit fill does not exceed thirty percent. Ten percent fill shall be reserved for future use.
   c. No more than eight 24VDC analog circuits are combined in a single conduit, unless specifically stated otherwise on the drawings.

3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 35
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Boxes:
   1. Conduit shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Boxes, Lump Sum. When so provided, payment for Boxes shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 1.
      b. Boxes, Inclusive. When no quantity is provided, Boxes shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
      b. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT).
   3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
      a. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
      b. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
      c. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
   4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable box systems as indicated on the drawings, scheduled in Section 26 05 00, and as specified herein.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for boxes:
   1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Clearly identify the types of boxes proposed.

1.06 FACTORY TESTING - NOT USED

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

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B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes:
1. Galvanized steel, with stamped knockouts.
2. Gangable, suitable for number of devices shown.
3. Suitable for flush mounting with drywall, FRP panel, masonry block, and poured concrete wall and ceiling finishes.

B. Sheet Metal Concrete/Masonry Boxes:
1. Galvanized steel, with stamped knockouts.
2. Gangable, suitable for number of devices shown.
3. Suitable for flush mounting with masonry block and poured concrete walls.

C. Luminaire and Equipment Supporting Boxes:
1. Rated for weight of equipment supported; include 3/8-inch male fixture studs where required.

D. Cast Boxes:
1. Cast ferralloy or aluminum, deep type, gasketed cover, threaded hubs.
2. Suitable for surface or flush mounting with drywall, FRP panel, masonry block, and poured concrete wall and ceiling finishes.

2.02 PULL AND JUNCTION BOXES

A. General:
1. Pull boxes and junction boxes shall be minimum 4 inch square (100 mm) by 2 1/8th inches (54 mm) deep for use with 1 inch (25 mm) conduit and smaller. On conduit systems using 1 1/4 inch (31.75 mm) conduit or larger, pull and junction boxes shall be sized per NEC but not less than 4 11/16 inch square (117 mm).
2. For telecommunication, fiber optic, security, and other low voltage cable installations the NEC box size requirements shall apply. All boxes, used on telecommunication, security, other low voltage and fiber optic systems with conduits of 1 1/4” and larger, shall be sized per the NEC conduit requirements. For determining box size, the conduit is the determining factor not the wire size.

B. Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.

C. Boxes Larger than 12 Inches (300 mm) in any dimension shall have a hinged cover, be rated NEMA 4X, and constructed of stainless steel.

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D. Cast Metal Boxes for Outdoor and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain-tight. Galvanized cast iron or aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

E. Cast Metal Boxes for Hazardous Locations (Class II, Division 2): Type 4X, surface-mounted junction box, UL listed as dust-tight.

F. Cast Metal Boxes for Underground Installations: Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Hot dipped galvanized cast iron box and plain cover with neoprene gasket and stainless steel cover screws. Cover Legend: ELECTRIC.

G. Box extensions and adjacent boxes within 48” of each other are not allowed for the purpose of creating more capacity.

H. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.

I. Wireways shall not be used in lieu of junction boxes.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. The Contractor shall obtain from the appropriate trades and review shop drawings for all equipment requiring electrical connections. Box rough-in shall be based upon shop drawing requirements.

B. The Contractor shall be responsible for coordinating box location and rough-in with actual equipment conditions and requirements.

C. Field verify all measurements. Do not base box rough-in or equipment locations on the contract drawings.

D. Identify conflicts with the work of other trades prior to installation of electrical equipment and conduit work.

E. Adjust box locations to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept boxes on site. Inspect for damage.

B. Protect boxes from corrosion and entrance of debris.

C. Store boxes above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. General:
1. Install conduit in accordance with NECA "Standard Practices for Good Workmanship in Electrical Contracting", all requirements of the NEC, and manufacturer recommended practices.

B. Box Installation:
1. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
2. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
3. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
4. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
5. Use flush mounting outlet boxes in all areas.
6. Do not install flush mounting boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24 inches separation in acoustic rated walls.

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7. Use gang box where more than one device is mounted together. Do not use sectional box.
8. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown.
9. Position outlet boxes to locate luminaires as shown on lighting plans.
10. Adjust flush-mounting outlets to make front flush with finished wall material.
11. Install knockout closure in unused box opening.

C. Structural Coordination:
1. Install boxes to preserve fire resistance rating of partitions and other elements.
2. Install flush mounting box without damaging wall insulation vapor barrier or reducing its effectiveness. Provide vapor box or vapor barrier hat for each box flush mounted in an exterior wall.
3. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
4. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

D. Box Support:
1. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
2. Use stamped steel bridges to fasten flush mounting outlet box between studs.
3. Use adjustable stainless steel channel fasteners for hung ceiling outlet box.
4. Do not fasten boxes to ceiling support wires.
5. Support boxes independently of conduit.

3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 41
WIRING DEVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Wiring Devices:
   1. Wiring devices shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the bid schedule or special Procedures - Division 1.
      a. Wiring Devices, Lump Sum. Where so provided, payment for wiring devices shall be made at the contract lump sum price bid or as specified in special conditions - Division 1.
      b. Wiring Devices, Inclusive. When no quantity is provided, wiring devices requirements shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA70 - National Electrical Code.
      b. ANSI/NFPA 820 - Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
   2. National Electrical Contractors Association (NECA), Standard of Installation, current edition.
   3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
      a. NEMA WD 1 - General Purpose Wiring Devices.
      b. NEMA WD 6 - Wiring Device Configurations.
   4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.

1.04 DESCRIPTION OF WORK

A. Provide and install complete and operable wiring devices as required on the drawings and as specified herein.

1.05 SHOP DRAWINGS

A. Submit shop drawings in accordance with Division 01.

B. The following information shall be submitted specifically for wiring devices:
   1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Clearly identify the types of wiring devices proposed.

1.06 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. Contractor shall be responsible for providing all necessary accessories required for a complete and operable system.

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C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

D. Manufacturer shall specialize in manufacture of products specified in this Section with minimum three years experience.

PART 2 PRODUCTS

2.01 120V EXTRA HEAVY DUTY SPECIFICATION GRADE WALL SWITCHES

A. Single Pole Switch:
1. 20A - Hubbell #HBL1221I.
2. Or equal.

B. Three-way Switch:
1. 20A - Hubbell #HBL1223I.
2. Or equal.

2.02 120V EXTRA HEAVY DUTY SPECIFICATION GRADE RECEPTACLES

A. GFCI Duplex Receptacle:
1. 20A - Hubbell # GFR8300HILU.
2. Or equal.

B. Corrosion Resistant Simplex Receptacle:
1. 20A - Hubbell #HBL53 CM 61.
2. Or equal.

C. Corrosion Resistant Duplex Receptacle:
1. 20A - Hubbell #HBL53 CM 62.
2. Or equal.

2.03 WALL PLATES

A. Wall plates shall be installed as follows:
1. Use smooth stainless steel plates for receptacles and switches in sheet steel or PVC boxes.
2. Use multi-screw gasketed cast plate where cast outlet boxes are required. Covers shall not be attached by using a single screw mounting into the wiring device, but shall be attached by mounting directly to the box.
3. Use Crouse Hinds WLRS or WLRD wet location covers for receptacles identified as “WP” which are located inside structures.
4. Use aluminum or cast metal cover rated for “Constant Use” for receptacles identified as “WP” and that are exposed to the weather.
5. Use Crouse-Hinds DS185 cover for all switches identified as “WP”.

PART 3 EXECUTION

3.01 DIVISION OF WORK

A. The Contractor shall have overall system responsibility and shall provide all materials and labor necessary provide a complete and operable system and comply with all requirements of this section.

B. The Contractor shall be responsible for coordinating device locations with actual equipment conditions and requirements.

3.02 FIELD MEASUREMENTS

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A. Field verify all measurements. Do not base exact wiring device locations on the contract drawings.

B. Adjust location of wiring devices to satisfy field requirements.

3.03 INSTALLATION

A. Wiring Device Installation:
1. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
2. Provide extension rings to bring outlet boxes flush with finished surface.
3. Clean debris from outlet boxes.
4. Install products in accordance with manufacturer's instructions.
5. Install devices plumb and level.
6. Install switches with OFF position down.
7. Install receptacles with grounding pole on top.
8. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
9. Install plates on switch, receptacle, and blank outlets in all areas.
10. Connect wiring devices by wrapping conductor around screw terminal.
11. Provide stainless steel hardware.
12. Install wall switch 46 inches above finished floor to centerline.
13. Install convenience receptacle in office space at 18 inches above finished floor to centerline.
14. Install convenience receptacle in electrical, process, mechanical or storage room at 42 inches above finished floor to centerline.
15. Install convenience receptacle 6 inches above counter to centerline.
16. Install convenience receptacle 4 inches above counter backsplash to centerline.
17. Install exterior convenience receptacle 30 inches above finished grade to centerline.
18. Adjust devices and wall plates to be flush and level.

B. Structural Coordination:
1. Verify outlet boxes are installed at proper height.
2. Verify wall openings are neatly cut and will be completely covered by wall plates.
3. Verify floor boxes are adjusted properly.

3.04 TESTING AND STARTUP SERVICES

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

END OF SECTION

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SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Identification for Electrical Systems:

1. Identification for Electrical Systems shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

a. Identification for Electrical Systems, Lump Sum. When so provided, payment for Identification for Electrical Systems shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.

b. Identification for Electrical Systems, Inclusive. When no quantity is provided, Identification for Electrical Systems shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.

1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

a. NFPA 70 - National Electrical Code.

b. ANSI Z535.4 - Product Safety Signs and Labels.

2. National Electrical Contractors Association (NECA), current edition.

a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.

1.04 DESCRIPTION OF WORK

A. Furnish and install electrical identification systems as indicated on the drawings and as specified herein.

1.05 SUBMITTALS - NOT USED

1.06 FACTORY TESTING - NOT USED

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.08 QUALITY ASSURANCE - NOT USED

1.09 WARRANTY - NOT USED

1.10 EXTRA MATERIALS - NOT USED

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Engraved three-layer laminated plastic, black letters on white background.

B. Lettering:

1. 1/4-inch letters for identifying individual equipment and loads.

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CONDUCTOR MARKING

The ends of each conductor shall be marked with circuit number, motor number, wire or terminal number.

Control system wire marking shall be coordinated with control system and equipment shop drawings.

Labels shall be typed in black lettering with indelible ribbons on a white, heat shrink sleeve. Markers shall be shrunk around the wire to ensure a tight, non-slip bond with a compatible heat gun.

2.02

A. Heat shrink wire markers shall be Brady Bradysleeve Type B-321 or B-322.

B. CONDUCTOR COLOR CODING

C.

D. Conductors No.6 AWG and smaller shall be provided with color coded insulation as described herein. Conductors larger than No.6 AWG may be color coded with appropriately colored Scotch No.35 tape at each end.

2.03

A. Color Coding:

B. 277/480 vac system shall be colored brown, orange, yellow, and gray for phases A, B, C, and neutral respectively.

1. 120/208 vac system shall be colored black, red, blue, and white for phases A, B, C, and neutral respectively.

2. 120/240 vac shall be colored black, red, and white for Line 1, Line 2, and neutral respectively.

3. 120 vac control wiring shall be colored red.

4. 24 VDC control wiring shall be colored purple and purple with white stripe for positive and negative conductors respectively.

5. Intrinsically safe control wiring shall be colored light blue.

6. Conductors within control cabinets and motor control centers which are supplied from an external source shall be colored yellow.

7. Grounding conductor and equipment ground conductors shall be colored green.

8.

2.04 EQUIPMENT, ENCLOSURE, AND CABINET WARNING SIGNS

A.

1. Electrical Voltage and Shock Hazard Signs.

B. Provide OSHA Voltage and Shock Hazard sign for each electrical enclosure, cabinet, or other piece of equipment that presents an electrical hazard under normal operating circumstances or presents an electrical hazard while the enclosure is open.

1.

C. Electrical Arc Flash Hazard Signs.

1. Provide Arc Flash Hazard sign for each electrical enclosure, cabinet, or other piece of equipment that presents an arc flash hazard in accordance with NEC and ANSI Z535.4.

2.

Electrical Source Signs.

PART 3 Provide sign indicating voltage level and source for each component of the power distribution system and for all control panels.

3.01 Provide indicating multiple sources where equipment is fed from multiple sources or where signal wiring is present that is powered from a source external to the equipment.

3.02

3.03 EXECUTION

A.

FIELD MEASUREMENTS - NOT USED

DELIVERY, STORAGE, AND HANDLING - NOT USED

INSTALLATION

Nameplates:

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Provide nameplates for grouped equipment such as panelboards, transformers, motor control centers, and control panels. Nameplate shall identify tag number, voltage, ampere rating, and description.

Provide nameplates for individual equipment such as motor control center compartments, field instruments, and field control stations. Nameplate shall identify tag number and description.

Provide nameplates for individual receptacles. Nameplate shall identify panel and circuit number supplying the receptacle.

1. Provide nameplates for control cabinets and motor control center compartments which contain wiring supplied from an external source. Nameplate shall state: Multiple power sources within, verify all power supplies are disconnected before servicing equipment.
2. Nameplates shall be secured to the front of equipment enclosures with stainless steel screws or rivets. Double sided tape will not be acceptable.
3. Secure nameplates for flush mounted panelboards behind the panelboard door.
4. Conductor Marking:
5. Mark conductors at every termination and splice point.
6. Mark conductors with wire numbers identified by control system supplier, with panel and circuit identification, or with MCC compartment and wire numbers.

B.

1. Conduit Marking:
2. Furnish colored band markers for each conduit longer than six feet and mark each conduit a minimum of twenty feet on center.

C.

1. TESTING AND START-UP SERVICES - NOT USED

3.04 TRAINING - NOT USED

3.05 END OF SECTION

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SECTION 26 05 75
ELECTRICAL SYSTEMS ANALYSIS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Electrical Systems Analysis:
   1. Electrical Systems Analysis shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Electrical Systems Analysis, Lump Sum. When so provided, payment for Electrical Systems Analysis shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Electrical Systems Analysis, Inclusive. When no quantity is provided, Electrical Systems Analysis shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
      b. NFPA 70E - Standard for Electrical Safety in the Workplace.
   2. Institute of Electrical and Electronics Engineers (IEEE), Specifications and Standards, current edition:
      a. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
      b. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings.
      c. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
      d. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis.
      e. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
      f. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations.

1.04 DESCRIPTION OF WORK

A. Furnish short-circuit and protective device coordination studies.

B. Furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current issue of NFPA 70E -Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 - 2018, the IEEE Guide for Performing Arc-Flash Calculations.

C. The electrical power system studies shall encompass the following electrical equipment located at the existing Waste Water Treatment Facility:
   1. MD - Service Entrance Enclosed Breaker.
   2. MD - STR-75 Feeder Breaker.
   3. HH2 - Main Breaker.
   4. HH2 - Branch Breakers.

1.05 RELATED SECTIONS - NOT USED

1.06 SUBMITTALS

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A. Submit shop drawings in accordance with Division 01.

B. Preliminary short-circuit and protective device coordination studies shall be submitted and approved prior to the approval of any electrical equipment submittals that may be affected by the results of the study.

C. Final short-circuit, protective device coordination, and arc flash hazard analysis studies shall be prepared and submitted based upon actual installed system characteristics.

D. Submit the following information specifically for Electrical Systems Analysis:
   1. The results of the short-circuit, protective device coordination, and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted. Electronic PDF copies of the report shall be provided.
   2. The report shall include the following sections:
      a. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
      b. Short-Circuit Methodology Analysis Results and Recommendations.
      c. Short-Circuit Device Evaluation Table.
      d. Protective Device Coordination Methodology Analysis Results and Recommendations.
      e. Protective Device Settings Table.
      f. Time-Current Coordination Graphs and Recommendations.
      g. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
      h. Arc Flash Labeling section showing types of labels to be provided.
      i. Section shall contain descriptive information as well as typical label images.
      j. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.
   3. Submit an electronic version of the software model used to prepare the final short-circuit, protective device coordination, and arc flash hazard analysis studies.

1.07 FACTORY TESTING - NOT USED

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.09 QUALITY ASSURANCE

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be an employee of the approved engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

D. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed.

E. The studies shall be performed using SKM Systems Analysis Power*Tools for Windows (PTW) software program or an approved equivalent software tool.

PART 2 PRODUCTS

2.01 DATA COLLECTION

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A. Field data collection shall be performed by a technician, qualified (as defined by NFPA 70E - 2004) to ensure accurate equipment modeling. The technician shall have completed an 8-hour instructor-led Electrical Safety Training Course. The course shall include NFPA 70E training which includes the selection and use of personal protective equipment.

B. The technician shall visually inspect to verify the equipment ratings, conductor ratings and overcurrent device data by removing panels, covers and doors where required to document the necessary data used in the analysis. The technician shall be qualified to perform these inspections with the equipment energized provided the incident energy values are less than 40cal/cm², greater values or unusual site conditions will require an equipment shutdown so the equipment can be inspected de-energized.

C. The Owner or Contractor shall provide qualified personnel to show the technician the equipment locations and to open all equipment doors, locks, etc. necessary to collect nameplate data.

D. Verify one-line drawings and provide marked corrections where discrepancies are found.

E. Data collection shall begin downstream from the utility service and continue down through the electrical distribution system as defined under scope of work. The study shall not include any single phase AC circuits or DC distribution systems as these types of circuits and systems are excluded from IEEE 1584 Arc Flash calculation guidelines. The study need not include equipment rated 240 volts or less per NFPA 70E, when supplied by a single transformer rated less than 125kVA.

F. Obtain from the utility the minimum, normal, and maximum operating service voltage levels, three-phase short circuit MVA and X/R ratio, as well as line-to-ground short circuit MVA and X/R ratio at the point of connection as shown on the drawings.

2.02 SHORT-CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:
1. Calculation methods and assumptions.
2. Selected base per unit quantities.
3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.
4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

D. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings.
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Identify in writing, any circuit protective devices improperly rated for the calculated available fault current.

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2.03 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title with descriptive device names.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:
1. Electric utility's overcurrent protective device.
2. Medium voltage equipment overcurrent relays.
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
6. Medium voltage conductor damage curves.
7. Ground fault protective devices, as applicable.
8. Pertinent motor starting characteristics and motor damage points, where applicable.
9. Pertinent generator short-circuit decrement curve and generator damage point.
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:
1. A one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time- current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram.
5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. Identify in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.04 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis and the protective device time-current coordination analysis.

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

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C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.

D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

G. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

H. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:
   1. Fault contribution from induction motors should not be considered beyond 5 cycles.

I. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

J. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

K. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

L. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

M. Provide the following:
   1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
      a. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.
         1) The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

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PART 3 EXECUTION

3.01 FIELD ADJUSTMENT

A. The Contractor or equipment manufacturer's start-up technician shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B. The Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. Square D shall notify Owner in writing of any required major equipment modifications.

3.02 ARC FLASH LABELS

A. Provide a 4.0 in. x 4.0 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The labels shall be designed according to the following standards:
1. UL969 - Standard for Marking and Labeling Systems.
2. ANSI Z535.4 - Product Safety Signs and Labels.
3. NFPA 70 (National Electric Code) - Article 110.16.

C. The label shall include the following information:
1. System Voltage.
    a. Flash protection boundary.
    b. Personal Protective Equipment category.
    c. Arc Flash Incident energy value (cal/cm^2).
    d. Limited, restricted, and prohibited Approach Boundaries.
        1) Study report number and issue date.

D. Labels shall be printed by a thermal transfer type printer, with no field markings.

E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:
1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
2. Wall Mounted Equipment - Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

F. Label Installation.
1. Labels shall be field installed by the Contractor. The technician providing the installation shall have completed an 8-Hour instructor led Electrical Safety Training Course with includes NFPA 70E material including the selection of personal protective equipment.

3.03 TRAINING - NOT USED

END OF SECTION

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SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Panelboards.
   1. Panelboards shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Panelboards, Lump Sum. When so provided, payment for Panelboards shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Panelboards, Inclusive. When no quantity is provided, Panelboards shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
   3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
      a. NEMA PB 1 - Panelboards.
      b. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
      c. NEMA AB 1 - Molded Case Circuit Breakers.
      d. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
      e. NEMA 250 - Enclosures for Electrical Equipment.
   4. International Electrical Testing Association (NETA).
      a. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
   5. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
      a. UL 50 - Enclosures for Electrical Equipment.
      b. UL 67 - Panelboards.
      c. UL 98 - Enclosed and Dead-front Switches.
      d. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures.
   6. Canadian Standards Association (CSA), Specifications and Standards, current edition:
      a. CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards.
      b. CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers.
   7. Federal Specifications and standards, current edition:
      a. W-P-115C - Type I Class 1.
      b. W-C-375B - Molded Case Circuit Breakers.
      c. W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service.
      d. W-P115C - Type 1 Class 2 Load Center.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable panelboards as indicated on the drawings and as specified herein.

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1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for panelboards:
   1. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. Illustrate one line diagrams with applicable voltage systems.
   3. Equipment ratings for voltage, amperage, and short circuit.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit the following information specifically for panelboards:
   1. Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.07 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: All panelboards provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than fifty years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

E. Panelboard manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.08 WARRANTY

A. See Division 01 for additional requirements.

1.09 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 600 VAC POWER DISTRIBUTION PANELBOARD

A. Manufacturers:
   1. Square D Company I-LINE - Class 2110.
   2. Cutler-Hammer Pow-R-Line.
   3. or equal.

B. Interior:

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1. Rated 600 vac or 250 VDC maximum. Continuous main current ratings as indicated on drawings not to exceed 1200 amperes maximum. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.
2. UL Listed short circuit current ratings as indicated on the drawings with a maximum of 200,000 RMS symmetrical amperes. Main lug and main breaker panelboards shall be suitable for use as Service Equipment.
3. The panelboard interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
4. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing shall be plated copper. Bus bar plating shall run the entire length of the bus bar. The entire interleaved assembly shall be contained between two U-shaped steel channels, permanently secured to a galvanized steel mounting pan by fasteners.
5. Interior trim shall be of dead-front construction to shield user from all energized parts. Main circuit breakers through 800 amperes shall be vertically mounted. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.
6. A solidly bonded copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided where indicated on the drawings.
7. Solid neutral shall be equipped with a full capacity bonding strap for service entrance applications. UL Listed panelboards with 200 percent rated solid neutrals shall have plated copper neutral bus for non-linear load applications where indicated on the drawings. Gutter-mounted neutral will not be acceptable.
8. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label, and Short Circuit Current Rating shall be displayed on the interior or in a booklet format. Leveling provisions shall be provided for flush mounted applications.

C. Circuit Breakers:
1. Interiors shall accept group mounted circuit breakers through 1200A.
   a. Circuit breakers shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
   b. Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
   c. Line-side circuit breaker connections shall be jaw type.
2. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

D. Enclosures:
1. Type 3R, 5, and 12:
   a. Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
   b. All doors shall be gasketed and be equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners. A clear plastic directory cardholder shall be mounted on the inside of door. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock.
   c. Maximum enclosure dimensions shall not exceed 44-inches wide and 14.5-inches deep.

2.02 MOLDED CASE CIRCUIT BREAKERS

A. General.
1. Circuit breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.

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3. The circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication. Circuit breaker escutcheon shall be clearly marked ON and OFF in addition to providing International I/O markings.
4. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.
5. Each circuit breaker shall be equipped with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit breaker tripping mechanism for maintenance and testing purposes.
6. Circuit breakers shall be factory sealed with a hologram quality mark and shall have date code on face of circuit breaker.
7. Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end use equipment along with the statement "Caution - Series Rated System. ____ A Available. Identical Replacement Component Required".
8. Manufacturer shall provide electronic and hard copy time/current characteristic trip curves (and Ip & I^2t let through curves for current limiting circuit breakers) for each type of circuit breaker.
9. The circuit breakers shall be UL Listed for use with and provided with the following accessories where indicated on the drawings: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits. Circuit breaker handle accessories shall provide provisions for locking handle in the ON and OFF position for all circuits that supply exit signs, emergency lights, energy management, control system panels, and fire alarm panels.
10. All circuit breakers shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.
11. Circuit breakers shall be fixed construction with factory installed mechanical lugs. All circuit breakers shall be UL Listed to accept field installable/removable lugs. Lug body shall be bolted in place; snap in design not acceptable. All lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors. Lugs shall be suitable for 90 degree C rated wire, sized according to the 75 degree C temperature rating in the National Electrical Code.
12. All circuit breakers shall be capable of accepting bus connections.
13. Any circuit breaker not set to the maximum trip rating shall be equipped with NEC locking mechanism.

B. Thermal-Magnetic Circuit Breakers.
1. Circuit breakers shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.
2. Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true rms sensing and thermally responsive to protect circuit conductor(s) in a 40 degree C ambient temperature.
3. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker.
4. Standard two- and three-pole circuit breakers up to 250 amperes at 600 VAC shall be UL Listed as HACR type.

C. Electronic Trip Circuit Breakers With Standard Function Trip System.
1. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the drawings.
2. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.
3. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and adjustment positions shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 80 percent of their ampere rating continuously.
4. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.
    a. Long Time Pickup Instantaneous Pickup.

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b. Long Time Delay.
c. Short Time Pickup (I^2t OUT only).
d. Short Time Delay (I^2t IN only).

5. A means to seal the trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.
6. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.
7. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in true rms with 2 percent accuracy.
8. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.
9. The trip system shall include a Long Time memory circuit to sum the time increments of intermittent overcurrent conditions above the pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.
10. Circuit breakers shall be equipped with back-up thermal and magnetic trip system.
11. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact panelboard locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Adjust panelboard installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept panelboard on site. Inspect for damage.

B. Protect panelboard from corrosion and entrance of debris.

C. Store panelboard above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. Install panelboards plumb and flush with wall finishes.

B. Install panelboards such that top of panel is located at an elevation of 6-feet above finished floor elevation.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

E. Stub five empty 1-inch conduits to accessible location above ceiling or below floor of each flush-mounted panelboard to allow for future expansion.

F. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 10 percent, rearrange circuits in the panelboard to balance the phase loads within 10 percent. Take care to maintain proper phasing for multi wire branch circuits.

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G. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

H. Verify that bonding jumper is properly installed in service entrance rated panels.

I. Thoroughly clean and remove construction debris from panelboard interior and exterior.

3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 24 19
MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Motor Control Centers.

1. Motor Control Centers shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

a. Motor Control Centers, Lump Sum. When so provided, payment for Motor Control Centers shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.

b. Motor Control Centers, Inclusive. When no quantity is provided, Motor Control Centers shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.

1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

a. NFPA 70 - National Electrical Code.

2. Canadian Standards Associates (CSA), Specifications and Standards, Current Edition.

3. Electrical and Electronic Manufacturers Association Canada (EEMAC), Specifications and Standards, Current Edition.

4. International Electrotechnical Association (IEC), Specifications and Standards, Current Edition:

a. IEC-60439 - Low Voltage Switchgear and Control Gear Assemblies.

5. National Electrical Contractors Association (NECA), current edition.

a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.

6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition:

a. ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.

b. ICS 2.3-1995 (R2002) - Industrial Control and Systems: Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers Rated Not More than 600 Volts.

c. ICS 4-2000 - Industrial Control and Systems: Terminal Blocks.

d. ICS 5-2000 - Industrial Control and Systems: Control Circuit and Pilot Devices.

7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition:

a. UL 845 - Standard for Motor Control Centers.

1.04 B. DESCRIPTION OF WORK

C. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:

Section 26 90 00 - Process Instrumentation & Control.

Furnish and install complete and operable motor control centers as indicated on the drawings and as specified herein.

Motor control equipment specified under this section shall be the product of a single manufacture unless stated otherwise.

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SUBMITTALS

Submit shop drawings in accordance with Division 01.

Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.05 Submit the following information specifically for motor control centers:

A. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.

B. Equipment ratings for voltage, amperage, and short circuit.

C. Dimension drawings.

1. Conduit entrance drawings:

2. Maximum conduit and cable size.

3. Locations.

4. Unit wiring diagrams:

a. Individual diagram for each unit.

b. Show tag numbers and descriptions.

5. Show wire and terminal numbers.

a. Unit layout diagrams:

b. Individual diagram for each unit.

c. Show tag numbers and descriptions.

6. Control Logic Diagrams:

a. Individual diagram for each unit.

b. Show tag numbers and descriptions.

7. Show wire and terminal numbers.

a. Show field device interconnections.

b. Custom drawings are required to fulfill this requirement. Manufacturer's standard diagrams are not acceptable.

c. Bus size and ratings.

d. Protective device frame sizes and trip ratings.

e. Nameplate legend.

8. Symbol and abbreviation list.

9. Manufacturer's installation instructions.

10. Indicate application conditions and limitations of use.

11. Indicate instructions for storage, handling, protection, examination, preparation, installation, starting, and testing of equipment.

12.

1.06

A. OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

B. Submit operation & maintenance manuals and instructions in accordance with Division 01.

C. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

1. Submit the following information specifically for motor control centers:

2. As-built wiring and layout diagrams.

3. Manufacturer maintenance instructions.

Motor controller data listing identifying all adjustable settings and configurable.

1.07

QUALITY ASSURANCE

All materials, equipment, and parts shall be new and unused of current manufacture.

System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

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Manufacturer Qualifications: All motor control centers provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than twenty years of documented experience.

Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

C. Motor Control Center manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

D. WARRANTY

E. See Division 01 for additional requirements.

1.08 EXTRA MATERIALS

A. See Division 01 for additional requirements.

1.09 PRODUCTS

A. MANUFACTURER

PART 2

2.01 Allen Bradley (Basis of Design to match the existing).

A. Eaton/Cutler-Hammer.

B. MOTOR CONTROL CENTER STRUCTURE

2.02

A. Enclosure:

1. NEMA Type 1 with closed cell neoprene gaskets.
2. 90-inch high by 20-inch deep structure consisting of one or more vertical sections of varying widths bolted together.

B.

1. Vertical Sections:
   a. Construction:
      b. Rigid, freestanding structure.
      c. Heavy-duty internal base mounting angles at bottom of structure, continuous within shipping block.
      d. Removable heavy duty lifting angle, continuous within shipping block. Lifting eyelets are not acceptable.
      e. Rounded-edge tightly fitted metal work with no visible air gaps.
      f. Full metal side sheets for isolation and minimization of fault propagation between adjacent vertical sections.
      g. Removable end plates:
      h. Horizontal power bus.
2. Horizontal wire way.
   a. End of structure vertical sections only.
      1) Removable one-piece top plate.
      2) Bottom plate.
      3) Wire ways:
      4) Horizontal:
         Top and bottom extending full depth of structure.
         Ninety square inches of unobstructed wiring space at top and bottom of each vertical section.
         Six inches high, extending entire length of structure with twenty-five square inch opening between vertical sections.
         Isolated from horizontal and vertical bus.

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Removable front covers held in place with captive screws.
Seven inch deep horizontal wire way in incoming line section, isolated from incoming line compartment.

Vertical:

Full height 4.37-inch wide by 7-inch deep in each vertical section.
Isolated from horizontal and vertical bus.
Integral to vertical section, independent from plug-in units.
Removable hinged cover with quarter-turn latches.
5) Vertical wire way tie bars for securing wiring in place.
6) Structure Coatings:

b. Structural metal parts cleaned, rinsed, and painted to uniform thickness.
1) Coatings:
2) Paint all surfaces ANSI 49 medium light gray except as noted.
3) Paint vertical wire ways and unit back plates gloss white.
4) Paint vertical wire ways and unit back plates gloss white.
5) Do not paint stainless steel parts.

3. Plate unpainted parts for corrosion resistance.

a.
b.

Bus bars:

1)
2)
3) Horizontal Power Bus:
4)

The horizontal bus shall be rated as shown on the drawings.
The horizontal bus material shall be copper with tin plating.

C.

1. The horizontal bus shall be supported, braced and isolated from the vertical bus with a high strength, non-tracking glass polyester material.

a.
b. For standard sections the horizontal bus shall be continuous within each shipping block and shall be braced within each section.
c. Horizontal bus splices shall have at least 2 bolts on each side.
d. Vertical Bus:
e.

2. The vertical power bus shall have an effective rating of 600A. If a center horizontal bus construction is utilized, then the rating shall be 300A above and below the horizontal bus for an effective rating of 600A. If a top or bottom mounted horizontal bus is utilized, then the full bus must be rated for 600A.

a.
b. The vertical bus material shall be copper with tin plating.
c. The vertical bus shall attach to the horizontal bus with at least 2 bolts.
d. The vertical bus shall be continuously braced by a high strength non-tracking glass-filled polyester material and sandwiched by a glass-filled polycarbonate molded cover.
e.

3. Automatic shutters shall cover plug-in stab openings when units are removed.

a. Ground Bus:
b. Provide a ground bus system consisting of a horizontal ground bus connected to vertical ground buses mounted in each section.
c. Provide an unplated copper (0.25 inch by 2 inch) horizontal ground bus mounted in the bottom of the MCC unless otherwise specified in the drawings.
d. Provide a pressure type mechanical lug mounted on the ground bus in the incoming line section.

4.

a. Provide a unit ground stab on all unit inserts. The ground stab shall establish unit insert grounding to the vertical ground bus before the plug-in power stabs engage the power bus. The grounding shall be maintained until after the plug-in power stabs are disengaged.
b. Neutral Bus.

D.

1. If a 4-wire system is specified, yet there are no neutral loads in the MCC, only a neutral connection plate is required in the MCC; i.e. a full neutral bus is not required.

If neutral loads are specified within the MCC, a full neutral bus is required. Provide a neutral bus across the full width of the MCC, an incoming neutral lug pad in the incoming section, and neutral connection plates in sections as required.

Isolation and Insulation:

Shutters shall automatically open when a unit is inserted and automatically close when a unit is removed, so that personnel are not exposed to live vertical bus bars and so that the bus is isolated from arcing faults.

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PLUG-IN UNITS

General.

Plug-in units shall consist of unit assembly, unit support pan and unit door assembly.

Units shall be supplied with removable doors. The unit doors shall be fastened to the structure so that the doors can be closed when the unit is removed.

A unit support pan shall be provided for support and guiding units. Unit support pans shall remain in the structure when units are removed to provide isolation between units.

2.03 A service position shall be provided for plug-in units that allows for the unit to be supported, but disengaged from the bus. The unit shall be capable of being padlocked in the service position.

A.

1.

2. Power Stabs.

Unit stabs for engaging the power bus shall be tin plated copper and provided with stainless back-up springs to provide and maintain a high pressure 4-point connection to the vertical bus.

3.

4. Wiring from the unit disconnecting means to the plug-in stabs shall not be exposed to the rear of the unit. A separate isolated pathway shall be provided for each phase to minimize the possibility of unit fault conditions reaching the power bus system.

B.

1. The power cable termination at the plug-in stab shall be a maintenance-free crimp type.

2.

Unit Mounting:

3. After insertion, each plug-in unit shall be held in place by a latch that is located at the front of the unit. Multi-turn latches requiring more than ten turns per latch shall not be acceptable.

C.

1. Mount plug-in stabs in polyester molding at the rear of the unit. Rout wiring from the unit disconnecting means to the plug-in stabs into this molding such that the wiring is not exposed at

2. the rear of the unit.

Fasten the unit door to the stationary structure (not the unit itself), so that the door can close with

3. the unit removed. Hinge the door on the left-hand side so that it opens away from the vertical wire way.

D. Disconnecting Means:

1. Units shall be provided with a heavy-duty, industrial, flange mounted handle mechanism for control

2. of each disconnect switch or circuit breaker.

3. The operator units may pivot in the vertical or horizontal plane.

The on-off condition shall be indicated by the handle position, red and green color indicators with

4. the words ON and OFF, and the international symbols I and O along with a pictorial indication of

5. the handle position.

Handles shall be capable of being locked in the OFF position with up to three padlocks.

6. The operator handle shall be interlocked with the unit door so that the disconnect cannot be switched to the ON position unless the unit door is closed. A means shall be provided for purposely

2.04 defeating the interlock during maintenance or testing.

The operator handle shall be interlocked with the unit so that the unit cannot be inserted or

A. withdrawn with the operator handle in the ON position.

1.

2.

MOTOR CONTROLLER UNITS

B.

1. Unit Control Power:

Mount control circuit transformer within the unit and provide primary fuses.

2. Provide excess capacity in addition to that required by the starter coil to accommodate loads shown on the drawings.

2.05

Motor Controllers:

Provide combination motor controllers, UL listed as a complete assembly including disconnecting means, contactor or solid-state reduced voltage controller, and overload protection as specified in Section 26 29 13.

Provide combination adjustable frequency motor controllers as specified in Section 26 29 23.

INCOMING LINE UNITS

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Incoming Main Lug Compartment:

Ampere rating as shown on drawings.

Communications compartment (where shown on drawings):

Redundant 120VAC power supplies for networks switches shall be provided.

Device Level Ring switch - Allen Bradley 1738-ETAP, Communications connections as shown on drawings.

600V rated STP communication cable throughout MCC and up to SCADA switch.

A. 1. Redundant 120VAC power supply for ethernet switches shall be equipped with surge protection and be provided from UPS back-up power. Utilizing devices from local SCADA panel as source is acceptable.

B. 1. 2. 3. 4.

FEEDER UNITS

Unit Mounting:

After insertion, each plug-in unit shall be held in place by a latch that is located at the front of the unit. Multi-turn latches requiring more than ten turns per latch shall not be acceptable.

2.06 A. 1. Mount plug-in stabs in polyester molding at the rear of the unit. Rout wiring from the unit disconnecting means to the plug-in stabs into this molding such that the wiring is not exposed at the rear of the unit.

2. Fasten the unit door to the stationary structure (not the unit itself), so that the door can close with the unit removed. Hinge the door on the left-hand side so that it opens away from the vertical wire way.

3.

Disconnecting Means:

B. 1. The operator handle of all units shall be interlocked with the MCC frame, so that a unit insert can not be withdrawn or inserted when the operator is in the ON position.

2. Feeder breakers shall be molded case circuit breakers with thermal magnetic trip of the ampacity indicated on the drawings and have a short circuit rating greater than the available fault current indicated on the drawings.

2.07 ETHERNET COMMUNICATIONS

A. 1. The MCC shall have Ethernet wiring incorporated into its design.

2. The MCC shall have Ethernet cabling incorporated throughout the vertical section.

3. Each motor starter, AC drive and soft starter unit in the MCC shall be supplied with a means to communicate via Ethernet and shall be capable of monitoring the scheduled points.

4. Each MCC shall include communication, 24VDC power equipment as shown on the SCADA network drawing allowing Ethernet/IP communication with the SCADA network.

2.08 A. 1. Communication cabling utilized throughout MCC shall be as 600V rated and designed for high EMF environments. STP cabling as specified shall be utilized for Ethernet communication cabling with MCC.

2. 3. 4.

MISCELLANEOUS REQUIREMENTS

B. Control Terminal Blocks:

1. Mounting: front interior of unit in accessible location.

2. Type: as specified in Section 26 90 11.

3. Machine printed labels.

C. 1. Wire size: #14 AWG.

Power Terminal Blocks:

NEMA Size 1 and 2 units: pull-apart blocks, #4 AWG maximum wire size.

NEMA size 3 units: Fixed blocks, #1/0 AWG maximum wire size.

NEMA size 4 and larger units: None.

Control Devices:

As specified in Section 26 90 11 and shown on drawings.

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Mounting: door mounted removable control station.
Overload reset: external low profile button.
Auxiliary contacts: as shown, minimum of two normally open and two normally closed.

Nameplates.

A master nameplate shall be provided on each MCC lineup.

Unit Nameplates:

Indicate unit identifier and description.

2. 3-5/8 inch by 1-1/8 inch engraved label in accordance with Section 16195.
3. Unit identification label:
4. Indicate catalog number/serial number of unit inside unit.

D.

1. Motor Data Label:
2. a. Machine printed adhesive label.
   b. Indicate:
3. a. Motor served.
   Motor nameplate horsepower.

E. Motor nameplate full load amperes.

1. Motor code letter.
2. a. Motor design letter.
   b. Motor service factor.
   c. Voltage and phase rating.
   d. Disconnecting means trip setting.
   e. Overload relay settings.
   f.
   g.
   h.
   i.

EXECUTION

PART 3

FIELD MEASUREMENTS

3.01

A. Field verify all measurements. Do not base exact motor control center locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C.

D. Identify deviation from physical sizes shown on the drawings to Engineer prior to bid date.

E. Contractor shall be responsible for modifications to the installation due to deviations from physical sizes shown on the drawings.

F.

G. Identify conflicts with the work of other trades prior to installation of electrical equipment.

3.02 Record nameplate data for each motor served.

A. Adjust motor control center installation to satisfy field requirements.

B.

DELIVERY, STORAGE, AND HANDLING

C. Accept motor control centers on site. Inspect for damage.

D.

E. The Contractor shall be responsible for all equipment necessary to receive, unload, move into building, and install motor control centers.

The Contractor shall be responsible for coordinating specific shipping split requirements with the manufacturer/supplier.

Conform to written instructions of manufacturer.

Protect motor control centers from corrosion and entrance of debris.

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Store motor control centers above grade. Protect from environment with suitable covering.

INSTALLATION

Adjust disconnecting means trip settings to satisfy motor nameplate requirements.

F. Provide overload relays sized and adjusted for the actual nameplate data recorded for each motor. No additional compensation will be allowed due to failure to select overload devices based upon actual motor nameplate data.

3.03

A. Record information for motor data labels and install motor data labels.

B. Install interconnecting wiring between vertical sections of MCC. No additional compensation will be allowed due to failure to coordinate wiring requirements with the manufacturer/supplier.

C. Install motor control centers plumb and flush with wall finishes.

D. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of all connections.

E.

F. Verify that bonding jumper is properly installed in service entrance rated motor control centers.

G. Thoroughly clean and remove construction debris from panelboard interior and exterior.

H. TESTING AND START-UP SERVICES

3.04

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 28 19
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Enclosed Switches.
   1. Enclosed Switches shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Enclosed Switches, Lump Sum. When so provided, payment for Enclosed Switches shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Enclosed Switches, Inclusive. When no quantity is provided, Enclosed Switches shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
      a. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
         1) NFPA 70 - National Electrical Code.
      b. National Electrical Contractors Association (NECA), Standard of Installation, current edition.
      c. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
         1) NEMA FU 1 - Low Voltage Cartridge Fuses.
         2) NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
         3) NEMA 250 - Enclosures for Electrical Equipment.
      d. International Electrical Testing Association (NETA).
         1) NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
      e. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.
         1) UL 98 - Enclosed and Dead Front Switches.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable enclosed switches as indicated on the drawings and as specified herein.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for enclosed switches:
   1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Outline drawings with dimensions.
   3. Equipment ratings for voltage, amperage, horsepower and short circuit.

1.06 QUALITY ASSURANCE

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A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.07 WARRANTY

A. See Division 01 for additional requirements.

1.08 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 250VAC/600VAC HEAVY DUTY DISCONNECT SWITCH

A. Manufacturers:
1. Square D Company.
2. Cutler-Hammer.
3. or equal.

B. Switch Interior:
1. All switches shall have switch blades which are visible when the switch is off and the cover is open.
2. Lugs shall be front removable and UL Listed for 60 degree C or 75 degree C aluminum or copper conductors as required by the application.
3. Fusible switches shall be equipped with factory installed or field installed fuse pullers.
4. Switches shall be equipped with plated copper current carrying parts to resist corrosion.
5. Switches shall be equipped with removable arc suppressors to facilitate access to line side lugs.
6. Switches shall have provisions for a field installable electrical interlock.

C. Switch Mechanism:
1. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be restrained by the operating handle after the closing or opening action of the contacts has started.
2. The operating handle shall be an integral part of the box, not the cover.
3. The handle position shall travel at least 90 degrees between off and on positions to clearly distinguish and indicate handle position.
4. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is on and prevent turning the switch on when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

D. Switch Enclosures:
1. Environmental Rating:
a. Service entrance switch, exterior: Type 4X, stainless steel.
b. Service entrance switch, interior: Type 1.
c. Disconnect switch, exterior: Type 4X, stainless steel.
d. Disconnect switch, interior: Type 4X, stainless steel.
e. Disconnect switch, interior when EMT conduit is allowed: Type 1.
f. Disconnect switch, hazardous location: Type 7/9.

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2. Covers:
   a. Type 1, 4X stainless steel enclosures: attached with welded pin-type hinges.
   b. Type 7/9 enclosures: attached with Type 316 stainless steel bolts.
3. Finish:
   a. Type 1 enclosures: gray baked enamel paint electrodeposited on cleaned, phosphate pre-treated steel.
   b. Type 4X stainless steel enclosures: brush finish on type 304 stainless steel.
   c. Type 7/9 enclosures: gray baked enamel on copper free cast aluminum alloy.
4. The enclosure shall have on and off markings stamped or cast into the cover.
5. The operating handle shall be provided with a dual colored, red/black position indication.
6. All switches shall have provisions to accept up to three 3/8-inch hasp padlocks to lock the operating handle in the off position.
7. Exterior switches shall have provisions to accept one 3/8-inch hasp padlocks to lock the operating handle in the on position.
8. Conduit Entrance:
   a. Tangential knockouts shall be provided for Type 1 switches rated 30-200A.
   b. Watertight conduit hubs for Type 4X stainless steel switches.
   c. Threaded conduit openings in both end walls for Type 7/9 enclosures.
9. Cover sealing means for switches rated through 200 amperes shall be quick release trunk latches (Type 1, 4X stainless steel enclosures) and type 316 stainless steel bolts (Type 7/9 enclosures).
10. Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor applications.
11. Type 4X stainless steel enclosures shall be dual rated as Type 3R to facilitate their use in outdoor applications.

E. Switch Ratings:
1. Switch shall be suitable for use as service entrance equipment where use is indicated on the drawings.
2. Switches shall be horsepower rated for ac and/or dc as indicated on the plans.
3. Switches shall be rated for the voltage applied.
4. The UL Listed short circuit current rating of the switches shall be:
   a. 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere).
   b. 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes).
   c. 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact enclosed switch locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Adjust enclosed switch installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept enclosed switches on site. Inspect for damage.

B. Protect enclosed switches from corrosion and entrance of debris.

C. Store enclosed switches above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

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A. Install fuses where switches are indicated as fusible switches on the drawings.

B. Install enclosed switches plumb and level.

C. Install enclosed switches such that top of enclosure is located at an elevation of 6-feet above finished floor elevation.

D. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections.

E. Verify that bonding jumper is properly installed in service entrance rated switches.

F. Thoroughly clean and remove construction debris from switch interior and exterior.

3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 29 13
MOTOR CONTROLLERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Motor Controllers.
   1. Motor Controllers shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Motor Controllers, Lump Sum. When so provided, payment for Motor Controllers shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Motor Controllers, Inclusive. When no quantity is provided, Motor Controllers shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. Canadian Standards Associates (CSA), Specifications and Standards, Current Edition.
   3. European Committee for Electrotechnical Standardization (CENELEC), Current Edition.
      a. EN 60947 - Low-Voltage Switchgear and Controlgear - Part 4-2: Contactors and Motor-Starters - AC Semiconductor Motor Controllers and Starters.
   4. Electrical and Electronic Manufacturers Association Canada (EEMAC), Specifications and Standards, Current Edition.
   5. International Electrotechnical Association (IEC), Specifications and Standards, Current Edition:
      a. IEC-60439 - Low Voltage Switchgear and Control Gear Assemblies.
   6. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
   7. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition:
      a. ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
      b. ICS 4-2000 - Industrial Control and Systems: Terminal Blocks.
      c. ICS 5-2000 - Industrial Control and Systems: Control Circuit and Pilot Devices.
      d. ICS 6-1993 - Industrial Control and Systems Enclosures.
   8. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition:
      a. UL 508 - Industrial Control Equipment.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
   1. Section 26 24 19 - Motor Control Centers.
   2. Section 26 90 00 - Process Instrumentation & Control.

B. Furnish and install complete and operable motor controllers as indicated on the drawings and as specified herein.

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C. Motor control equipment specified under this section shall be the product of a single manufacture and shall be the same as that provided under Section 26 24 19 unless stated otherwise.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein in accordance with the requirements specified under Section 26 24 19, which state that submittals for all motor control equipment be included as part of the submittal for the complete, integrated process instrumentation and control system and in accordance with the requirements specified under Section 26 90 00.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein in accordance with the requirements specified under Section 26 24 19, which state that submittals for all motor control equipment be included as part of the submittal for the complete, integrated process instrumentation and control system and in accordance with the requirements specified under Section 26 90 00.

C. The following information shall be provided specifically for adjustable frequency drive systems:
   1. Motor controller data listing identifying the configured values of all adjustable settings and configurable parameters.

1.07 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: All motor controllers provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than twenty years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

E. Motor Control Center manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.08 WARRANTY

A. See Division 01 for additional requirements.

1.09 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Allen-Bradley.

B. Eaton/Cutler-Hammer.

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2.02 ELECTROMECHANICAL MOTOR CONTROLLERS

A. Overload Protection:
   1. General:
      a. Provide Type 2 overload protection where indicated on the drawings.
      b. Provide Type 1 overload protection where indicated on the drawings and for all motor controllers where overload protection type is not specified on the drawings.
   2. Type 2 Overload Protection:
      a. Motor starter units shall have a manual reset electronic overload relay that incorporates the following features:
         1) On-board Ethernet communications.
         2) LEDs for status indication.
         3) Test/Reset button.
         4) Adjustable trip of NEMA Class 5 to 30. Unless indicated, the trip class shall be set for NEMA Class 20 operation.
         5) On board 120VAC Discrete IO - 2 inputs / 2 Relay Outputs.
         6) Expansion modules - 120VAC Discrete IO 4 inputs / 2 Relay Outputs.
         7) Protective Functions:
            i. Functions shall provide a programmable trip level, warning level, time delay, and inhibit window.
            ii. Protective functions shall include thermal overload, underload, jam, current imbalance, stall, phase loss, zero sequence ground fault (if specified), and PTC thermistor input (if specified on drawings).
         8) Current Monitoring functions shall include phase current, average current, full load current, current imbalance percent, percent thermal capacity utilized, voltage, power, and ground fault current (if specified).
         9) Diagnostic Information shall include device status, warning status, time to reset, trip status, time to overload trip, and history of last five trips.

B. Non-Reversing Starters:
   1. Magnetic starters through NEMA Size 9 shall be equipped with double-break silver alloy contacts. The starter must have straight-through wiring. Each starter shall have one (1) NO auxiliary contact.
   2. Coils shall be permanently marked with voltage, frequency and part number.
   3. NEMA Size 00 through 2 starters shall be suitable for the addition of at least six (6) external auxiliary contacts of any arrangement normally open or normally closed. Size 3 through 8 starters shall be suitable for the addition of up to eight (8) external auxiliary contacts of any arrangement normally open or normally closed.

2.03 SOLID-STATE REDUCED-VOLTAGE MOTOR CONTROLLERS

A. Manufacturer:
   1. Allen-Bradley SMC-Flex.
   2. Eaton/Cutler-Hammer IT/S811.

B. Ratings:
   1. The solid state reduced voltage controller shall accept an input voltage of 480 VAC, three phase plus or minus 10 percent.
   2. Environmental Ratings.
      a. Storage ambient temperature range: -20 to 75 degrees C.
      b. Operating ambient temperature range: 0 to 40 degrees C.
      c. The relative humidity range: 5 to 95 percent non-condensing.
      d. Operating elevation: up to 2000 Meters.
   3. Provide redundant, thermostatically controlled ventilation fans to maintain interior of motor controller enclosure within the specified environmental ratings.

C. Design:
   1. The open-type controller device shall be modular, consisting of a power structure and a logic component.

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2. Power Structure:
    a. The power structure shall include an SCR bypass.
    b. The power structure shall include a built-in overload.
    c. For ratings 1 Amps to 1200 Amps, the power structure shall consist of three power poles with integral heatsinks.
    d. Power poles are to be modular in design that each is easily replaceable.
    e. Back-to-back SCR pairs shall be the only power switching semiconductor means acceptable. Diode-SCR (Silicon Controlled Rectifier) combinations shall not be acceptable.
    f. SCRs shall have the following minimum repetitive peak inverse voltage ratings.
        1) 1400V for units rated 200 to 480V.
        2) 1600V for units rated 200 to 600V.
3. Logic Component:
    a. The logic component shall be a self-contained control module, compatible with the full range of power structures. The control module shall mount directly to the power structure.
    b. The control module shall provide digital microporcessor control and supervision of all controller operation, including pulse firing of the SCRs.
    c. The control module shall consist of the following.
        1) Self-tuning power supply accepting control power input from 100 to 240 VAC or 24V AC/DC, 50/60 Hz.
        2) Logic control circuitry incorporating a latch circuit for three-wire control.
        3) SCR firing circuitry that incorporates an RC snubber network to prevent false firing.
        4) Input / output circuitry.
        5) Digital programming keypad.
        6) Backlit LCD display.
        7) DPI communication port.
    d. The control module shall be easily removed from the power structure, without the need to disassemble associated printed circuit board assemblies.
    e. The control terminals shall be easily accessible and located on the front top of the device. The terminals shall be UL rated for 300 Volts, 10 Amps maximum and accept a maximum of two wires rated number 18 to number 14 AWG.

D. Features:
1. Starting Modes:
    a. The controller shall provide the following starting modes as standard.
        1) Soft Start with Selectable Kickstart:
            i. Programmable initial torque value of 0 to 90 percent of locked rotor torque.
            ii. Programmable acceleration ramp time from 0 to 30 seconds.
            iii. A selectable kickstart, or boost, shall be provided at the beginning of the voltage ramp. The kickstart shall provide a current pulse of 550 percent of the full load current. The kickstart time shall be adjustable from 0 to 2 seconds.
        2) Current Limit Start:
            i. Provides means of limiting the maximum starting current.
            ii. Programmable for 50 to 600 percent of full load current.
        3) Full Voltage Start:
            i. Provides across the line starting.
            ii. Ramp time shall be less than 0.25 seconds.
        4) Dual Ramp Start:
            i. Provides two separate soft start profiles with separately adjustable ramp times and initial torque settings.
            ii. Programmable acceleration times from 0 to 30 seconds.
            iii. Programmable initial torque values from 0 to 90 percent of locked rotor torque.
        5) Soft Stop:
            i. The Soft Stop option shall provide a voltage ramp- down for an extended motor stopping time.

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ii. Soft Stop shall be initiated by a dedicated Soft Stop input. A coast-to-rest stop shall still be possible with a separate stop input.
iii. Programmable voltage ramp down time from 0 to 60 seconds.
iv. The load shall stop when the motor voltage drops to a point where the load torque is greater than the motor torque.

6) Preset Slow Speed:
i. Provides a slow speed for applications requiring a slow speed.
ii. The Preset Slow Speed option shall provide two jog speeds in the forward direction: high (15 percent of base speed) and low (7 percent of base speed).
iii. The Preset Slow Speed option shall provide two jog speeds in the reverse direction: high (20 percent of base speed) and low (10 percent of base speed).
iv. Reverse operation of the motor shall be available in the jog mode without the use of a reversing contactor.
v. The starting current for the slow speed operation shall be user adjustable from 0 to 450 percent of the motor's full load current rating.
vi. The running current for the slow speed operation shall be user adjustable from 0 to 450 percent of the motor's full load current rating.

7) Pump Control:
i. The Pump Control option shall be implemented to provide closed loop control of a motor to match the specific torque requirements of centrifugal pumps for both starting and stopping. This shall aid in eliminating the phenomena commonly referred to as “water hammer.” Methods utilizing Soft Start with Soft Stop shall not be acceptable.
ii. Closed loop control shall be achieved without using external sensors or feedback devices.
iii. Pump Stop shall be initiated by a dedicated Pump Stop input. A coast-to-rest stop shall still be possible with a separate stop input.
iv. Programmable starting time from 0 to 30 seconds.
v. Programmable stopping time from 0 to 120 seconds.

2. LCD Display:
a. An alphanumeric, backlit LCD display shall be provided for controller set-up, diagnostics, status and monitoring. The display shall be four-line, 16 characters minimum.
b. Digital parameter adjustment shall be provided through a keypad. Analog potentiometer adjustments are not acceptable.

3. Overload Protection:
a. Shall meet applicable standards as a motor thermal protective device.
b. Shall utilize three-phase current sensing. The use of two current transformers shall be unacceptable.
c. Selectable trip classes of 10, 15, 20 and 30 shall be provided as standard.
d. Electronic thermal memory shall provide enhanced motor protection.

4. Digital I/O:
a. A minimum of four auxiliary contacts shall be provided for customer use.
b. The contacts shall be rated for 240 Volts AC maximum.
c. Contact configuration shall contain:
1) Normal/Up-to-Speed/Bypass.
2) Fault.
3) Alarm.
4) Normal.

5. DPI Serial Communication Port:
a. A DPI serial communication port shall be provided as standard.

6. Monitoring:
a. The controller shall provide the following monitoring functions indicated through the LCD display.
1) Three-phase current.
2) Three-phase voltage.
3) Power in kW.

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4) Power usage in kWh.
5) Power factor.
6) Motor thermal capacity usage.
7) Elapsed time.

7. Protection and Diagnostics:
   a. The following protection shall be provided as standard with the controller.
      1) Pre-start line fault advising of shorted SCR or missing load connection with phase indication.
      2) Running line fault advising power loss, shorted SCR or missing load connection.
      3) Pre-start power loss with phase indication.
      4) Overtemperature.
      5) Open Gate with phase indication.
   b. The following defeatable protection shall be provided as standard with the controller.
      1) Underload.
      2) Undervoltage.
      3) Overload.
      4) Overvoltage.
      5) Voltage Unbalance.
      6) Excessive Starts Per Hour.
      7) Phase Reversal.
      8) Stall.
      9) Jam.
   c. When fault conditions are detected, the controller shall inhibit starting or shut down SCR pulse firing.
   d. Fault diagnostics shall be indicated in descriptive text on the LCD display. The exclusive use of fault codes is unacceptable.
   e. An auxiliary contact that is programmable for fault indication shall be provided for customer use.
8. Additional Features:
   a. Provide Ethernet/IP communication card to incorporate the motor controller into the MCC Ethernet structure.
   b. All I/O points related to SSRV motor control as shown on the contract documents shall be incorporated into the control system by additional I/O modules, hardwired I/O, or as required by the application.

E. System Components:
1. Transient Protection Modules:
   a. Transient protection with separately mounted protective modules.
   b. Protective modules shall consist of metal oxide varistors (MOVs) in combination with capacitors to protect the power components from electrical transients and / or electrical noise. The capacitors shall be provided to shunt noise energy away from the controllers electronics.
   c. The MOVs and capacitors shall be encapsulated in a clear material for easy inspection.
   d. The protective modules shall be mounted so that they will not cause damage to the power components upon absorbing an electrical transient.
   e. The MOVs shall be rated for a minimum of 220 joules.
2. Input Circuit Breaker:
   a. Provide a door interlocked thermal magnetic circuit breaker disconnect.
   b. Operator Handles:
      1) Provide flange mounted operator handles for free standing units.
      2) Through the door operating handles are acceptable for wall mounted units.
      3) Refer to requirements of Section 26 24 19 for motor control center mounted equipment.
      4) Handles shall be padlockable.
   c. The system shall be rated for the available fault current identified on the drawings. The rating shall be shown on the system label.
3. Isolation Contactor.

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a. Input contactor shall provide positive isolation of the solid-state controller from line power to prevent leakage current through the SCRs.
b. Input contactor shall close when motor is signaled to start, energizing the solid-state controller and allowing reduced voltage starting.
c. Input contactor shall open after the solid-state controller has stopped the motor and de-energize the solid-state controller.
d. Input contactor shall not switch loaded motor under any circumstances.

4. Bypass (Shorting) Contactor.
   a. Bypass contactor shall close and positively short circuit the SCRs after the motor has attained full voltage running condition.
   b. Bypass contactor shall open when motor is signaled to stop, allowing the SCRs to control stopping of the motor.
   c. Bypass contactor shall not switch loaded motor under any circumstances.
   d. Bypass contactor integral to the motor controller is acceptable.
5. Control Power Transformer:
   a. Provide a control power transformer mounted and wired inside of the system enclosure.
   b. The transformer shall be rated for an additional 100 VA for customer use.
   c. The transformer shall be provided with fused primary and secondary protection.
6. Pilot Control Devices:
   a. Provide front of panel mounted pilot devices as shown on drawings.
7. Human Interface Module:
   a. Provide a door mounted Human Interface Module with integral display and programming keys.
   b. The display shall show operating conditions, adjustments and fault indications.
   c. The display shall be backlit LCD and shall consist of four lines of 16 characters alphanumeric.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact motor controller locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Identify deviation from physical sizes shown on the drawings to Engineer prior to bid date.

D. Contractor shall be responsible for modifications to the installation due to deviations from physical sizes shown on the drawings.

E. Identify conflicts with the work of other trades prior to installation of electrical equipment.

F. Record nameplate data for each motor served.

G. Adjust motor controller installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept motor controller on site. Inspect for damage.

B. The Contractor shall be responsible for all equipment necessary to receive, unload, move into building, and install motor control centers.

C. Conform to written instructions of manufacturer.

D. Protect motor controllers from corrosion and entrance of debris.

E. Store motor controllers above grade. Protect from environment with suitable covering.

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3.03 INSTALLATION

A. Adjust disconnecting means trip settings to satisfy motor nameplate requirements.

B. Provide overload relays sized and adjusted for the actual nameplate data recorded for each motor. No additional compensation will be allowed due to failure to select overload devices based upon actual motor nameplate data.

C. Record information for motor data labels and install motor data labels.

D. Install motor controllers plumb and flush with wall finishes.

E. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of all connections.

F. Thoroughly clean and remove construction debris from panelboard interior and exterior.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 08 00 - Commissioning of Electrical Systems.

B. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.05 TRAINING

A. Refer to the requirements of Section 26 08 00 - Commissioning of Electrical Systems.

B. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 29 23
ADJUSTABLE FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Adjustable Frequency Motor Controllers.
   1. Adjustable Frequency Motor Controllers shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Adjustable Frequency Motor Controllers, Lump Sum. When so provided, payment for Adjustable Frequency Motor Controllers shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Adjustable Frequency Motor Controllers, Inclusive. When no quantity is provided, Adjustable Frequency Motor Controllers shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. Canadian Standards Associates (CSA), Specifications and Standards, Current Edition.
   3. European Committee for Electrotechnical Standardization (CENELEC), Current Edition.
      a. EN 60947 - Low-Voltage Switchgear and Controlgear - Part 4-2: Contactors and Motor-Starters - AC Semiconductor Motor Controllers and Starters.
   4. Electrical and Electronic Manufacturers Association Canada (EEMAC), Specifications and Standards, Current Edition.
   5. Institute of Electrical and Electronics Engineers (IEEE), current edition.
      a. IEEE 519-1992 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
   6. International Electrotechnical Association (IEC), Specifications and Standards, Current Edition:
      a. IEC-60439 - Low Voltage Switchgear and Control Gear Assemblies.
   7. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
   8. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition:
      a. ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
      b. ICS 3.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.
      c. ICS 4-2000 - Industrial Control and Systems: Terminal Blocks.
      d. ICS 5-2000 - Industrial Control and Systems: Control Circuit and Pilot Devices.
      e. ICS 6-1993 - Industrial Control and Systems Enclosures.
      f. ICS 7-1993 - Industrial Control and Systems Adjustable-Speed Drives.
      g. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
   9. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition:
      a. 4.UL 508C - Power Conversion Equipment.

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1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
   1. Section 26 24 19 - Motor Control Centers.
   2. Section 26 90 00 - Process Instrumentation & Control.

B. Furnish and install complete and operable adjustable frequency drive systems as indicated on the drawings and as specified herein.

C. Motor control equipment specified under this section shall be the product of a single manufacture and shall be the same as that provided under Section 26 24 19 unless stated otherwise.

D. Adjustable frequency drive systems work may include work in new motor control centers and/or work in existing motor control centers. Refer to the drawings for detailed description of the work.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein in accordance with the requirements specified under Section 26 24 19, which state that submittals for all motor control equipment be included as part of the submittal for the complete, integrated process instrumentation and control system and in accordance with the requirements specified under Section 26 90 00.

C. In addition to the requirements of Section 26 24 19, the following information shall be submitted specifically for adjustable frequency drive systems:
   1. Submit harmonic voltage distortion analysis based upon the minimum three phase bolted fault short circuit current available at the point of service. Submittal data shall not relieve contractor of specified performance requirements. Analysis shall include:
      a. Calculate percent voltage distortion, with respect to fundamental voltage, for all harmonics up to the 99th.
      b. Comparison with IEEE 519 standards for acceptable voltage distortions on such systems.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein in accordance with the requirements specified under Section 26 24 19, which state that submittals for all motor control equipment be included as part of the submittal for the complete, integrated process instrumentation and control system and in accordance with the requirements specified under Section 26 90 00.

C. The following information shall be provided specifically for adjustable frequency drive systems:
   1. Motor controller data listing identifying the configured values of all adjustable settings and configurable parameters.

1.07 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications:
   1. All equipment provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than twenty years of documented experience.

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2. The adjustable frequency drive system manufacturer shall have been engaged in the manufacture of PWM style adjustable frequency drives for a minimum of ten years.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

E. Adjustable frequency drive system manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.08 WARRANTY

A. See Division 01 for additional requirements.

B. See Section 01 78 00 for additional requirements.

1.09 EXTRA MATERIALS

A. See Division 01 for additional requirements.

B. See Section 01 60 00 for additional requirements.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Allen-Bradley, Bulletin Power Flex 753/755 Series (Basis of Design matching existing).

B. Eaton/Cutler-Hammer, PowerXL DG1 Series (considered as a Contractor Substitution only).

2.02 GENERAL

A. Provide adjustable frequency, drive control systems capable of converting the scheduled voltage, 3-phase, 60 Hz, input power into variable voltage, adjustable frequency, 3-phase output of suitable capacity and waveform to serve as input power to squirrel cage induction motors of the scheduled characteristics (constant or variable torque).

B. Harmonic Distortion:
1. The adjustable frequency drive systems shall operate satisfactorily when connected to a bus supplying other solid state power conversion equipment which may be causing up to 10 percent total harmonic voltage distortion and commutation notches up to 36,500 volt microseconds, or when operated from the same bus.
2. Individual or simultaneous operation of the adjustable frequency drive systems shall not add more than 5 percent total harmonic voltage distortion to the normal bus, nor more than 10 percent while operating from the standby generator in accordance with IEEE 519, 1992.
3. Maximum total and individual harmonic current distortion limits for each odd harmonic shall not exceed those set forth by IEEE 519, Latest Edition.
4. If harmonic filters or reactors are needed to meet these requirements, then the manufacturer shall provide and be responsible for the design and manufacture of these items.

2.03 RATINGS

A. The drive shall accept an input voltage of the nominal three phase voltage indicated on the drawings, plus or minus 10 percent.

B. Displacement power factor: shall range between 1.0 and 0.95, lagging, over the entire speed range.

C. Efficiency: minimum of 97 percent at full load and speed.

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D. Environmental Ratings:
1. Storage ambient temperature range: -40 to 70 degrees C.
2. Operating ambient temperature range: 0 to 40 degrees C without derating.
3. Relative humidity range: 5 to 95 percent non-condensing.
4. Operating elevation: up to 1000 meters without derating.

E. Provide redundant, thermostatically controlled ventilation fans to maintain interior of drive enclosure within the specified environmental ratings.

F. Output power Ratings:
1. The output voltage shall be adjustable from 0 to rated input voltage.
2. The output frequency range shall adjustable from 0 to 400Hz.
3. The inverter section shall produce a pulse width modulated (PWM) waveform using latest generation IGBTs.

2.04 DRIVE UNIT DESIGN

A. Hardware:
1. Utilize diode or fully gated bridge on the input.
2. Utilize DC bus inductor on all drives rated 7.5hp or greater.
3. Utilize switching logic power supply operating from the DC bus.
4. Incorporate phase to phase and phase to ground MOV protection.
5. Utilize gold plated plug-in connections on printed circuit boards.
6. Microprocessor based inverter logic shall be isolated from power circuits.
7. Utilize latest generation IGBT inverter section.
8. Inverter section shall not require commutation capacitors.
9. Employ interface common for all horsepower ratings. Interface shall include a LCD digital display and programming keypad.
10. Utilize a main control board with common control connections for all ratings.

B. Control Design:
1. The drive design shall be optimized for NEMA Design B motors.
2. The drive design shall allow for operation of the drive with the motor disconnected.
3. Provide a controlled shut down, when properly fused, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.
4. Utilize an adjustable PWM carrier frequency within a range of 2 to 8 kHz to help eliminate audible noise.
5. Provide either Selectable Sensorless Vector or V/Hz modes.
6. The drive shall have the capability of selecting operation for either variable or constant torque loads. Selection of variable torque shall provide 115 percent of rated VT current for up to one minute. Selection of constant torque shall provide 150 percent of rated CT current for up to one minute.
7. Provide multiple programmable stop modes including:
    a. Ramp.
    b. Coast.
    c. DC-Brake.
    d. Ramp-to-Hold.
    e. S-Curve.
8. Provide multiple acceleration and deceleration rates.
9. The drive shall have an adjustable output frequency up to 400Hz.
10. The drive shall be capable of sensing a loss of the speed reference.
11. All adjustments shall be made with the door closed.

C. Power Conditioning:
1. The drive shall be designed to operate on an AC line which may contain line notching and up to 10 percent harmonic distortion.
2. An input isolation transformer shall not be required for protection from normal line transients. If line conditions dictate the use of a transformer, the K factor shall be 4.0 or less.

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2.05 DRIVE UNIT FEATURES

A. Control Mode:
1. Selectable sensorless vector or V/Hz mode selectable through programming.
2. The sensorless vector mode shall use motor nameplate data plus motor operating data such as IR drop, nominal flux current and flux up time.
3. The volts per hertz mode shall be programmable for squared, cubed, straight line, pre-programmed or full custom patterns.

B. Current Limit:
1. Programmable current limit from 20 to 160 percent of constant torque rating.
2. Current limit shall be active for all drive states: accelerating, constant speed and decelerating.
3. The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.

C. Acceleration / Deceleration:
1. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3600 seconds.
2. A second set of remotely selectable Accel/Decel settings shall be accessible through the control interface.
3. An adaptive current limit circuit shall be available and capable of being disabled through programming for fast acceleration of low inertia loads.

D. Speed Regulation Modes:
1. Open Loop.
2. Slip Compensation with 0.5 percent speed regulation.
3. Droop - Negative Slip Compensation with 0.5 percent speed regulation.
4. Traverse Function.
5. Closed loop encoder feedback with 0.1 percent speed regulation.
6. Process PI control.

E. Speed Profiles:
1. Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S-Curve" profiles that provide changing accel/decel rates.
2. S-Curve profiles shall be selectable for fixed or adjustable values.

F. Adjustments:
1. A digital interface shall be used for all set-up, operation and adjustment settings.
2. All adjustments shall be stored in nonvolatile memory (EEPROM).
3. No potentiometer adjustments shall be required.
4. The drive shall provide EEPROM memory for factory default values.

G. Process PI Control:
1. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.
2. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the setpoint, the regulator shall adjust the drive output until the feedback equals the reference.
3. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
4. Protection shall be provided for a loss of feedback or reference signal.

H. Fault Reset / Run:
1. The drive shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart.
2. Ground fault, shorted output faults, and other internal microprocessor faults shall not automatically reset/restart.

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3. The time between restarts shall be adjustable from 0.5 to 30 seconds.

I. Skip Frequencies:
1. Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.
2. The set points shall have a bandwidth adjustable from 0 to 15Hz.

J. Run on Power Up:
1. A user programmable restart function shall be provided to automatically restart the equipment after restoration of power after an outage.

K. Line Loss Restart:
1. The drive shall have a line loss restart function. This programmable function shall select the reconnect mode of the drive after recovery from a line loss condition.
2. The reconnect modes shall be Last Speed, Speed Search, Track Volts, or Use Encoder.
3. This feature shall be capable of being disabled thus forcing the drive to start from zero hertz.

L. Fault Memory:
1. The last four faults as well as operating frequency, drive status and power mode shall be stored at the time of fault.
2. Information shall be maintained in the event of a power loss.

M. Overload Protection:
1. The drive shall provide internal Class 10 motor overload protection investigated by UL to comply with N.E.C. Article 430.
2. Overload protection shall be speed sensitive and adjustable for motors with speed ranges of 2:1, 4:1 and 10:1.
3. A viewable parameter shall store the overload usage in percent.
4. An alarm bit shall be available to adjust a process to eliminate an overload trip.

N. Auto Economizer:
1. An auto economizer feature shall automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage. If the load increases, the drive shall automatically return to normal operation.

O. Flying Start:
1. The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed.
2. The flying start feature shall be operable with or without encoder feedback.

P. Control Logic Ride Through:
1. The control logic shall be capable of "riding through" a power outage of up to 2 seconds in duration.

Q. Inertia Ride Through:
1. The drive shall respond to a loss of AC input power by adjusting the output frequency to create a regenerative situation in the motor. The regenerated energy shall be used to power the drive logic during the power outage.
2. The amount of voltage drop required to trigger inertial ride through and the level at which regulation occurs shall both be adjustable.
3. Inertia ride through shall be capable of being enable or disable through programming.

R. Inputs and Outputs:
1. The standard Input / Output board shall consist of both analog and digital I/O.
2. No jumpers or switches shall be required to configure inputs and outputs. All functions shall be fully programmable.
3. If standard Input/ Output board does not have specified I/O additional add-on modules shall be utilized to provide required I/O.

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4. The Input / Output board shall have the following analog inputs as standard.
    a. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 11 bit plus sign, 10V common mode noise rejection.
    b. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 11 bit plus sign, 160V common mode noise rejection.
    c. Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect and square root.
5. The Input / Output board shall have the following analog outputs as standard.
    a. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 11 bit plus sign.
    b. The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.
    c. Programming shall be available to select either absolute or signed values of these parameters.
6. The Input / Output board shall have the following digital inputs as standard.
    a. Quantity of six (6) digital inputs rated 120Vac.
    b. All inputs shall be individually programmable for functions from a list of twenty-nine (29) that includes Start, Run, Stop, External Fault, Speed Select, Jog and Process PI functions.
7. The Input / Output board shall have the following digital outputs as standard.
    a. Quantity of four (4) relay outputs, form C (1 N.O. - 1 N.C.).
    b. Contact output ratings shall be 250Vac / 30Vdc (2.0 Amps maximum), resistive or inductive.
    c. Relays shall be programmable to twenty-six (26) different conditions including Fault, Alarm, At Speed, Drive Ready and PI Excess Error.
    d. Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.

S. Reference Signals:
1. The drive shall be capable of using the following input reference signals:
    a. Analog inputs.
    b. Preset speeds.
    c. Remote potentiometer.
    d. Digital MOP.
    e. Human Interface.
    f. Communication module commands.

T. Communication:
1. The drive shall be capable of communicating with an Ethernet/IP network.
2. The drive shall be configured such that multi-cast traffic is turned off and all Ethernet messages shall be discriminate communications.

U. Loss of Reference:
1. In the event of loss of the reference signal, the drive shall be user programmable to the following:
    a. Fault the drive.
    b. Alarm and maintain last reference.
    c. Alarm and go to preset speed.
    d. Alarm and go to minimum speed.
    e. Alarm and go to maximum speed.
    f. Alarm and maintain last output frequency.

V. Metering:
1. The following parameters shall be accessible through the human interface module:
    a. Output Current in Amps.
    b. Output Voltage in Volts.
    c. Output Power in kW.
    d. Elapsed MWh.

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e. DC Bus Voltage.
f. Output Frequency.
g. Heatsink Temperature.
h. Last eight (8) faults.
i. Elapsed Run Time.

W. Faults:
1. Fault information shall be accessible through the human interface module. 2. A fault buffer shall store the last four faults in a first-in / first-out manner.
2. At a minimum the following faults shall be displayed:
a. Power Loss.
b. Undervoltage.
c. Overvoltage.
d. Overload.
e. Overtemperature (Heat Sink).
f. Overcurrent detected in instantaneous overcurrent trip circuit.
g. Maximum retries.
h. Phase-to-phase and phase-to-ground faults.

2.06 DISCONNECTING MEANS

A. Provide a door interlocked motor circuit protector disconnect.

B. Operator Handles.
1. Provide flange mounted operator handles for free standing units.
2. Provide through the door operating handles for wall mounted units.
3. Refer to requirements of Section 26 24 19 for motor control center mounted equipment.
4. Handles shall be padlockable.

C. The system shall be rated for the available fault current identified on the drawings. The rating shall be shown on the drive label.

2.07 DRIVE INPUT FUSES

A. Provide drive input fuses.

B. The drive input fuses shall be selected by the manufacturer and mounted in fuse blocks.

2.08 CONTROL POWER TRANSFORMER

A. Provide a control power transformer mounted and wired inside of the drive system enclosure.

B. The transformer shall be rated for drive power plus 250VA for customer use.

C. Refer to Drawings for detail for separate source control power and disconnects.

2.09 CONTACTORS

A. General:
1. Contactors shall be IEC or NEMA rated devices suitable for the application intended.
2. Provide Isolation contactors where indicated on the drawings. Refer to motor control center schedules for input and output appurtenances requirements for each adjustable frequency motor controller.

B. Isolation:
1. Input contactor shall provide positive isolation of the controller from line power.
2. Input contactor shall close when motor is signaled to start, energizing the controller and allowing adjustable speed control.

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3. Input contactor shall open after the controller has stopped the motor and de-energize the controller.
4. Input contactor shall not switch loaded motor under any circumstances.

2.10 AUXILIARY POWER SUPPLY

A. Where shown on the plans or where required by the appropriate code, derive auxiliary power from sources inside the MCC bucket.

B. Provide Auxiliary power supply to maintain power on drive controls while input contactor is opened. Provide additional 24 VDC power supplies and additional modules as required to maintain power on drive. Using Device Level Ring power supply as shown on drawings is acceptable source of 24VDC power.

C. Provide additional power surge protection for Auxilary power supply to prevent power surges from impacting drive controls, the network, or power supply. Recommend Islatrol IC+ for additional surge protection. Providing power source from SCADA control panel after surge protector and UPS is acceptable.

2.11 POWER CONDITIONING EQUIPMENT

A. General:
1. Provide Input Line Reactors where indicated on the drawings. Refer to motor control center schedules for input and output appurtenances requirements for each adjustable frequency motor controller.
2. Provide dV/dT filters where indicated on the drawings. Refer to motor control center schedules for input and output appurtenances requirements for each adjustable frequency motor controller.

B. Common Mode Choke:
1. Provide a common mode choke at the drive output to help, in conjunction with the proper grounding techniques, reduce or eliminate interference with sensitive electronic equipment or communication devices installed in the same system.

C. Input Line Reactor:
1. Provide a drive input line reactor mounted within the drive system enclosure for drives that do not have a harmonic filter indicated on One- line drawings.
2. The line reactor shall meet the following specifications:
   a. The construction shall be iron core with an impedance of (3) percent.
   b. The winding shall be copper wound.
   c. The insulation shall be Class H with a 115 degree C rise.
   d. The unit shall be rated for system voltage and frequency.

D. dV/dT Filter.
1. Manufacturer.
   a. MTE.
   b. TCI, LLC.
2. Ratings:
   a. Amperage determine by drive, 480V, 3-phase, 60Hz.
   b. Minimum common-mode current reduction: 50%.
   c. Minimum efficiency: 99%.
   d. Maximum motor terminal voltage: 150% of DC bus voltage.
3. Installation:
   a. Drive carrier frequency shall be set to lowest selectable setting suitable for application as recommended by manufacturer.
   b. Mounted in seperate panel if MCC layout has space constraints not allowing installation in MCC.

2.12 PILOT CONTROL DEVICES

A. Provide front of panel mounted pilot devices as shown on drawings.

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2.13 ENCLOSURES

A. The enclosure shall be NEMA 4 as indicated on the contract drawings.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact equipment locations locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Identify deviation from physical sizes shown on the drawings to Engineer prior to bid date.

D. Contractor shall be responsible for modifications to the installation due to deviations from physical sizes shown on the drawings.

E. Identify conflicts with the work of other trades prior to installation of electrical equipment.

F. Record nameplate data for each motor served.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept adjustable frequency motor controllers on site. Inspect for damage.

B. The Contractor shall be responsible for all equipment necessary to receive, unload, move into building, and install motor control centers.

C. The Contractor shall be responsible for coordinating specific shipping split requirements with the manufacturer/supplier.

D. Conform to written instructions of manufacturer.

E. Protect adjustable frequency motor controllers from corrosion and entrance of debris.

F. Store adjustable frequency motor controllers above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. Adjust disconnecting means trip settings to satisfy motor nameplate requirements.

B. Record information for motor data labels and install motor data labels.

C. Adjust all programmable drive features, including but not limited to auto restart parameters. The drive system must automatically restart after a power fail condition.

D. Provide typed label inside each unit identifying configured values for all programmable drive parameters.

E. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of all connections.

F. Verify that cooling fans are operating properly.

G. Thoroughly clean and remove construction debris from filters, enclosure interior, and exterior.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 43 00
SURGE PROTECTION DEVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. SURGE PROTECTION DEVICES.
   1. Surge Protection Devices shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Surge Protection Devices, Lump Sum. When so provided, payment for Surge Protection Devices shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Surge Protection Devices, Inclusive. When no quantity is provided, Surge Protection Devices shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.

1.04 DESCRIPTION OF WORK

A. The Surge Protective Device (SPD) covered under this section includes all service entrance type surge protective devices suitable for use as Type 1 or Type 2 devices per UL1449 4th Edition, applied to the line or load side of the utility feed inside the facility.

B. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to finish and install surge protection devises.

C. Provide UL 1449 Type 1 Listed Surge Protective Devices (SPD) for the protection of AC electrical circuits formerly known as Transient Voltage Surge Suppression (TVSS) System. Provide high energy surge current diversion and be suitable for application in Type 1 environments.

D. Modes of Protection:
   1. Line to Ground, Line to Neutral and Neutral to Ground for services with a neutral.
   2. For Services without a neutral, Line to Line and Line to Ground.

E. Provide common and normal modes of protection.

1.05 SUBMITTALS

A. Submit Shop Drawings for equipment provided under this Section.

B. Submit shop drawings and product information for approval and final documentation in quantities listed according to Conditions of the Contract. Identify customer name, customer location, and customer order number.

C. Submit ANSI/UL 1449 Listing documentation to indicate the following:

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1. Short Circuit Current Rating (SCCR).
2. Voltage Protection Ratings (VPRs) for all modes.
3. Maximum Continuous Operating Voltage rating (MCOV).
4. Nominal Discharge Current rating (I-n).
5. Type 1 device.
6. VPR, MCOV, I-n, and Type 1 information is posted at www.UL.com under Certifications; search using UL Category Code: VZCA. SCCRs are posted in manufacturer's published documentation.
7. UL data and visual inspection takes precedence over manufacturer's published documentation.
8. Independent Lab, 3rd party single surgetest reports validating published single and repetitive surge current ratings. Standard Factory test reports are not acceptable. Calculated surge ratings are not acceptable.

D. Provide shop drawings including manufacturer installation instruction manual and line drawings detailing dimensions and weight of enclosure, internal wiring diagram illustrating all modes of protection in each type of SPD required, wiring diagram showing field connections, and manufacturer's recommended wire and breaker sizes (if required).
   1. Prior to approval to bid, modules using encapsulation shall be presented without encapsulation for visual inspection and construction review, proprietary technology included. MOV type and quantity shall reflect kA ratings on cutsheets, verification of diagnostic monitoring, thermal and overcurrent protection, etc.

1.06 QUALITY ASSURANCE

A. Reference Standard: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise stated in this document:
   1. UL 1449 4th Edition 2014 Revision (effective 3/26/2016).
   2. UL 1283.
   3. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
   4. ANSI/IEEE C62.45, Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.
   5. UL96A.
   6. IEEE 1100 Emerald Book.
   7. National Fire Protection Association (NFPA 70: National Electrical Code).

1.07 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 24 16 - Panelboards.

1.08 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.09 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

D. ANSI/UL 1449 Surge Protective Devices Fourth Edition or Newer.

E. IEEE 587.

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F. FIPS PUB 94.

G. IEEE C62.11 - Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (> 1 kV).

H. IEEE C62.41.1 Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits.

I. IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.

J. IEEE C62.45 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and less) AC Power Circuits.

K. IEEE C62.62 IEEE Standard Test Specifications for Surge Protective Devices (SPDs) for Use on the Load Side of the Service Equipment in Low Voltage (1000V and less) AC Power Circuits.

L. National Electrical Code - Article 285.

M. National Fire Protection Association - NFPA 20, 70, 75, and 780.

N. UL 96A Installation Requirements for Lightning Protection Systems.

1.10 WARRANTY

A. Warranty on defective material and workmanship shall be for 15 years.

B. Copy of warranty to be sent with submittal.

C. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Internally-mounted surge protection devices specified under this section shall be the same manufacturer as that provided under Section 26 24 16 Panelboards, or an engineer-approved equivalent.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide factory-installed, internally-mounted SPDs.

C. Provide a surge protection device with a minimum surge current rating of 125kA per mode / 250kA per phase.

D. Surge protection device protection method shall utilize thermally protected metal oxide varistors (MOVs).

E. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

F. Protected Modes:
1. Wye Systems: L-N, L-G, N-G, L-L.
2. Delta Systems: L-G, L-L.
3. Single Split Phase Systems: L-N, L-G, N-G, L-L.
4. High Leg Delta Systems: L-N, L-G, N-G, L-L.

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G. Protection Modes UL1449 4th Edition VPR(6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277), (208Y/120), (600Y/347). 3-Phase, 4 wire circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449 section 37.6: UL 1449 Voltage Protection Ratings (VPRs):

H. Electrical Noise Filter: each unit shall include a high performance EMI/RFI noise rejection filter with a maximum attenuation of 54dB per MIL-STD-220B.
   1. SPD shall include a EMI/RFI noise rejection filter for all L-N modes as well as a removable filter in the N-G mode.

I. The UL1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.

J. The UL1449 Nominal Discharge Surge Current Rating shall be 20kA.

K. The minimum SCCR rating of the SPD shall be 50kA without the need for upstream over current protection.

L. The SPD shall be listed as Type1 SPD, suitable for use in Type1 or Type2 applications.

2.03 SPD FABRICATION

A. SPD Modules:
   1. UL Listed as Type 1 (verifiable at www.UL.com), intended for use without need for external or supplemental overcurrent controls. Protect suppression component of every mode, including N-G, by internal overcurrent and thermal overtemperature controls. SPDs relying on external or supplementary installed safety disconnects do not meet intent of specification.
   2. UL Labeled with 20kA I-nominal (I-n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Mater label and NFPA 780.
   3. Suppression components: Heavy-duty MOVs, selenium cells, or combination of both.
   4. Provide surge current diversion paths for all modes of protection: L-N, L- G, N-G in WYE systems, and L-L, L-G in DELTA systems.
   5. Provide service entrance SPD audible diagnostic monitoring by way of audible alarm.
   6. Provide service entrance SPD with 1 set of NO/NC dry contacts for alarm conditions.
   7. Provide SPD with status indicator lights with visual indication of degradation in performance such that 70-100% green, 40-70% amber, 0- 40% red.
   8. SPD components or entire module shall be replaceable at 70% or below of visual indication.
   9. For externally-mounted SPDs, if a dedicated breaker for the SPD is not provided in the switchgear, switchboard, or panelboard provide a separately mounted non-fused disconnect switch. Dedicated breaker to serve as a means of disconnect for distribution SPDs.
   10. Meet or exceed the following criteria:
      a. ANSI/UL 1449 Listed Voltage Protection Ratings (VPRs) for 6kV 3000A testing as follows:
   11. ANSI/UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):
   12. Provide warranty for a period of 15 yrs, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period at no additional replacement cost to the end-user or if visual indication of status LED's turns to amber or red (installation not included).
      a. Service Entrance:
         1) Install 1 primary suppressor external to the service entrance in accordance with manufacturer instructions.
         2) Install SPD on line or load side.
         3) Bond SPD ground to service entrance ground.
      b. Distribution Panelboards.
         1) Install 1 suppressor external to each designated distribution panelboard.
         2) Install surge suppression device in accordance with manufacturer instructions.

2.04 SURGE PROTECTION DEVICES

A. Install surge suppression device in accordance with manufacturer instructions.

PART 3 EXECUTION

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3.01 FIELD MEASUREMENTS

A. Field verify with exact measurements, the available mounting space for control system equipment. Identify deficiencies prior to beginning installation.

B. Where ranges are indicated on the contract documents, they are to be considered preliminary. Field verify the exact ranges required based on field conditions.

3.02 DELIVERY STORAGE AND HANDLING

A. It shall be the responsibility of the installing contractor to receive all process instrumentation and control equipment at the job site. Carefully inspect all equipment for damage prior to accepting from the shipping agency. Do not accept shipment if damage is evident.

B. Exercise due diligence in storing, protecting, and moving process instrumentation and control equipment. Damaged or worn equipment will not be accepted and will be replaced at no additional cost to the Owner.

3.03 INSTALLATION

A. Install SPD within 3 feet of the line side of power source.

B. Provide HPI cable between line side of power and external power disconnect, and between external power disconnect and SPD.

C. Install equipment in locations as indicated on the contract documents. Adjust locations as needed to ensure operability, serviceability, and compliance with all applicable codes and standards.

D. Installation shall be completely tested prior to start-up. This work includes verification of all field wiring continuity and proper termination of wiring.

3.04 TESTING AND START-UP SERVICES

A. System Integrator shall provide installation and start-up services required to place the complete system into operation.

B. Each signal and function shall be fully tested. These tests shall be based on actual operation of primary elements and verification of proper control system response. Submit test results as part of Operations and Maintenance Manual.

C. Record calibrations of all analog devices.

D. Demonstrate proper operation of the process and instrumentation control system to the Owner and in the presence of the Engineer.

3.05 TRAINING

A. Training shall be suitable for plant operations personnel with limited knowledge of electrical components.

B. Provide two instructor days of operator training at the job site. Training shall consist of operations instruction and maintenance/trouble-shooting instruction.
   1. Operations instruction shall identify all control loops with description of all interlocks, interface with other loops, and operational input requirements. Describe procedures for re-starting the system.
   2. Maintenance instruction shall identify periodic maintenance that can be performed by the operator. Provide description of procedures and locations for replacement of consumable devices such as fuses and for checking the calibration or operation of devices.
   3. Trouble-shooting instruction shall identify simple procedures and methods for identifying potential causes in the event of failures. For example, instruct operator on correlation of input signals and PLC I/O module indicator lights.

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3.06 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. The SPD manufacturer’s technician shall perform a system checkout and start-up in the field to assure proper installation, operation and to initiate the warranty of the system. The technician will be required to do the following:
   1. Verify voltage clamping levels utilizing a diagnostic test kit, comparing factory readings to installed readings.
   2. Verify N-G connection.
   3. Record information to a product signature card for each product installed.

D. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

END OF SECTION

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SECTION 26 90 00
PROCESS INSTRUMENTATION & CONTROL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Process Instrumentation & Control.
   1. Process Instrumentation & Control shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Process Instrumentation & Control, Lump Sum. When so provided, payment for Process Instrumentation & Control shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Process Instrumentation & Control, Inclusive. When no quantity is provided, Process Instrumentation & Control shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
      a. ANSI/ISA-5.1-1984 - Instrumentation Symbols and Identification.
      b. ANSI/ISA-5.3-1983 - Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.
      c. ANSI/ISA-95.00.01-2000 - Enterprise Control System Integration, Part 1: Models and Terminology.
      d. ANSI/ISA-TR99.00.01-2004, Security Technologies for Manufacturing and Control Systems.
      e. ANSI/ISA-TR99.00.02-2004, Integrating Electronic Security into the Manufacturing and Control Systems Environment.
   2. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   3. CE - European Community, Applicable Directives.
      a. EN50005 - for Terminal Markings.
      b. EN50081-1- Generic Emission Standard.
      c. EN50082-1 - Generic Immunity Standard.
      d. EN61000-4-4 - Electromagnetic compatibility (EMC). Testing and measurement techniques.
      e. EN61000-4-5 - Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test.
   4. Canadian Standards Association (CSA), Specifications and Standards, current edition:
      a. CSA C22.2, Industrial Control Equipment.
   5. CUL - Underwriter's Laboratories of Canada.
   6. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
      a. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
   7. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
      a. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

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b. NEMA ICS 3 - Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC.

8. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
   a. UL508 - Industrial Control Equipment.
   b. UL508A - Industrial Control Panels.
   c. UL 913 - Intrinsically Safe Specification.
   d. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated Process Instrumentation and Control System, the following sections shall be included under the scope of this section:
   1. Section 26 24 19 - Motor Control Centers.
   2. Section 26 29 13 - Motor Controllers.
   3. Section 26 29 23 - Adjustable Frequency Motor Controllers.
   4. Section 26 90 10 - Control Panel Construction.
   5. Section 26 90 11 - Control Panel Components.
   6. Section 26 90 20 - Instrumentation Devices.
   7. Section 26 90 60 - Ethernet Networking Equipment.

B. The work specified herein shall include the furnishing of all materials, equipment, labor, and supervision necessary to fabricate, install, start-up, and test a complete and operable Process Instrumentation and Control System.

C. The labor specified herein includes but is not limited to engineering, software development, panel fabrication, equipment calibration and adjustment, testing, training, and documentation.

D. This section identifies the overall functional requirements for the Process Instrumentation and Control System.

E. This section includes coordination with the work of other sections. This work includes identification of exact interface requirements with motors, control panels, and field instrumentation provided under other portions of this specification. It shall be the responsibility of the system integrator specified under this section to execute this coordination during the shop drawing submittal phase of the work. Additional costs due to inadequate coordination as required herein shall be borne solely by this contractor.

F. This section includes coordination with electrical contractor to ensure that the proper number of raceways and conductors are installed. It shall be the responsibility of the system integrator to coordinate this work with the installing electrician. Additional costs due to inadequate coordination as required herein shall be borne solely by this contractor.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for process instrumentation and control system:
   1. General requirements specific to this section include:
      a. Submit complete and integrated document containing all equipment included under the scope of this section.
      b. Submittal shall be complete, neat, orderly, and indexed with tabbed dividers. Partial submittals will not be accepted.
      c. Include a complete list of proposed exceptions to and deviations from these specifications.
      d. Clarity and completeness are of prime importance. Acceptability of submittal drawings shall be at the sole discretion of the Engineer in regards to this requirement.
      e. Additional requirements for the various subsystems are specified in the corresponding sections.
   2. Submit the following information:
      a. Bill of Materials:

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1) Complete listing of all components identifying exact make and model, quantity, and description.

b. Component Data Sheets:
   1) Detailed listing for each type of device, identifying Engineer's tag number, manufacturer, model, options, ranges, and other information necessary to supplement component catalog cut sheets and clearly show compliance with these specifications.

c. Component Catalog Cut sheets:
   1) Manufacturer's standard catalog information.

d. Control Panel Construction Drawings:
   1) Scaled drawings of all control panels and enclosures.
   2) Front panel elevation complete with nameplate legend.
   3) Back panel elevation complete with schedule of devices.

e. Control Panel Schematic Wiring Diagrams:
   1) Ladder type schematic diagrams.
   2) Show all devices requiring electrical connections.
   3) Identify all wire and terminal numbers.
   4) Identify PLC I/O addresses.
   5) Reference Engineer's tag number where assigned.
   6) Cross-reference all relay contacts and coils.
   7) Identify switching action on all switching devices.
   8) Common diagrams will not be accepted.

f. Analog Loop Diagrams:
   1) Show all devices requiring electrical connections.
   2) Identify all wire and terminal numbers.
   3) Identify PLC I/O addresses.
   4) Identify location of loop power supply.
   5) Identify field devices, back-of-panel devices, and front-of panel devices.
   6) Show tabular summary of transmitter output capability, input impedance of each receiver, total loop impedance, and reserve output capacity.
   7) Reference Engineer's tag number where assigned.
   8) Common diagrams will not be accepted.

g. Control Panel Plumbing Diagrams:
   1) Show all devices requiring plumbing connections (air or liquid).
   2) Show pipe/tube sizing.
   3) Show all control devices (valves, regulators, filters, etc.).

h. Control Panel Power and Environmental Requirements:
   1) Identify voltage and ampacity requirements.
   2) Show sizing calculations for environmental controls (ventilation, heat, air conditioning).

i. Interconnecting Wiring Diagrams:
   1) Show all interconnections between control panels.
   2) Show all interconnections between control panels and motor control centers.
   3) Show all interconnections between control panels and field devices.
   4) Show all interconnections between motor control centers and field devices.
   5) Identify all wire and terminal numbers, including field terminal junction box terminals.

j. Control Device Installation Details:
   1) Supplement contract documents with additional details necessary for proper installation of control devices.

k. Configuration Documentation:
   1) Submit complete, documented configuration data for all configurable controllers.
   2) Additional requirements for PLC systems and PC based SCADA systems are identified in the individual subsystem sections.

1.06 CONTROLS PRESENTATION, SYSTEM STARTUP, AND SUPPORT SERVICES

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A. System Integrator shall assemble the SCADA system as a complete process monitoring and control system, including HMI Computers / Servers, SCADA Panels, MCC's, Drives, Telemetry Systems, and Alarming Systems where applicable. These System shall be demonstrated that the systems are operational before shipment to the project site.

B. System Integrator shall be responsible for coordinating with the Pelletizer System Supplier. Refer to Section 44 53 00. The Pelletizer System Supplier shall provide all control, monitoring, alarming, and setpoint data registers to the System Integrator for incorporation of all graphics and interfacing with the existing SCADA system at the facility and pelletizer system motor control center. The Pelletizer System Supplier shall be responsible for full control of all pelletizer systems, but SCADA shall be configured by the System Integrator to monitor, alarm, and change setpoints of the pelletizer systems from SCADA.

C. Before field startup, a minimum of three, one-hour, virtual Control Presentations will be conducted by the System Integrator in conjunction with the Pelletizer System Supplier. These tests shall be witnessed by the Owner and Engineer. All feedback from the Owner and Engineer shall be accepted and changes shall be integrated before the next presentation or before field startup. All problems, errors, insufficiencies, and failures identified during testing shall be resolved before shipment. Schedule a test a minimum of two week in advance.
   1. Meeting #1: To facilitate the implementation of the work specified under this section and work specified under other sections, a pre-submittal controls meeting shall be held. The meeting shall coordinate PLC addressing, control function requirements (functional description / control loop review), operator interface requirements, and other interface/coordination issues.
   2. Meeting #2: Preliminary controls and graphics will be presented for preliminary feedback from the Owner and Engineer.
   3. Meeting #3: Final controls and graphics will be presented for final feedback from the Owner and Engineer before system startup in the field.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit the following information specifically for process instrumentation and control system:
   1. Submit final revised shop drawings incorporating any modifications made as a result of factory test, installation, start-up, operational testing, or for any other cause. Submit results of all field-testing and corrective actions taken for all discrete control devices and for all analog control devices. Submit analog device calibration data sheets.
   2. Submit manufacturers standard operation & maintenance information including installation manuals and safety instructions.
   3. Submit contact list identifying names, addresses, telephone numbers, and any additional contact information for each equipment service organization involved with the Process Instrumentation and Control System.
   4. Submit detailed operation and maintenance procedures for each major equipment item; include description of operation for all modes of operation, routine maintenance procedures, and trouble-shooting guide.
   5. Submit listing spare parts provided under this contract and of recommended additional spare parts not provided under this contract along with costs.

C. Submit the following information specifically for the SCADA system on a jump drive or portable hard drive (not to be used for the back-up of the computers):
   1. A copy of all final PLC programs with documentation,
   2. A copy of all Panelview configuration files containing all windows / screens to allow for a complete recovery of the system,
   3. A copy of all HMI computer/ server images containing all windows / screens to allow for a complete recovery of the system from this image,
   4. A copy of all network switch configuration files,
   5. A list of all IP addresses, and passwords for all devices on the network.
   6. A list of all passwords for PLC code and blocks within PLC code.
   7. A copy of all Radio configuration files.

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8. A copy of all Firewall configuration files.
9. A copy of all VFD and solid state overload configuration files.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 ADDITIONAL REQUIRMENTS

A. System Integrator shall provide an additional 24 hours of programming time to provide additional functionality to the system that is not specified herein.

1.10 WARRANTY

A. See Division 01 for additional requirements.

1.11 ADDITIONAL INFORMATION (NOT USED)

PART 2 PRODUCTS

2.01 SYSTEM INTEGRATOR

A. The system integrator shall be a firm specializing in the integration of control systems with documented experience in the detailed design, construction, configuration, and maintenance of PLC based control systems and motor control centers for the water/wastewater utility market. This experience must include a minimum of five projects similar in nature to this project during the last five years.

B. The system integrator shall have in-house capability to handle complete system engineering, control panel fabrication, instrument supply and calibration, commissioning, testing, and troubleshooting of the process instrumentation and control system.

C. The system integration firm shall employ an engineering staff of not less than five engineers and technicians with a combined experience of no less than 50 years designing, constructing, and configuring process control systems.

D. The system integration firm shall have an active $1,000,000 professional liability insurance policy.

E. The system integrator shall be factory authorized to commission Drives, PLC's and MCC's, and to be an authorized Rockwell Strategic Provider with full development software to modify and create new applications in the specified HMI software.

F. Acceptable system integrators include:
1. Altronex Control Systems - a Division SJE Rhombus, contact Kurt Atwood, telephone number (608) 210-1455.
2. No Exceptions.

2.02 GENERAL FUNCTIONAL DESCRIPTION

A. Summary of System Improvements.

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1. SCADA Software - Wonderware License:
   a. At the completion of this project, current Wonderware license shall have a minimum of 10% spare tags remaining. If less than 10% spare tags remain on the license, the System Integrator shall update the License to the next available tag count as required.
2. Adjustable Frequency Drive Replacement & MCC Communication:
   a. Existing AFDs in MCCs and AFD control panels shall be replaced under this project. Refer to MCC one-lines for AFDs scheduled for replacement and additional requirements.
   b. Existing MCC-A, B, and C utilize DeviceNet communications. All new or replaced AFDs in these MCCs shall be upgraded to Ethernet communications as part of this project. Existing MCC-D and H utilize a combination of hardwired and Ethernet communication. All new or replaced AFDs in these MCCs will utilize Ethernet communications or a combination of Ethernet and hardwired I/O. Refer to MCC one-lines for communication requirements for each drive.
   c. Across-the-line starter motor control and DeviceNet communication to remain as is.
3. STR-05 Control Building:
   a. Update graphics at main and redundant SCADA computers. Incorporate new Pelletizer System and other modifications as shown on the plans and as described herein.
4. STR-10 Headworks Building:
   a. Modify existing Fiberoptic Network Interface Panel, FIP-A, to include new Ethernet communications from MCC-A.
   b. New Ethernet network switch in existing MCC-A shall receive backup power from existing UPS.
   c. Update graphics as required at redundant SCADA computer in LCP-A.
5. STR-30 Chemical Building:
   a. Provide new Chemical Feed Pump, Chemical Tank level monitoring, ventilation, and other building SCADA functions as shown on the plans and as described in the Detailed Functional Descriptions.
6. STR-50 & 55 UV Disinfection and Effluent Building:
   a. Existing Trojan UV 3000 Plus system to be replaced with new Trojan UV Signa System. UV System to be controlled by new Supervisory Control Center.
   b. UV System Supplier shall provide equipment, instrumentation, and controls. UV System Supplier shall also provide all monitoring and alarming to the System Integrator. The System Integrator shall configure SCADA to monitor and alarm the new UV system.
7. STR-60 Pump & Digester Building:
   a. Modify existing Fiberoptic Network Interface Panel, FIP-C, to include new Ethernet communications from MCC-C. Provide larger Ethernet network switch as shown and specified.
   b. New Ethernet network switch in existing MCC-C shall receive backup power from existing UPS.
   c. Update graphics as required at redundant SCADA computer in LCP-C.
   d. Modify existing LCP-C to include all new control points as shown on the plans.
   e. WWTP Potable Water System controls to be modified as shown on the plans and as described in the Detailed Functional Descriptions.
8. STR-70 Sludge Processing Building:
   a. Modify existing Fiberoptic Network Interface Panel, FIP-B, to include new Ethernet communications from MCC-B.
   b. New Ethernet network switch in existing MCC-B shall receive backup power from existing UPS.
   c. MCC-B is equipped with two DeviceNet – Ethernet converters Field verify if the redundant converter is still in use. Remove if no longer in use.
9. STR-75 Sludge Dryer Building:
   a. Existing Sludge Dryer System will be modified to include new Sludge Pelletizer processes after the Sludge Dryer process and before the Bulk Bagging process.
   b. Pelletizer System Supplier shall provide equipment and instrumentation. Pelletizer System Supplier shall also provide all control, monitoring, alarming, and setpoint data registers to the System Integrator. The System Integrator shall configure SCADA to monitor, alarm, and change setpoints of the pelletizer systems.

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c. System Integrator shall provide motor control center and motor control center structure for pelletizer system equipment.
d. Pelletizer System Supplier will provide new Pelletizer System Main Control Panel and Local Control Station. Pelletizer System Main Control Panel shall communicate with the existing SCADA system through existing Sludge Drying Building PLC Control Panel, LCP-H.

10. Removed Processes:
a. Heavy Solids Pump, P-12-3-2, shall be removed as part of this project. The System Integrator shall remove associated motor control, functionality, and graphics from the existing SCADA system. Spare out associated PLC or MCC I/O. New adjustable frequency motor control shall not be provided for this process as part of the AFD replacement work under this project. Refer to MCC one-lines.
b. Cake Bin Scrubber Inlet Air Blower, M-30-1-1, shall be removed as part of this project. System Integrator shall remove associated motor control, functionality, and graphics from the existing SCADA system. Spare out associated PLC or MCC I/O. New adjustable frequency motor control shall not be provided for this process as part of the AFD replacement work under this project. Refer to MCC one-lines.
c. Refer to Detailed Functional Descriptions for additional removal requirements.

11. All SCADA system graphical modifications and additions shall be reviewed and approved by the Owner before field startup. All owner feedback shall be incorporated.

B. General Requirements:
1. The process instrumentation and control system consists of the following functional divisions which will be defined in detail for each loop under Detailed Functional Description:
a. General: includes brief description of system purpose.
b. Local Control Functions: includes local control stations, pilot control devices, instruments, sensors and manufacturer's control panels.
c. Motor Control Center Functions: includes hardwired MCCs and pilot control devices located within these MCCs.
d. SCADA System Control Functions: includes PLC hardware, interface devices, and PLC logic.
e. SCADA System Monitoring Functions: includes graphical user interface hardware and configuration, event monitoring and logging functions, analog parameter trending, and alarm handling.
f. SCADA System Historical Data Functions: includes data calculations, display of corresponding values to HMI, and storage of those values to historical database for use in preparing reports.

C. Typical Motor Control Functions:
1. General:
a. Several standard motor control strategies are incorporated into this design and are described herein. Operator interface screens, configuration, and pilot device circuitry shall be similar for all motors of each type.
b. Type I Motor Control - Full-Voltage, Non-Reversing.
c. Type III Motor Control - Ethernet capable adjustable frequency drive.
d. Type V Motor Control - Ethernet capable, soft starter reduced voltage.

2. Type I Motor Control - Full-Voltage, Non-Reversing.
a. Local Control Functions:
1) LOCAL HAND-OFF-AUTO selector switch located at the motor shall control motor operation.
i. HAND Position: motor shall run continuously unless MCC HOA switch is in the OFF position.
ii. OFF Position: motor shall not run.
iii. AUTO Position: control by MCC HAND-OFF-AUTO selector switch shall be enabled.
2) Sensor provided under Division 44 shall detect MOTOR HIGH TEMPERATURE condition.
3) Any additional sensors or functions are specified in the detailed functional description.
b. Motor Control Center Functions:

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1) MCC HAND-OFF-AUTO selector switch shall control motor operation only when LOCAL HAND-OFF-AUTO selector switch is in AUTO position.
    i. HAND Position: motor shall run continuously unless LOCAL HOA switch is in the OFF position.
    ii. OFF Position: motor shall not run.
    iii. AUTO Position: start and stop in response to the SCADA System REQUIRED signal.
2) In the event of a power outage a motor operating in HAND position shall automatically restart while a motor operating in the AUTO position shall automatically restart after power is restored if the SCADA System REQUIRED signal is present.
3) Type 2 solid-state overload device shall provide motor protection. MOTOR OVERLOAD condition, detected by overload device, shall activate corresponding MCC pilot light and prevent motor operation.
4) MOTOR RUN condition, detected by motor starter auxiliary contact, shall activate corresponding MCC pilot light.
5) Provide monitoring of the following conditions: SCADA SYSTEM CONTROL AVAILABLE, MOTOR OVERLOAD, MOTOR RUN, and MOTOR HIGH TEMPERATURE.
6) Provide additional functions as specified in the detailed functional description.

c. SCADA System Control Functions:
1) Graphical display HAND-OFF-AUTO selector (unless specified otherwise) shall control the REQUIRED signal.
    i. HAND Position: the signal shall be active.
    ii. OFF Position: the signal shall be inactive.
    iii. AUTO Position: the signal shall be controlled by the automatic control strategy specified in the detailed functional description.
2) Generate CALL-TO-RUN (CTR) FAIL alarm based on a discrepancy between MOTOR RUN and REQUIRED signals after an adjustable FAIL DELAY time has elapsed. CALL-TO-RUN FAIL condition shall prevent motor operation from the SCADA system until cleared and reset. CALL-TO-RUN FAIL shall only activate when SCADA SYSTEM CONTROL AVAILABLE is active.
3) Provide additional functions as specified in the detailed functional description.

d. SCADA System Monitoring Functions:
1) Display the following status conditions: SCADA SYSTEM CONTROL AVAILABLE, REQUIRED, RUN, MOTOR OVERLOAD, AND MOTOR HIGH TEMPERATURE.
2) Display, trend, and record the following parameters: None.
3) Incorporate into the alarm notification system and display the following alarm conditions: CALL-TO-RUN FAIL.
4) Provide additional functions as specified in the detailed functional description.

e. SCADA System Historical Data Functions:
1) Display non-resettable runtime total.
2) Calculate, display, and record daily runtime total.
3) Calculate, display, and record number of daily starts.
4) Provide additional functions as specified in the detailed functional description.

3. Type III Motor Control - Ethernet capable, adjustable frequency drive.

a. Local Control Functions:
1) LOCAL HAND-OFF-AUTO selector switch located at the motor shall control motor operation.
    i. HAND Position: motor shall run continuously at speed preset on AFD unless MCC HOA switch is in the OFF position.
    ii. OFF Position: motor shall not run.
    iii. AUTO Position: control by MCC HAND-OFF-AUTO selector switch shall be enabled.
2) Sensor provided under Division 44 shall detect MOTOR HIGH TEMPERATURE condition.
3) Any additional sensors or functions are specified in the detailed functional description.

b. Motor Control Center Functions:

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1) MCC HAND-OFF-AUTO selector switch shall control motor operation only when LOCAL HAND-OFF-AUTO selector switch is in AUTO position.
   i. HAND Position: motor shall run continuously at speed preset on AFD unless LOCAL HOA switch is in the OFF position.
   ii. OFF Position: motor shall not run.
   iii. AUTO Position: start and stop in response to the REQUIRED and Ethernet speed command signals.
2) Pilot control circuitry shall be designed such that HAND position control and any additional interlock circuitry identified in the detailed functional descriptions will be functional regardless of the status of the Ethernet network.
3) In the event of a power outage a motor operating in HAND position shall automatically restart while a motor operating in the AUTO position shall automatically restart after power is restored if the REQUIRED signal is present.
4) AFD RUN condition shall activate MCC RUN pilot light.
5) MOTOR HIGH TEMPERATURE condition shall activate corresponding MCC pilot light and prevent motor operation until cleared by positioning the MCC HAND-OFF-AUTO selector switch in the OFF position.
6) Temperature switch mounted within the motor control center compartment shall activate COOLING FAN FAIL signal.
7) Provide monitoring of the following conditions: SCADA SYSTEM CONTROL AVAILABLE, MOTOR RUN, AFD FAIL, COOLING FAN FAIL, and MOTOR HIGH TEMPERATURE.
8) AFD shall be configured with a starting ramp.
9) AFD input contactor shall disconnect the AFD from line power when not required to run. When REQUIRED signal is activated, input contactor shall close thus energizing the drive and after an adjustable time (after AFD has completely started up and is ready to run) the AFD shall be signaled to start.
10) Adjustable frequency drive shall provide motor protection and shall provide monitoring the following motor data functions via the Ethernet network: AFD READY, AFD ALARM, AFD FAULT, MOTOR OVERLOAD, AVERAGE CURRENT, and PERCENT SPEED.
11) Provide additional functions as specified in the detailed functional description.

c. SCADA System Control Functions:
1) Graphical display HAND-OFF-AUTO selector (unless specified otherwise) shall control the REQUIRED signal.
   i. HAND Position: the signal shall be active and the SPEED COMMAND shall be manually input.
   ii. OFF Position the signal shall be inactive.
   iii. AUTO Position: the signal and the SPEED COMMAND shall be controlled by the automatic control strategy specified in the detailed functional description.
2) Provide MOTOR HIGH TEMPERATURE condition REMOTE RESET as described above.
3) Generate CALL-TO-RUN (CTR) FAIL alarm based on a discrepancy between MOTOR RUN and REQUIRED signals after an adjustable FAIL DELAY time has elapsed. CALL-TO-RUN FAIL condition shall prevent motor operation from the SCADA system until cleared and reset. CALL-TO-RUN FAIL shall only activate when SCADA SYSTEM CONTROL AVAILABLE is active.
4) Generate ABNORMAL CURRENT signal when motor average current falls below or rises above adjustable MINIMUM/MAXIMUM set points.
5) Generate COMMUNICATION FAIL alarm based upon a loss of communication with the motor AFD.
6) Provide additional functions as specified in the detailed functional description.

d. SCADA System Monitoring Functions:
1) Display the following status conditions: SCADA SYSTEM CONTROL AVAILABLE, REQUIRED, MOTOR RUN, AFD READY, AFD ALARM, AFD FAULT, AFD FAIL, COOLING FAN FAIL, MOTOR HIGH TEMPERATURE, ABNORMAL CURRENT, and MOTOR OVERLOAD.

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2) Display, trend, and record the following parameters: AVERAGE CURRENT and PERCENT SPEED.
3) Incorporate into the alarm notification system and display the following alarm conditions: CALL-TO-RUN FAIL and COMMUNICATION FAIL.
4) Provide additional functions as specified in the detailed functional description.

e. SCADA System Historical Data Functions:
1) Display non-resettable runtime total.
2) Calculate, display, and record daily runtime total.
3) Calculate, display, and record number of daily starts.
4) Provide additional functions as specified in the detailed functional description.

4. Type V Motor Control - Ethernet capable, soft starter reduced voltage

a. Local Control Functions:
1) LOCAL HAND-OFF-AUTO selector switch located at the motor shall control motor operation.
i. HAND Position: motor shall run continuously unless MCC HOA switch is in the OFF position.
ii. OFF Position: motor shall not run.
iii. AUTO Position: control by MCC HAND-OFF-AUTO selector switch shall be enabled.
2) Sensor provided under Division 44 shall detect MOTOR HIGH TEMPERATURE condition.
3) Any additional sensors or functions are specified in the detailed functional description.

b. Motor Control Center Functions:
1) MCC HAND-OFF-AUTO selector switch shall control motor operation only when LOCAL HAND-OFF-AUTO selector switch is in AUTO position.
i. HAND Position: motor shall run continuously unless LOCAL HOA switch is in the OFF position.
ii. OFF Position: motor shall not run.
iii. AUTO Position: start and stop in response to the SCADA System REQUIRED signal.
2) Pilot control circuitry shall be designed such that HAND position control and any additional interlock circuitry identified in the detailed functional descriptions will be functional regardless of the status of the Ethernet network.
3) In the event of a power outage a motor operating in HAND position shall automatically restart while a motor operating in the AUTO position shall automatically restart after power is restored if the REQUIRED signal is present.
4) SSRV RUN condition shall activate MCC RUN pilot light.
5) MOTOR HIGH TEMPERATURE condition shall activate corresponding MCC pilot light and prevent motor operation until cleared by positioning the MCC HAND-OFF-AUTO selector switch in the OFF position.
6) Temperature switch mounted within the motor control center compartment shall activate COOLING FAN FAIL signal.
7) Provide monitoring of the following conditions: SCADA SYSTEM CONTROL AVAILABLE, MOTOR RUN, SSRV FAIL, COOLING FAN FAIL, and MOTOR HIGH TEMPERATURE.
8) SSRV input contactor shall disconnect the SSRV from line power when not required to run. When REQUIRED signal is activated, input contactor shall close thus energizing the drive and after an adjustable time (after SSRV has completely started up and is ready to run) the SSRV shall be signaled to start.
9) Soft starter reduced voltage shall provide motor protection and shall provide monitoring the following motor data functions via the Ethernet network: SSRV READY, SSRV ALARM, SSRV FAULT, MOTOR OVERLOAD, and AVERAGE CURRENT.
10) Provide additional functions as specified in the detailed functional description.

c. SCADA System Control Functions:
1) Graphical display HAND-OFF-AUTO selector (unless specified otherwise) shall control the REQUIRED signal.
i. HAND Position: the signal shall be active.

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ii. OFF Position the signal shall be inactive.
iii. AUTO Position: the signal shall be controlled by the automatic control strategy specified in the detailed functional description.

2) Provide MOTOR HIGH TEMPERATURE condition REMOTE RESET as described above.
3) Generate CALL-TO-RUN (CTR) FAIL alarm based on a discrepancy between MOTOR RUN and REQUIRED signals after an adjustable FAIL DELAY time has elapsed. CALL-TO-RUN FAIL condition shall prevent motor operation from the SCADA system until cleared and reset. CALL-TO-RUN FAIL shall only activate when SCADA SYSTEM CONTROL AVAILABLE is active.
4) Generate ABNORMAL CURRENT signal when motor average current falls below or rises above adjustable MINIMUM/MAXIMUM set points.
5) Generate COMMUNICATION FAIL alarm based upon a loss of communication with the motor SSRV.
6) Provide additional functions as specified in the detailed functional description.

d. SCADA System Monitoring Functions:
1) Display the following status conditions: SCADA SYSTEM CONTROL AVAILABLE, REQUIRED, MOTOR RUN, SSRV READY, SSRV ALARM, SSRV FAULT, SSRV FAIL, COOLING FAN FAIL, MOTOR HIGH TEMPERATURE, ABNORMAL CURRENT, and MOTOR OVERLOAD.
2) Display, trend, and record the following parameters: AVERAGE CURRENT.
3) Incorporate into the alarm notification system and display the following alarm conditions: CALL-TO-RUN FAIL and COMMUNICATION FAIL.
4) Provide additional functions as specified in the detailed functional description.

e. SCADA System Historical Data Functions:
1) Display non-resettable runtime total.
2) Calculate, display, and record daily runtime total.
3) Calculate, display, and record number of daily starts.
4) Provide additional functions as specified in the detailed functional description.

2.03 UNIT PROCESS NO.6 – OXIDATION DITCH

A. Loop 6-4: Chemical Feed Pumps
1. General:
a. Chemical Feed Pumps No.1, No.2, and No.3 are provided under another Division of the specifications but must be wired and incorporated into the SCADA system by Division 26.
b. Existing Chemical Feed Pumps No.1 and No.2 are constant speed while No.3 is flow paced. Proposed Chemical Feed Pump No.1 is constant speed while No.2 and No.3 are flow paced. Update SCADA System graphics, controls, and alarming for new Chemical Feed Pump functionality as shown on the P&ID and as described herein.
c. Proposed Chemical Feed Pumps require external STOP signal rather than START signal. Provide control relays and modify existing control panel LCP-C as required to accommodate proposed Chemical Feed Pump functionality.
d. Utilize spare I/O in existing control panel LCP-C for new Chemical Feed Pump functionality.
e. Existing Carrier Water solenoid control valve to remain. Incorporate as required into the new Chemical Feed Pump controls.
f. The Contractor shall provide the instrumentation and/or controls as shown on the drawings and as described herein.

2. Local Control Functions:
a. Existing HAND-OFF-AUTO location control stations to remain and be incorporated into new Chemical Feed Pump local control.
b. Chemical Pumps shall receive discrete REQUIRED and analog PACE signals from SCADA.
c. Chemical Pumps shall provide discrete RUN, discrete FAIL, and analog SPEED FEEDBACK signals to SCADA.
d. Local junction box shall be required for transitioning between Chemical Feed Pump manufacturer cabling and field wiring.

3. Motor Control Center Functions: None.
4. SCADA System Control Functions:

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a. Maintain existing SCADA system control for Chemical Feed Pumps No.1 and No.3.
b. Provide Chemical Feed Pump No.2 Interlock SCADA Selector Switch with the following interlock options. Chemical Feed Pump No.2 control shall match existing Chemical Feed Pump No.3 control.
1) DAILY DOSE
2) DECANT
3) FILTRATE
4) ORTHO-P

5. SCADA System Monitoring Functions:
a. Display, trend, and record the following parameters:
1) Maintain existing SCADA system monitoring for Chemical Feed Pumps No.1 and No.3.
2) Provide the following SCADA system monitoring for Chemical Feed Pump No.2. Chemical Feed Pump No.3 monitoring shall match existing Chemical Feed Pump No.3 monitoring.
i. CHEMICAL FEED PUMP NO.2 SPEED
ii. CHEMICAL FEED PUMP NO.2 FLOW PACE SELECTION

b. SCADA System Alarming:
1) Provide CHEMICAL FEED PUMP NO.1 FAIL
2) Provide CHEMICAL FEED PUMP NO.2 FAIL
3) Provide CHEMICAL FEED PUMP NO.3 FAIL

6. SCADA System Historical Data Functions:
a. Update Chemical Feed Pumps in display page and historical data collection and trending as required.

B. Loop 6-5: Chemical Tank Monitoring and Control
1. General:
a. The Contractor shall provide the instrumentation and/or controls as shown on the drawings and as described herein.
b. Chemical Storage Tank radar Level Elements shall not be mounted inside the Chemical Storage Tank

2. Local Control Functions:
a. Level Elements LE-6-5-1 & 2 provide level signal to local readout and transmitter LIT-6-5-1.
b. Level Indicator/Transmitter LIT-6-5-1 shall provide a local readout of each of the CHEMICAL TANK LEVELs and provide two analog signals to SCADA.

3. Motor Control Center Functions: None.
4. SCADA System Control Functions:
a. Provide operator settable setpoints for:
1) CHEMICAL TANK MINIMUM LEVEL
b. Generate Level Transmitter FAIL signal based on out-of-range values after an operator adjustable time delay.

5. SCADA System Monitoring Functions:
a. Display, trend, and record the following parameters:
1) Monitor CHEMCIAL TANK LEVEL signal.
2) Calculate, display, and record CALCULATED TOTAL, DAILY TOTAL, and DAILY DOSAGE.
b. SCADA System Alarming:
1) CHEMICAL TANK LOW LEVEL
2) Level Transmitter FAIL

6. SCADA System Historical Data Functions:
a. Incorporate Chemical Tank level into Chemical Feed Pump display page and historical data collection and trending as required.

C. Loop 6-6: Chemical Building Ventilation
1. General:
a. Provide 120V motor control as shown on the drawings and as described herein for Chemical Building Exhaust Fan, 30-EF-1.

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b. Provide SCADA control utilizing instant and delay timers for fans and associated dampers. Control components shall be located inside Temperature Control Panel, TCP-6-6-1, located in the Chemical Building.
c. The Contractor shall provide the instrumentation and/or controls as shown on the drawings and as described herein.

2. Local Control Functions:
a. Existing PLC control panel LCP-C located in the Pump & Digester Building shall provide local control and monitoring of Chemical Room Exhaust Fan. Incorporate into SCADA as shown on drawings and as described herein.
b. Door Switch ZS-6-6-1 shall provide discrete signal CHEMICAL BUILDING ENTRY to SCADA.
c. Temperature Transmitter TT-6-6-1 shall provide analog signal CHEMICAL BUILDING TEMPERATURE to SCADA.
d. Damper No.1 and No.2 actuators power shall be interlocked inside the Temperature Control Panel TCP-6-6-1 with the Exhaust Fan REQUIRED signal. Time delay the Exhaust Fan REQUIRED signal long enough for the dampers to reach the fully open position.

3. Motor Control Center Functions: None.

4. SCADA System Control Functions:
a. Graphical display HAND-OFF-AUTO selector switch shall control the REQUIRED signal:
1) HAND Position: The REQURIED signal shall be active.
2) OFF Position: The REQURIED signal shall be inactive.
3) AUTO Position: The REQURIED signal shall be controlled as described by the Chemical Building Ventilation Automatic Control Strategy.
b. Generate CALL-TO-RUN FAIL alarm based on a discrepancy between MOTOR RUN and REQUIRED signals after an adjustable FAIL DELAY time has elapsed. CALL-TO-RUN FAIL condition shall prevent motor operation from the SCADA system until cleared and reset.
c. Chemical Building Ventilation Automatic Control Strategy:
1) Provide Operator adjustable RUN TIME setpoint and daily SCHEDULED RUN TIMES setpoints for interval duration control.
2) Interlock CHEMICAL BUILDING ENTRY condition with Exhaust Fan REQUIRED signal and RUN TIME setpoint.
3) Provide an Operator adjustable CHEMICAL BUILDING FREEZE setpoints. When CHEMICAL BUILDING TEMPERATURE falls below associated freeze setpoints, CHEMICAL BUILDING FREEZE alarm condition shall annunciate. Exhaust Fan REQUIRED signals shall be interlocked with the CHEMICAL BUILDING FREEZE conditions and shall prevent operation until the system has been cleared by an Operator reset.

5. SCADA System Monitoring Functions:
a. Display, trend, and record the following parameters:
1) Monitor CHEMICAL BUILDING TEMPERATURE condition.
2) Exhaust Fan IN AUTO
3) Exhaust Fan REQUIRED
4) Exhaust Fan RUNNING
b. SCADA System Alarming:
1) Exhaust Fan CALL-TO-RUN FAIL
2) CHEMICAL ROOM FREEZE
3) TREATMENT ROOM FREEZE

6. SCADA System Historical Data Functions:
a. Incorporate Chemical Building Ventilation into Chemical Feed Pump display page and historical data collection and trending as required.
b. Display Exhaust Fan non-resettable runtime total.
c. Calculate, display, and record Exhaust Fan daily runtime total and number of daily starts.

D. Loop 6-7: Chemical Building Flood

1. General:
a. The Contractor shall provide the instrumentation and/or controls as shown on the drawings and as described herein.

2. Local Control Functions:
a. Flood switch LSH-6-7-1 provides a discrete signal CHEMICAL BUILDING FLOOD to SCADA.

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3. Motor Control Center Functions: None.
4. SCADA System Control Functions: None.
5. SCADA System Monitoring Functions:
    a. Display, trend, and record the following parameters:
        1) Monitor CHEMICAL BUILDING FLOOD signal.
    b. SCADA System Alarming:
        1) Provide CHEMICAL BUILDING FLOOD alarm upon activation of flood switch.
6. SCADA System Historical Data Functions:
    a. Incorporate flood monitoring and alarm handling into Chemical Feed Pump display page and historical data collection and trending as required.

2.04 UNIT PROCESS NO.8 – UV DISINFECTION

A. Loop 8: UV Disinfection
1. General:
    a. Existing Trojan UV 3000 Plus system to be replaced with new Trojan UV Signa system.
    b. New UV Supervisory Control Center provided under another Division of the specifications but must be wired and incorporated into the SCADA system by Division 26.
    c. New UV Supervisory Control Center shall be located in the same location as the original SCC. Protect conduits and conductors during construction to utilize existing control wiring for new SCC.
    d. The Contractor shall provide the instrumentation and/or controls as shown on the drawings and as described herein.
2. Local Control Functions:
    a. Provide all wiring between new UV Supervisory Control Center, Power Distribution Center, and Hydraulic System Center for a complete and operable communication system.
    b. New SCC to interface with existing Hach Analytical System control panel. Both are located in the Effluent Building.
    c. The new SCC shall receive a FLOW PACE signal from the existing SCADA system PLC in LCP-C.
    d. The new SCC shall provide a COMMON ALARM signal to SCADA system PLC in LCP-C.
3. Motor Control Center Functions: None.
4. SCADA System Control Functions:
    a. The new SCC shall provide to SCADA parameters to allow for full monitoring and alarming at the SCADA system.
    b. The new SCC shall receive and be interlocked with a UVT signal from the existing Hach Analytical System control panel.
5. SCADA System Monitoring Functions:
    a. Display, trend, and record the following parameters:
        1) UV AVERAGE INTENSITY
        2) UV CALCULATED DOSE
        3) UV BANK (x) INTENSITY
    b. SCADA System Alarming:
        1) System Integrator shall coordinate with Owner for specific Minor, Major, and Critical alarms to be monitored and displayed for each bank.
        2) Existing monitored alarms include: COMMON ALARM, CLEANING SYSTEM FAILURE, BANK (x) LAMP FAILURE, BANK (x) LOW INTENSITY, BANK (x) LOW LEVEL, BANK (x) MULITPLE LAMP FAILURE
6. SCADA System Historical Data Functions:
    a. Update Effluent / UV Disinfection display page and historical data collection and trending for new Trojan UV Signa system as required.

2.05 UNIT PROCESS NO.9 – EFFLUENT MONITORING

A. Loop 9-1: Effluent Flow Monitoring
1. General:
    a. Existing effluent Parshall flume flow element, transmitter, and controls to remain and be utilized by new Trojan UV Signa system.

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2. Local Control Functions: Existing to remain.
3. Motor Control Center Functions: None.
4. SCADA System Control Functions:
    a. New UV System Supervisory Control Center shall be interlocked and paced with EFFLUENT FLOW signal.
5. SCADA System Monitoring Functions: Existing to remain.
6. SCADA System Historical Data Functions: Existing to remain.

B. Loop 9-2: Effluent Analytical Monitoring
1. General:
    a. Existing Effluent Sampling to remain as is. Sampler to be relocated inside of the Effluent Building to provide working clearance for new Supervisory Control Center.
    b. Existing Hach Analytical System, including Filtrax filtration module, Filtrax control unit, Phosphax unit, and Hach system control panel with a SC4500 controller, to remain and be modified for inclusion of a new Hach UVAS plus sc UV sensor provided under another Division of the specifications.
2. Local Control Functions:
    a. Modify existing Hach SC4500 for inclusion of new UVT probe.
    b. Update computer and graphics in existing Hach System Control Panel to display, monitor, and trend the new UVT measurements.
3. Motor Control Center Functions: None.
4. SCADA System Control Functions:
    a. Hach System Control Panel to provide UVT measurements to new Trojan UV Signa Supervisory Control Center for control of UV Signa system.
    b. Update SCADA computer and remote Hach system connection to display, monitor, and trend the new UVT measurements.
5. SCADA System Monitoring Functions:
    a. Display, trend, and record the following parameters:
        1) CURRENT UVT
        2) AVERAGE UVT
    b. SCADA System Alarming:
        1) Provide an Operator adjustable HIGH and LOW UVT alarm setpoints.
6. SCADA System Historical Data Functions:
    a. Update Effluent / UV Disinfection and display page along with Hach System remote viewer page and historical data collection and trending for new UVT monitoring as required.

2.06 UNIT PROCESS NO.12 – AEROBIC DIGESTERS

A. Loop 12-1: Digester Monitoring
1. General:
    a. Existing digester level transmitters and dissolved oxygen probes remain.
    b. Existing D.O. monitoring shall be utilized in new Digester Blower No.1 & No.2 Automatic Control Strategy.
2. Local Control Functions: Existing to remain.
3. Motor Control Center Functions: None.
4. SCADA System Control Functions:
    a. DIGESTER NO.1 & NO.2 D.O. signals shall be interlocked with Digester Blower No.1 & No.2, respectively, to provide D.O. control in new Digester Blower No.1 & No.2 Automatic Control Strategy.
5. SCADA System Monitoring Functions: Existing to remain.
6. SCADA System Historical Data Functions: Existing to remain.

B. Loop 12-2: Digester Blowers
1. General:
    a. Existing Digester Blowers No.1 & No.4 serve Digester No.1. Digester Blower No.1 is the primary blower. Both Digester Blowers are equipped with across-the-line motor control.
    b. Existing Digester Blowers No.2 & No.3 serve Digester No.2. Digester Blower No.2 is the primary blower. Both Digester Blowers are equipped with across-the-line motor control.

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c. Existing SCADA automatic control strategy runs blowers intermittently based upon adjustable interval/duration time control setpoints, with up to four interval and duration settings per day for each blower.
d. Primary Digester Blowers (No.1 & No.2) shall be upgraded to adjustable frequency motor control. Provide AFD Control Panels as existing MCCs will not accommodate new bucket space factor requirements.
e. New Digester Blowers shall utilize Ethernet communications.
f. Provide new Digester Blowers No.1 & No.2 Automatic Control Strategy.
g. Digester Blowers No.1 & No.2 are upgraded from Type I to Type III motor control. Update SCADA to include any control, monitoring, and trending that is typical of Type III motor control requirements that the existing Type I motor control requirements does not satisfy.
h. The Contractor shall provide the instrumentation and/or controls as shown on the drawings and as described herein.

2. Local Control Functions:
   a. New Digester Blower No.1 & No.2 AFD Control Panel to contain new motor control for the primary digester blowers.
   b. Existing Digester Blower Cooling Fans motor control to remain in existing MCC buckets. Provide control wiring as required between new AFD Control Panel and existing MCC buckets. Refer to the P&IDs.
3. Motor Control Center Functions:
   a. Maintain existing front- and back-of-panel devices for Digester Blower No.1 & No.2 on the MCC bucket as shown on the P&ID.
   b. Provide new front- and back-of-panel devices for Digester Blower Cooling Fans as shown on the P&ID.
4. SCADA System Control Functions:
   a. Provide new SCADA selector switch to toggle between INTERVAL DURATION CONTROL and D.O. CONTROL automatic control strategies for the existing digester blowers.
   b. While in D.O. CONTROL, SCADA shall remove Digester Blowers No.3 and No.4 from the automatic blower alteration sequence.
   c. Digester Blower No.1 & No.2 Automatic Control Strategy:
      1) In AUTO, Digester Blowers shall start, stop, and run at the speeds required based upon the corresponding DIGESTER NO.1 and NO.2 D.O. LEVEL.
      2) Provide the following independent DIGESTER D.O. LEVEL setpoints for each digester:
         i. HIGH D.O.
         ii. TARGET D.O.
         iii. LOW D.O.
   d. Digester Blower Speed Control:
      1) Provide independent D.O. control loop for each digester.
      2) The operating speeds of Digester Blowers shall be controlled to maintain the target D.O. level in the corresponding digesters.
      3) Provide the following adjustable parameters:
         i. D.O. Dead Band: Band about target D.O. where digester blower speeds are not adjusted.
         ii. Sample Time Delay: Time delay between adjustments to aerator speeds.
         iii. D.O. Minimum Error: D.O. deviation from Target D.O. corresponding to Minimum Speed Adjustment.
         iv. Minimum Speed Adjustment: Speed Adjustment.
         v. D.O. Maximum Error: DO deviation from Target D.O. corresponding to Maximum Speed Adjustment.
         vi. Maximum Speed Adjustment: Speed Adjustment.
      4) If Digester D.O. level falls within D.O. dead band, digester blower speeds shall not be adjusted.
      5) Adjust digester blower speeds based upon linear function defined by D.O. Minimum Error, Minimum Speed Adjustment and D.O. Maximum Error, Maximum Speed Adjustment points. Adjustment to digester blower speeds shall occur at interval defined by Sample Time Delay.
5. SCADA System Monitoring Functions:

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a. Display, trend, and record the following parameters:
1) DIGESTER BLOWER NO.1 SPEED
2) DIGESTER BLOWER NO.2 SPEED
b. SCADA System Alarming: None additional.

6. SCADA System Historical Data Functions:
a. Modify existing Digester Blower historical data management as required by Type III motor control.

2.07 UNIT PROCESS NO.13 – SLUDGE FEED PUMPS

A. Loop 13-1: Sludge Feed Pumps
1. General:
a. Existing Type III motor control. New AFDs shall be provided as part of AFD replacement scope under this project. AFD communications shall be upgraded from DeviceNet to Ethernet under this project.
b. New rotary lobe Sludge Feed Pumps provided under another Division of the specifications to replace existing progressive cavity style pumps.
c. Existing Sludge Feed Pump suction flow switches to be removed without replacement. Remove LOSS OF SUCTION monitoring and control from the existing SCADA system. Do not provide new LOSS OF SUCTION pilot devices on MCC bucket. Spare out any associated I/O.
d. Existing Sludge Feed Pump seal water system to be removed without replacement. Remove Sludge Feed Pump seal water monitoring and control from the existing SCADA system. Spare out any associated I/O.
2. Local Control Functions:
a. Existing Sludge Feed Pump discharge annular seal pressure switch / gauge to be relocated. HIGH DISCHARGE PRESSURE signal to be rewired to MCC-C.
3. Motor Control Center Functions: Existing to remain.
4. SCADA System Control Functions: Existing to remain.
5. SCADA System Monitoring Functions: Existing to remain.
6. SCADA System Historical Data Functions: Existing to remain.

B. Loop 13-2: Sludge Feed Flow Monitoring
1. General: Existing to remain.
2. Local Control Functions: Existing to remain.
3. Motor Control Center Functions: None.
4. SCADA System Control Functions: Existing to remain.
5. SCADA System Monitoring Functions: Existing to remain.
6. SCADA System Historical Data Functions: Existing to remain.

2.08 UNIT PROCESS NO.16 – THICKENED SLUDGE DIGESTING

A. Loop 16-2: Dewatering Press Sludge Feed Flow Monitoring
1. General: Existing to remain.
2. Local Control Functions:
a. Existing Dewatering Press Sludge Feed flow meter to be relocated. Provide new manufacturer's cable from relocated flow meter to existing flow transmitter.
3. Motor Control Center Functions: None.
4. SCADA System Control Functions: Existing to remain.
5. SCADA System Monitoring Functions: Existing to remain.
6. SCADA System Historical Data Functions: Existing to remain.

B. Loop 16-3: Dewatering Press Feed Pump
1. General:
a. Existing Type III motor control. New AFDs shall be provided as part of AFD replacement scope under this project. AFD communications shall be upgraded from DeviceNet to Ethernet under this project.

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b. New rotary lobe Dewatering Press Feed Pump provided under another Division of the specifications to replace existing progressive cavity style pumps.
c. Existing Dewatering Press Feed Pump suction flow switch to be removed without replacement. Remove LOSS OF SUCTION monitoring and control from the existing SCADA system. Do not provide new LOSS OF SUCTION pilot devices on MCC bucket. Spare out any associated I/O.
d. Existing Dewatering Press Feed Pump seal water system to be removed without replacement. Remove Dewatering Press Feed Pump seal water monitoring and control from the existing SCADA system. Spare out any associated I/O.

2. Local Control Functions: Existing to remain.
3. Motor Control Center Functions: Existing to remain.
4. SCADA System Control Functions: Existing to remain.
5. SCADA System Monitoring Functions: Existing to remain.
6. SCADA System Historical Data Functions: Existing to remain.

2.09 UNIT PROCESS NO.19 – POTABLE & NON-POTABLE WATER SYSTEMS

A. Loop 19-1: Potable Water System

1. General:
   a. Existing Type III motor control. New AFDs shall be provided as part of AFD replacement scope under this project. AFD communications shall be upgraded from DeviceNet to Ethernet under this project.
   b. Existing Potable Water System utilizes a hydropneumatic style tank. Hydropneumatic style tank to be upgraded to a bladder style tank under this project.
   c. Existing instrumentation Potable Water System instrumentation not located within the Control Panel (pressure switch, solenoid control valve, level transmitter) to be removed without replacement. Remove monitoring and control from the existing SCADA system. Spare out any associated I/O.
   d. Existing WWTP Potable Water System Control Panel and Operator Interface to be salvaged and relocated. Existing pressure switches and transmitter inside of the existing WWTP Potable Water System Control Panel to be utilized for new Potable Water System Automatic Control Strategy.
   e. Existing clamp-on style flow meter and transmitter to be replaced with new clamp-on style.
   f. The Contractor shall provide the instrumentation and/or controls as shown on the drawings and as described herein.
2. Local Control Functions:
   a. New Flow Element and Transmitter FE/FIT-19-1-1 provides analog signal POTABLE WATER FLOW RATE to SCADA.
   b. New Flow Element and Transmitter FE/FIT-19-1-1 provides pulse signal POTABLE WATER FLOW TOTAL to SCADA.
3. Motor Control Center Functions: No additional functions.
4. SCADA System Control Functions:
   a. Provide the following Potable Water System PRESSURE setpoints, each with an adjustable dead-band timer:
      1) POTABLE WATER WELL PUMP OFF
      2) POTABLE WATER WELL PUMP TRAGET PRESSURE
      3) POTABLE WATER WELL PUMP ON
   b. Provide the following adjustable speed setpoints:
      1) POTABLE WATER WELL PUMP MAXIMUM AFD SPEED
      2) POTABLE WATER WELL PUMP MINIMUM AFD SPEED
      3) System Integrator shall determine minimum AFD speed necessary to produce minimum flow rate identified by the Process Engineer and program this value into the MCC-mounted drive.
   c. Potable Water System Automatic Control Strategy:
      1) Pump shall start when pressure falls to the POTABLE WATER WELL PUMP ON setpoint, and speed shall be varied to maintain the POTABLE WATER WELL PUMP TARGE PRESSURE setpoint.

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2) Pump shall not be allowed to run at a speed below the POTABLE WATER PUMP MINIMUM AFD SPEED setpoint.
3) Pump shall stop when pressure rises to the POTABLE WATER PELL PUMP OFF setpoint.

5. SCADA System Monitoring Functions:
   a. Update existing SCADA system as required to accommodate new control strategy for bladder style tank. Remove unused display and alarming associated with existing hydropneumatic style tank.
6. SCADA System Historical Data Functions:
   a. Update existing SCADA system as required to accommodate new control strategy for bladder style tank. Remove unused trending associated with existing hydropneumatic style tank.

2.10 UNIT PROCESS NO.27 – DRIED SLUDGE TRANSPORT

A. Loop 27-1: Transfer Conveyor Motor Control
1. General: Existing to remain.
2. Local Control Functions: Existing to remain.
3. Motor Control Center Functions: Existing to remain.
4. SCADA System Control Functions: Existing to remain.
5. SCADA System Monitoring Functions: Existing to remain.
6. SCADA System Historical Data Functions: Existing to remain

B. Loop 27-2: Transfer Conveyor Roller Gate Control
1. General:
   a. Existing Transfer Conveyor will be equipped with a new Roller Gate to convey dried sludge into the new Pelletizer System.
   b. The Contractor shall provide the instrumentation and/or controls as shown on the drawings and as described herein.
2. Local Control Functions:
   a. Roller Gate No.3 provided under another Division of the specifications shall provide ROLLER GATE NO.3 OPEN and CLOSED discrete signals to Pelletizer System Main Control Panel.
   b. Solenoid Control Valve provided under another Division of the Specifications shall receive discrete signal REQUIRED OPEN from Pelletizer System Main Control Panel.
   c. Provide Transfer Conveyor Roller Gate Local Control Station (OPEN-CLOSE-AUTO). New control station shall be equipped with new OCA switch for new Roller Gate No.3 along with new OCA switch for existing Roller Gates No.1 & No.2.
3. Motor Control Center Functions: None.
4. SCADA System Control Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
   b. PELLETIZER SYSTEM E-STOP ENGAGED condition shall close new Roller Gate No.3 to stop feeding dried sludge into the Pelletizer System and open the existing Roller Gate that feeds dried sludge to the Bulk Bagging System. Existing Roller Gates are controlled by Sludge Dryer Building Control Panel while new Roller Gate is controlled by Pelletizer System Main Control Panel. Coordinate with Pelletizer System Supplier to implement e-stop functionality as described.
5. SCADA System Monitoring Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.

2.11 UNIT PROCESS NO.35 – PELLETIZER AND COOLER CONVEYANCE SYSTEMS

A. Loop 35-1: Inclined Screw Conveyor
1. General:
   a. The System Integrator shall provide Type III motor control as modified herein for control of new Inclined Screw Conveyor.

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b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.

2. Local Control Functions:
   a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
   b. Low Level Switch LSL-35-1-1 provides discrete signal HOPPER LOW LEVEL to Pelletizer System Main Control Panel.
   c. E-Stop Local Control Station shall provide discrete signal PELLETIZER SYSTEM E-STOP ENGAGED to Pelletizer System Main Control Panel.
3. Motor Control Center Functions:
   a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
4. SCADA System Control Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
5. SCADA System Monitoring Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.

B. Loop 35-2: Screener
1. General:
   a. The System Integrator shall provide Type III motor control as modified herein for control of new Screener.
   b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.
2. Local Control Functions:
   a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
   b. High Level Switch LSH-35-2-1 provides discrete signal HOPPER HIGH LEVEL to Pelletizer System Main Control Panel.
   c. Speed Switch SS-35-2-1 provides discrete signals ALARM and SHUTDOWN SPEED to Pelletizer System Main Control Panel.
3. Motor Control Center Functions:
   a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
4. SCADA System Control Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
5. SCADA System Monitoring Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.

C. Loop 35-3: Pelletizer Bucket Elevator
1. General:
   a. The System Integrator shall provide Type III motor control as modified herein for control of new Pelletizer Bucket Elevator.
   b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.
2. Local Control Functions:
   a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
   b. Speed Switch SS-35-3-1 provides discrete signals ALARM and SHUTDOWN SPEED to Pelletizer System Main Control Panel.
3. Motor Control Center Functions: No additional functions.
4. SCADA System Control Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.

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5. SCADA System Monitoring Functions:
    a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
    a. Provided by and coordinated with the Pelletizer System Supplier.

D. Loop 35-4: Counterflow Cooler Input Conveyor
1. General:
    a. The System Integrator shall provide Type III motor control as modified herein for control of new Counterflow Cooler Input Conveyor.
    b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.
2. Local Control Functions:
    a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
    b. Low and High Pressure Switches PSL/PSH-35-4-1 provides discrete signals TENSION CYLINDER HIGH and LOW PRESSURE to Pelletizer System Main Control Panel.
    c. Minimum and Maximum Position Switches ZSL/ZSH-35-4-1 provides discrete signals TENSION CYLINDER MAXIMUM and MINIMUM POSITION to Pelletizer System Main Control Panel.
    d. Lid Position Switch ZSO-35-4-1 provides discrete signal TURNAROUND LID OPEN to Pelletizer System Main Control Panel.
3. Motor Control Center Functions:
    a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
4. SCADA System Control Functions:
    a. Provided by and coordinated with the Pelletizer System Supplier.
5. SCADA System Monitoring Functions:
    a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
    a. Provided by and coordinated with the Pelletizer System Supplier.

E. Loop 35-5: Counterflow Cooler Output Conveyor
1. General:
    a. The System Integrator shall provide Type III motor control as modified herein for control of new Counterflow Cooler Output Conveyor.
    b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.
2. Local Control Functions:
    a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
    b. Low and High Pressure Switches PSL/PSH-35-5-1 provides discrete signals TENSION CYLINDER HIGH and LOW PRESSURE to Pelletizer System Main Control Panel.
    c. Minimum and Maximum Position Switches ZSL/ZSH-35-5-1 provides discrete signals TENSION CYLINDER MAXIMUM and MINIMUM POSITION to Pelletizer System Main Control Panel.
    d. Lid Position Switch ZSO-35-5-1 provides discrete signal TURNAROUND LID OPEN to Pelletizer System Main Control Panel.
3. Motor Control Center Functions:
    a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
4. SCADA System Control Functions:
    a. Provided by and coordinated with the Pelletizer System Supplier.
5. SCADA System Monitoring Functions:
    a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
    a. Provided by and coordinated with the Pelletizer System Supplier.

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2.12 UNIT PROCESS NO.36 – PELLETIZER SYSTEM

A. Loop 36-1: Pelletizer Feeder
   1. General:
      a. The System Integrator shall provide Type III motor control as modified herein for control of new Pelletizer Feeder.
      b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.
   2. Local Control Functions:
      a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
      b. Low and High Level Switch LSL/LSH-36-1-1 provides discrete signals HOPPER HIGH and LOW LEVEL to Pelletizer System Main Control Panel.
   3. Motor Control Center Functions:
      a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
   4. SCADA System Control Functions:
      a. Provided by and coordinated with the Pelletizer System Supplier.
   5. SCADA System Monitoring Functions:
      a. Provided by and coordinated with the Pelletizer System Supplier.
   6. SCADA System Historical Data Functions:
      a. Provided by and coordinated with the Pelletizer System Supplier.

B. Loop 36-2: Pelletizer Conditioner & Water Add System
   1. General:
      a. The System Integrator shall provide Type III motor control as modified herein for control of new Pelletizer Conditioner.
      b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.
   2. Local Control Functions:
      a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
      b. Flow Element and Transmitter FE/FT-36-2-1 provides analog signal ADD WATER FLOW RATE to Pelletizer System Main Control Panel.
      c. Electrical Control Valve WCV-36-2-1 provides analog signal POSITION REFERENCE to Pelletizer System Main Control Panel.
      d. Electrical Control Valve WCV-36-2-1 shall receive the analog signal POSITION COMMAND from the Pelletizer System Main Control Panel.
      e. Solenoid Control Valve WCV-36-2-2 shall receive the discrete signal OPEN COMMAND from the Pelletizer System Main Control Panel.
      f. Temperature Transmitter TT-36-2-1 provides analog signal SLUDGE TEMPERATURE to Pelletizer System Main Control Panel.
   3. Motor Control Center Functions:
      a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
   4. SCADA System Control Functions:
      a. Provided by and coordinated with the Pelletizer System Supplier.
   5. SCADA System Monitoring Functions:
      a. Provided by and coordinated with the Pelletizer System Supplier.
   6. SCADA System Historical Data Functions:
      a. Provided by and coordinated with the Pelletizer System Supplier.

C. Loop 36-3: Pellet Mill
   1. General:
      a. The System Integrator shall provide Type V motor control as modified herein for control of new Pellet Mill.

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b. Pelletizer System Main Control Panel, LCP-36-3-1, shall be provided by the Pelletizer System Supplier.
c. Pelletizer System Local Control Station, XS-36-3-1, shall be provided by the Pelletizer System Supplier.
d. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.

2. Local Control Functions:
a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
b. E-Stop Local Control Station shall provide discrete signal PELLETIZER SYSTEM E-STOP ENGAGED to Pelletizer System Main Control Panel.
c. Pelletizer System Local Control Station shall provide discrete signal PELLETIZER SYSTEM E-STOP ENGAGED to Pelletizer System Main Control Panel.
d. Door Position Switch ZS-36-3-1 provides discrete signal PELLET MILL DOOR OPEN to Pelletizer System Main Control Panel.
e. Alarm Light YL-36-3-1 shall receive discrete signal PELLETIZER SYSTEM ACTIVE from Pelletizer System Main Control Panel.

3. Motor Control Center Functions:
a. SHUTDOWN TORQUE condition shall activate the corresponding pilot light and prevent motor operation until cleared by pressing the RESET pushbutton.
b. Trapped-Key-Interlock furnished by the Pelletizer System Supplier shall be installed in the new motor control center bucket. Coordinate installation requirements with the Pelletizer System Supplier to accommodate space and wiring requirements for the device.
c. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.

4. SCADA System Control Functions:
a. Provided by and coordinated with the Pelletizer System Supplier.

5. SCADA System Monitoring Functions:
a. Monitor and alarm SHUTDOWN TORQUE condition.
b. Provided by and coordinated with the Pelletizer System Supplier.

6. SCADA System Historical Data Functions:
a. Provided by and coordinated with the Pelletizer System Supplier.

2.13 UNIT PROCESS NO.37 – COUNTERFLOW COOLER SYSTEM

A. Loop 37-1: Counterflow Cooler Inlet Feeder

1. General:
a. The System Integrator shall provide Type I motor control as modified herein for control of new Counterflow Cooler Inlet Feeder.
b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.

2. Local Control Functions:
a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
b. The following Level Switches shall provide discrete signals to Pelletizer System Main Control Panel:
1) LSL-37-1-1: COUNTERFLOW LOW LEVEL
2) LSC-37-1-1: COUNTERFLOW OPERATING LEVEL
3) LSH-37-1-1: COUNTERFLOW OVERFLOW LEVEL
4) LSH-37-1-2: HIGH INLET FEEDER HOPPER LEVEL
5) LSH-37-1-3: HIGH SURGE HOPPER LEVEL
c. Temperature Transmitters TT-37-1-1 & 2 shall provide PELLET and AMBIENT TEMPERATURE to Pelletizer System Main Control Panel.
d. Discharge Grid Position Switch ZS-36-3-1 provides discrete signal CLOSED POSITION to Pelletizer System Main Control Panel.
e. Solenoid Control Valve SCV-37-1-1 shall receive discrete signal OPEN COMMAND from Pelletizer System Main Control Panel.

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3. Motor Control Center Functions:
   a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
4. SCADA System Control Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
5. SCADA System Monitoring Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.

B. Loop 37-2: Counterflow Cooler Fines Rotary Valve
1. General:
   a. The System Integrator shall provide Type I motor control as modified herein for control of new Counterflow Cooler Fines Rotary Valve.
   b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.
2. Local Control Functions:
   a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
   b. High Level Switch LSH-37-2-1 shall provide discrete signal CYCLONE HIGH LEVEL to Pelletizer System Main Control Panel.
3. Motor Control Center Functions:
   a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
4. SCADA System Control Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
5. SCADA System Monitoring Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.

C. Loop 37-3: Counterflow Cooler Main Fan
1. General:
   a. The System Integrator shall provide Type III motor control as modified herein for control of new Counterflow Cooler Main Fan.
   b. The Pelletizer System Supplier shall provide the instrumentation and controls as shown on the drawings and as described herein.
2. Local Control Functions:
   a. No HOA Local Control Station shall be located at the motor as described by the General functional descriptions.
   b. Temperature Transmitter TT-37-3-1 shall provide analog signal EXHAUST AIR TEMPERATURE to Pelletizer System Main Control Panel.
3. Motor Control Center Functions:
   a. Pelletizer System E-Stop safety relay shall either be hardwired to the enable bit of the motor controller as shown on the drawings or hardwired to cut the control power for the motor controller in the MCC bucket.
4. SCADA System Control Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
5. SCADA System Monitoring Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.
6. SCADA System Historical Data Functions:
   a. Provided by and coordinated with the Pelletizer System Supplier.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

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A. Field verify with exact measurements, the available mounting space for control system equipment. Identify deficiencies prior to beginning installation.

B. Where ranges are indicated on the contract documents, they are to be considered preliminary. Field verify the exact ranges required based on field conditions.

3.02 DELIVERY STORAGE AND HANDLING

A. It shall be the responsibility of the installing contractor to receive all process instrumentation and control equipment at the job site. Carefully inspect all equipment for damage prior to accepting from the shipping agency. Do not accept shipment if damage is evident.

B. Exercise due diligence in storing, protecting, and moving process instrumentation and control equipment. Damaged or worn equipment will not be accepted and will be replaced at no additional cost to the Owner.

3.03 INSTALLATION

A. Install equipment in locations as indicated on the contract documents. Adjust locations as needed to ensure operability, serviceability, and compliance with all applicable codes and standards.

B. Installation shall be completely tested prior to start-up. This work includes verification of all field wiring continuity and proper termination of wiring.

3.04 TESTING AND START-UP SERVICES

A. System Integrator shall provide installation and start-up services required to place the complete system into operation.

B. Each signal and function shall be fully tested. These tests shall be based on actual operation of primary elements and verification of proper control system response. Submit test results as part of Operations and Maintenance Manual.

C. Record calibrations of all analog devices.

D. Demonstrate proper operation of the process and instrumentation control system to the Owner and in the presence of the Engineer.

3.05 TRAINING

A. Training shall be suitable for plant operations personnel with limited knowledge of electrical components.

B. Provide two instructor days of operator training at the job site. Training shall consist of operations instruction and maintenance/trouble-shooting instruction.
   1. Operations instruction shall identify all control loops with description of all interlocks, interface with other loops, and operational input requirements. Describe procedures for re-starting the system.
   2. Maintenance instruction shall identify periodic maintenance that can be performed by the operator. Provide description of procedures and locations for replacement of consumable devices such as fuses and for checking the calibration or operation of devices.
   3. Trouble-shooting instruction shall identify simple procedures and methods for identifying potential causes in the event of failures. For example, instruct operator on correlation of input signals and PLC I/O module indicator lights.

END OF SECTION

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SECTION 26 90 10
CONTROL PANEL CONSTRUCTION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Control Panel Construction.
1. Control Panel Construction shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Control Panel Construction, Lump Sum. When so provided, payment for Control Panel Construction shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Control Panel Construction, Inclusive. When no quantity is provided, Control Panel Construction shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards:
a. ANSI/NFPA 70 - National Electrical Code and state amendments thereto.
b. ANSI/NFPA 79 - Electrical Standard for Industrial Machinery.
2. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition.
3. Canadian Standards Associates (CSA), Specifications and Standards, Current Edition.
a. CSA Standard C22.2 No. 0 - General Requirements - Canadian Electrical Code, Part II.
b. CSA Standard C22.2 No. 0.4 - Bonding and Grounding of Electrical Equipment (Protective Equipment).
c. CSA Standard C22.2 No. 14 - Industrial Control Equipment for Use in Ordinary (Non-Hazardous) Locations.
d. CSA Standard C22.2 No. 40 - Cutout, Junction, and Pull boxes.
e. CSA Standard C22.2 No. 94 - Special Purpose Enclosures.
4. Electrical and Electronic Manufacturers Association Canada (EEMAC), Specifications and Standards, Current Edition.
5. International Electrotechnical Association (IEC), Specifications and Standards, Current Edition.
a. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
b. IEC 60204 - Safety of Machinery - Electrical Equipment of Machines.
c. IEC 60079 - Electrical Apparatus for Explosive Gas Atmospheres.
6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition.
a. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
b. NEMA ICS6 - Enclosures for Industrial Controls and Systems.
7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.
a. UL50 - Cabinets and Boxes.
b. UL508 - Industrial Control Equipment.
c. UL508A - Industrial Control Panels.
d. UL 698A - Industrial Control Panels - with Intrinsically Safe Circuits entering Hazardous Areas.

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e. UL94 - Flammability of Plastic Materials.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
1. Section 26 90 00 - Process Instrumentation & Control.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. All control panels shall be constructed in accordance with UL 508 standards and shall bear the UL 508 listing.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

B. Provide one spare vapor phase corrosion inhibiting capsule for each control panel.

C. Provide a ten or twenty percent of the total number of terminals as installed spares in each control panel.

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1.11 DESIGN REQUIREMENTS

CONTROL PANEL CONSTRUCTION REQUIREMENTS					
TAG NUMBER	DESCRIPTION	TYPE	SIZE	UPS	NOTES
TCP-6-6-1	CHEMICAL BUILDING TEMPERATURE CONTROL PANEL	G	18"H X 18"W X 12"D	N/A	2
LCP-12-2-1	DIGESTER BLOWER NO.1 AFD CONTROL PANEL	A	48"H X 36"W X 12"D	N/A	1
LCP-12-2-2	DIGESTER BLOWER NO.2 AFD CONTROL PANEL	A	48"H X 36"W X 12"D	N/A	1
NOTES:					
1.	EXISTING AVAILABLE SPACE IN MOTOR CONTROL CENTER UNABLE TO ACCOMODATE UPGRADE FROM ACROSS-THE-LINE TO ADJUSTABLE FREQUENCY MOTOR CONTROL. PROVIDE AFD CONTROL PANEL AS SHOWN. REFER TO THE P&IDS, MCC ONE-LINES, AND FUNCTIONAL DESCRIPTIONS FOR PANEL REQUIREMENTS.				
2.	TEMPERATURE CONTROL PANEL TO CONTAIN CONTROL DEVICES TO ACHIEVE SCADA SYSTEM CONTROL OF BUILDING VENTILATION SYSTEM. REFER TO P&IDS AND FUNCTIONAL DESCRIPTIONS FOR PANEL REQUIREMENTS.				

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Fabricate, install instruments, plumb and wire in factory.

B. Test wiring and plumbing prior to shipment.

C. Make external connections by way of numbered terminal blocks.

D. Separate electrical components from pneumatic and hydraulic components by metal barriers.

E. Conform to ISA standards.

2.02 TYPE A - CONTROL PANEL ENCLOSURE, WALL-MOUNTED

A. Manufacturer:
1. Hoffman Enclosures, Inc. Concept Wall-Mount Enclosure.
2. Saginaw Enclosures.
3. WestTool Enclosures.
4. or equal.

B. Environmental Rating:
1. NEMA Type 4/12.

C. Construction:
1. 16 gauge or 14 gauge steel.
2. Seams continuously welded and ground smooth.
3. Minimum width body flange trough excludes liquids and contaminants Integral body grounding stud.
4. Panel mounting studs.

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5. Mounting holes in back of body for direct mounting Hidden hinges for clean aesthetic appearance Standard full access 170 degree door opening.
6. Doors are interchangeable and easily removable by pulling captive hinge pins.
7. Door bar on hinge side for wire management and grounding Additional door bar and stiffener on larger enclosures for extra rigidity High-impact thermoplastic data pocket.
8. Seamless foam-in-place one-piece gasket provides oil-tight and dust-tight seal against contaminants.
9. Self-grounding latch system with double seal provides maximum protection against leakage.
10. Quarter-turn door latching system installed on door with a slotted insert Internal, switch operated fluorescent light.
11. Finish:
    a. Gray or textured light gray polyester powder coated inside and out.
    b. Steel sub-panels are painted white.

2.03 TYPE G - CONTROL PANEL ENCLOSURE, FIBERGLASS

A. Manufacturer:
1. Hoffman Enclosures, Inc. Fiberglass Type 4X Wall-Mount Enclosures.
2. Saginaw Enclosures.
3. WestTool Enclosures.
4. or equal.

B. Environmental Rating:
1. NEMA Type 3/3R/4/4X/12/13.

C. Construction.
1. Fiberglass-reinforced material has excellent temperature and chemical resistance qualities and exhibits outstanding physical properties.
2. Seams are sealed, no holes or knockouts.
3. Seamless foam-in-place gasket assures watertight and dust-tight seal.
4. Fiberglass material is easily punched, drilled, filed, or sawed.
5. Hinges and quick-release latches are fiberglass-reinforced polyester.
6. Hasp for padlocking is Type 316L stainless steel.
7. Data pocket is high-impact thermoplastic.
8. Internal, switch operated fluorescent light.
9. Copper flashed steel collar studs for mounting optional panels and terminal block kits.
10. Finish/Color:
    a. Fiberglass enclosure is gray inside and out.
    b. Steel sub-panels are painted white.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.04 CONTROL PANEL FABRICATION AND ENVIRONMENTAL PROTECTION REQUIREMENTS

A. Instrument Mounting:
   1. Locate instruments designated for back-of-panel mounting in manner to allow for maintenance and adjustment.
   2. Instrument mounting height shall not exceed 6 ft-6 in. Minimum height shall be 4 ft-0 in.
   3. Panel cutouts for instruments and other devices, such as lights and switches, shall be cut, punched, or drilled and smoothly finished with rounded edges.
   4. Provide steel angle stiffeners on back of panel face to prevent panel deflection under instrument loading or operation.
   5. Provide internal structural steel framework for instrument support purposes and panel bracing. Internal framework shall permit lifting of panel without racking or distortion.

B. Equipment Mounting:
   1. Provide shelf or bracket support for any equipment not secured to panel, such as a UPS, router, firewall, or Wi-Fi access point. Shelf placement shall allow for bending space for wiring entering panel.

C. Corrosion Protection:
   1. Provide vapor phase corrosion inhibiting capsules in each control panel to protect all exposed metal surfaces for a period of at least two years. Corrosion inhibiting modules shall be Northern Instrument Corporation, Zerust vapor capsules Model VC-2-2 or Hoffman Engineering Corporation corrosion inhibitor Model A-HCI-5.
   2. Provide thermostatically controlled condensation heater in panels located high humidity areas and in areas in which ambient temperature will vary. Heater shall be sized to prevent condensation within panel.

D. Heating, Ventilating, and Air Conditioning:
   1. Provide heating equipment as specified under Part 2.
   2. Provide filtered ventilation fan(s) where needed and sized to dissipate heat generated by components located within control panel.
   3. Provide filtered air conditioning equipment and insulate panel where needed to maintain internal panel temperature within operating parameters of internal panel components.

3.05 CONTROL PANEL ELECTRICAL REQUIREMENTS

A. Electric Service:
   1. Design control panel to operate on electrical supply indicated on the drawings.
      a. Three phase service:
         1) Provide main circuit breaker.
         2) Provide branch circuit breakers for distribution of three phase and single phase power at voltages above 120VAC.
         3) Control panel and internal components shall be rated to interrupt the available fault current.
         4) Main circuit breaker and branch circuit breakers shall be coordinated such that a fault in a branch circuit will trip only the branch circuit breaker and not the main circuit breaker.
         5) Separate 480VAC wiring from control voltage wiring.
         6) Provide appropriately sized control power transformer.
         7) Provide miniature circuit breakers for distribution of 120VAC control power in accordance with the following:
            a) No more than 20 devices on any single circuit.
            b) Where multiple units perform parallel operations, do not group all devices on the same branch circuit. The purpose is to prevent the failure of any single branch circuit from shutting down at entire operation.
            c) Do not exceed the ampacity of the branch circuit.
            d) Panel service outlet shall be protected by separate branch circuit breakers.

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8) Power supplies shall be protected by separate branch circuit breakers.
9) Provide 20 amp, 120VAC service outlet circuit within back-of-panel area.
10) Control power transformer fuses and branch circuit breakers shall be coordinated such that a fault in a branch circuit will trip only the branch circuit breaker and not the control power transformer fuses.
11) Branch circuit breakers shall be rated for 15A and 250VAC.
12) Fuses shall not be substituted for circuit breakers.

b. Single phase service:
1) Provide 20A main circuit breaker.
2) Provide miniature circuit breakers for distribution of 120VAC control power in accordance with the following:
a) No more than 20 devices on any single circuit.
b) Where multiple units perform parallel operations, do not group all devices on the same branch circuit. The purpose is to prevent the failure of any single branch circuit from shutting down at entire operation.
c) Do not exceed the ampacity of the branch circuit.
d) Panel service outlet shall be protected by separate branch circuit breakers.
e) Power supplies shall be protected by separate branch circuit breakers.
3) Provide 20A, 120VAC service outlet circuit within back-of-panel area - protected by a 15A breaker.
4) Main circuit breaker and branch circuit breakers shall be coordinated such that a fault in a branch circuit will trip only the branch circuit breaker and not the main circuit breaker.
5) Branch circuit breakers shall be rated for 15A and 250VAC.
6) Fuses shall not be substituted for circuit breakers.

c. Uninterruptible power supply:
1) Where panel is equipped with an uninterruptible power supply, provide distribution of 120VAC power on the line and load sides of the UPS.
2) Panel service outlet and other non-critical loads shall be powered from the line side of the UPS. Critical loads, including but not limited to all digital control equipment, shall be powered from the load side of the UPS.
3) Provide UPS bypass circuitry for 24VDC UPS systems or for systems that do not have a double conversion type UPS installed.

d. Back-up control systems:
1) Where panel includes fail-safe back-up control circuitry, the back-up control circuits shall be fed with a separate circuit from a lighting panel or from a separate control power transformer.

B. Output Signal Fusing:
1. Provide appropriately sized fuses for all output signals to devices located external to the panel in accordance with the following requirements:
a. Maximum fuse size: 5A.
b. Separate fuse for each device.
c. Fuses shall be installed in indicating type fuse holder terminal blocks.

C. Control Panel Wiring:
1. Wiring within panels, consoles, racks, and cabinets shall meet the following requirements:
a. Wires for ac circuits shall be 300V or 600V, Type MTW stranded copper and shall be sized for the current to be carried but not smaller than No.16 AWG.
b. Wires for analog signal circuits shall be 300V stranded copper and shall be twisted shielded pairs not smaller than No.18 AWG.
c. Wires for other dc circuits shall be 300V, Type MTW stranded copper not smaller than No.18 AWG.
d. Wiring for special signals such as communications, digital data, and multiplexed signals shall use manufacturers standard cables.
2. Terminal blocks for panels, consoles, racks, and cabinets shall meet the following requirements:

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a. Wire all spare or unused panel mounted elements, including PLC input/output points, to terminal blocks.
b. Provide open construction terminal blocks for wiring that is entirely internal to the panel.
c. Provide isolation switch terminal blocks for all wiring that is not entirely internal to the panel.
d. Rail-mount individual terminals to create a complete assembly. Provide terminals constructed such that jumpers can be installed with no loss of space on terminal or rail.
e. Size all terminal block components to allow insertion of all necessary wire sizes and types.
f. Provide power distribution blocks for distribution of control panel power at voltages exceeding 120VAC.

3. Grounding:
a. Panels, consoles, racks, and cabinets shall be provided with an isolated copper grounding bus for all signal and shield ground connections. This ground bus shall be grounded at a common single ground point. The signal grounding system shall meet National Electrical Code requirements.
b. Each analog loop shall only be grounded at a single point for the loop. This single point shall be at the location of the dc power supply for the loop.

D. Power Supplies:
1. Provide dc power supplies as required to power instruments requiring external dc power, including two-wire transmitters and dc relays.
2. Power supplies shall be suitable for intrinsically safe circuits where two-wire transmitters are located in a hazardous area.

E. Electrical Transient Protection:
1. All electrical and electronic elements of the control system shall be protected against damage due to electrical transients induced in interconnecting lines from lighting discharges and nearby electrical systems.
2. Surge Suppressor Locations:
a. As a minimum, provide surge suppressors at the following locations:
1) Provide 480VAC, panel mounted surge suppressor on the load side of each 480VAC main circuit breaker in each panel.
2) Provide 120VAC, panel mounted surge suppressor on the load side of each 120VAC main circuit breaker in each panel.
3) Provide 24VDC, panel mounted surge suppressor at the panel connections of all analog signal circuits that have any portion of the circuit extending outside of a protecting building.
4) Provide 24VDC, field mounted surge suppressor at the field connection of each analog signal transmitter located outside of a protecting building.

3.06 STANDARD SIGNAL INTERFACES

A. Unless otherwise specified discrete input and output signals shall conform to the following:
1. Isolated unpowered (dry) contact closures.
2. Power contact from panel receiving signal or device receiving signal.

B. Unless otherwise specified input and output analog signals shall conform to following:
1. External to panel: isolated, 4-20 mADC.
2. Internal to panel: 1 to 5VDC signals.
3. For 2-wire transmitter provide isolated type and power with 24VDC from panel or device receiving signal.
4. Where isolation is required to interface with particular equipment or because of loop impedance, provide isoloated, DC-to-DC transmitter.

3.07 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.08 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 11
CONTROL PANEL COMPONENTS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Control Panel Components.
   1. Control Panel Components shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Conditions - Division 1.
      a. Control Panel Components, Lump Sum. When so provided, payment for Control Panel Components shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Conditions - Division 1.
      b. Control Panel Components, Inclusive. When no quantity is provided, Control Panel Components shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. ANSI/NFPA 70 - National Electrical Code and state amendments thereto.
      b. ANSI/IEEE C37.90 - IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus.
      c. ANSI/IEEE C62.11- IEEE Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits.
      d. ANSI/IEEE C62.34 - IEEE Standard for Performance of Low-Voltage Surge-Protective Devices (Secondary Arresters).
      e. ANSI/IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
   2. CE - European Community, Applicable Directives.
      a. EN50005 - for Terminal Markings.
      b. EN50081-1- Generic Emission Standard.
      c. EN50082-1 - Generic Immunity Standard.
      d. EN61000-4-4 - Electromagnetic compatibility (EMC). Testing and measurement techniques.
      e. EN61000-4-5 - Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test.
   3. Canadian Standards Association (CSA), Specifications and Standards, current edition:
      a. CSA C22.2, Industrial Control Equipment.
   4. CUL - Underwriter's Laboratories of Canada.
   5. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
      a. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
   6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
      a. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
      b. NEMA ICS 3 - Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC.
   7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
      a. UL508 - Industrial Control Equipment.

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b. UL508A - Industrial Control Panels.
c. UL 913 - Intrinsically Safe Specification.
d. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
1. Section 26 90 00 - Process Instrumentation & Control.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

B. Supply two spare lamps of each type supplied for this project.

C. Supply two spare relays of each type supplied for this project.

PART 2 PRODUCTS

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2.01 CIRCUIT BREAKER - MINIATURE

A. Manufacturer:
   1. Square D QOU Unit Mount Class 720.
   2. Or equal.

B. Agency Approvals:
   1. UL Listed.

C. General:
   1. Surface, flush or DIN rail mounting in one-, two- and three-pole construction.
   2. Used for overcurrent protection and switching on both ac and dc systems.

D. Construction:
   1. Terminal lug wire size: 1- No.14 - No.2 AWG Cu or Al.
   2. Reversible line and load lugs for convenient flush or surface mount wiring.
   3. DIN mounted (symmetrical rail 35 x 7.5 DIN/EN 50 022).
   4. UL Listed as HACR type -- 15A to 70A.
   5. Field installable quick connectors.
   6. Single handle with internal common trip.
   7. UL Listed 48VDC (5,000 AIR).

2.02 CONTROL POWER TRANSFORMER

A. Manufacturer:
   1. Cutler Hammer, Type MTE.
   2. Square D.
   3. Or equal.

B. Agency Approvals:
   1. UL Listed.
   2. CSA Certified.

C. Construction:
   1. Epoxy encapsulated coils.
   2. High quality silicon steel laminations.
   3. Copper magnet wire.
   4. 55 degree C rise, Class 105 insulation system.
   5. Molded terminals.

D. Electrical:
   1. Capacity:
      a. Select transformer VA rating based upon connected load with an additional 25 percent spare capacity.
   2. Primary terminals:
      a. 240 x 480VAC.
      b. 230 x 460VAC.
      c. 220 x 440VAC.
      d. Finger-safe terminal covers.
   3. Secondary terminals:
      a. a.120VAC.
      b. 115VAC.
      c. 110VAC.
      d. Finger-safe terminal covers.
   4. Fusing:
      a. Dual primary fuse block.
      b. Single secondary fuse block.

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c. Finger-safe fuse block covers.
d. Class CC fuses, sized for VA rating of transformer.

5. Mounting:
a. Back panel.

2.03 INTRINSICALLY SAFE RELAY

A. Manufacturer:
1. Diversified Electronics, Inc. - Model ISO120-xx.
2. Or equal.

B. Agency Approvals:
1. UL 913.
2. Class I, Groups A, B, C, D.
3. Class II, Groups, E, F, G.
4. Class III.

C. Construction:
1. Surface mount enclosure.
2. Life expectancy:
a. Mechanical: 20 million operations.
b. Electrical: 50,000 operations at rated load.
c. Duty Cycle: continuous.
3. Operating Temperature: -4 to 131 degrees F.

D. Electrical:
1. Control Voltage: 120VAC, 60 Hz, nominal.
2. Control Switch:
a. Open circuit voltage: 6.2VDC.
b. Short circuit current: 10uA.
3. Isolation: 2500VAC, input to output.
4. Power Consumption: 2.5VA.
5. Contact rating:
a. SPST - N.O.
b. 5A per channel, 120VAC, resistive.
c. 278VA, inductive.
6. Channels: 2, 3, or 4.
7. Status LED: One per channel.

E. Installation:
1. Panel mounted in accordance with ANSI/NFPA 70.

F. Hazardous Location Switch:
1. Maximum lead length: 1000 feet.
2. Non-energy storing or generating.
3. Contains no capacitance or inductance, resistive switch only.
4. Installed in accordance with ANSI/NFPA 70.

2.04 PILOT DEVICE - INDICATING LIGHT

A. Manufacturer:
1. Allen Bradley Bulletin 800T/800H.
2. Cutler-Hammer.
3. IDEC.
4. Square D.
5. Or equal.

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B. Agency Approvals:
   1. UL Listed.
   2. CSA Certified.
   3. CE Compliant.

C. Mechanical:
   1. Size: 30.5 mm.
   2. Environmental rating:
      a. NEMA 4/13 watertight/oiltight: NEMA 1, 12, 3R, 4 control panels.
      b. NEMA 4/4X corrosion resistant: NEMA 4X control panels and remote control stations.
   3. Life expectancy: 200,000 operations.
   4. Push-to-test, transformer type, dual input.

D. Electrical:
   1. Input power: 120VAC.
   2. Lamp:
      a. High visibility, 28 chip cluster LED.
      b. Color: red, green, amber, as scheduled.
   3. Lens: High impact plastic, colored to match lamp.

E. Nameplate: Standard or jumbo with engraved service legend.

F. Field Mounted Control Stations:
   1. Type I Enclosure: NEMA 4X polycarbonate enclosure.
   2. Type II Enclosure: NEMA 4X stainless steel enclosure.
   3. Type III Enclosure: NEMA 7 hazardous location enclosure.

2.05 PILOT DEVICE - PUSHBUTTON

A. Manufacturer:
   1. Allen Bradley Bulletin 800T/800H.
   2. Cutler-Hammer.
   3. IDEC.
   4. Square D.
   5. Or equal.

B. Agency Approvals:
   1. UL Listed.
   2. CSA Certified.
   3. CE Compliant.

C. Mechanical:
   1. Size: 30.5 mm.
   2. Environmental rating:
      a. NEMA 4/13 watertight/oiltight: NEMA 1, 12, 3R, 4 control panels.
      b. NEMA 4/4X corrosion resistant: NEMA 4X control panels and remote control stations.
   3. Life expectancy: 10,000,000 operations.
   4. Momentary contact, non-illuminated.

D. Electrical:
   1. Rated Voltage: 120VAC.
   2. Continuous current rating:
      a. AC: 10A.
      b. DC: 2.5A.
   3. Operational current:
      a. Make: 7200VA.
      b. Break: 720VA.

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4. Operator:
    a. Mushroom head: Emergency stop service.
    b. Flush-head: All other services.

E. Nameplate: Standard or jumbo with engraved service legend.

F. Field Mounted Control Stations:
1. Type I Enclosure: NEMA 4X polycarbonate enclosure.
2. Type II Enclosure: NEMA 4X stainless steel enclosure.
3. Type III Enclosure: NEMA 7 hazardous location enclosure.

2.06 PILOT DEVICE - SELECTOR SWITCH

A. Manufacturer:
1. Allen Bradley Bulletin 800T/800H.
2. Cutler-Hammer.
3. IDEC.
4. Square D.
5. Or equal.

B. Agency Approvals:
1. UL Listed.
2. CSA Certified.
3. CE Compliant.

C. Mechanical:
1. Size: 30.5 mm.
2. Environmental rating:
    a. NEMA 4/13 watertight/oiltight: NEMA 1, 12, 3R, 4 control panels.
    b. NEMA 4/4X corrosion resistant: NEMA 4X control panels and remote control stations.
3. Life expectancy: 1,000,000 operations.
4. Maintained contact, non-illuminated (spring return from right or left where scheduled).

D. Electrical:
1. Rated Voltage: 120VAC.
2. Continuous current rating:
    a. AC: 10A.
    b. DC: 2.5A.
3. Operational current:
    a. Make: 7200VA.
    b. Break: 720VA.
4. Operator:
    a. Standard knob operator, two-position, or three-position.
    b. Keyed operator: where scheduled.

E. Nameplate: Standard or jumbo with engraved service legend.

F. Field Mounted Control Stations:
1. Type I Enclosure: NEMA 4X polycarbonate enclosure.
2. Type II Enclosure: NEMA 4X stainless steel enclosure.
3. Type III Enclosure: NEMA 7 hazardous location enclosure.

2.07 POWER SUPPLY - 12/24VDC

A. Manufacturer:
1. Phoenix Contact Quint Series.
2. SOLA/Hevi-Duty Series SDP.

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3. IDEC.
4. Or equal.

B. Agency Approvals:
1. UL Listed.
2. CSA Approved.

C. Mechanical:
1. Enclosure:
a. IP20.
b. Sealed plastic.
c. Fine ventilation grid.
2. Mounting: DIN rail.

D. Electrical:
1. Capacity:
a. Size to power connected loads. Reserve 25 percent of capacity for future use.
b. Provide multiple power supplies where needed to accommodate load.
2. Input:
a. Voltage: 100-240VAC.
b. Frequency: 45-65Hz.
c. Efficiency: 88.5 percent.
d. Current: 1.0A at 100VAC.
3. Output:
a. Voltage: 24VDC +/- 1% or 10-12VDC.
b. Voltage regulation: 1 percent.
c. Overvoltage protection: <32 VDC.
d. Noise suppression: EMI values below EN50081-1.
e. Current: 120W at 24VDC or 2.5A at 12VDC.
4. Redundancy Module.
a. For MCC applications provide active redundance module.
b. Auto Current Balancing.
c. Evenly distributes load balance between power supplies.
d. Over Voltage Protection.
5. Monitoring:
a. LED Indicator.
b. Output power good status contact.

2.08 RELAY - 120V GENERAL PURPOSE

A. Manufacturer:
1. Allen Bradley Bulletin 700-HB.
2. IDEC RU Series.
3. Finder 55 Series.
4. Or equal.

B. Agency Approvals:
1. UL Listed.
2. CE Marked.

C. Mechanical:
1. Enclosure: Transparent dust cover.
2. Contacts: Silver cadmium oxide.
3. Insulating Material: Molded, high dielectric.
4. Terminal Markings: In accordance with EN50-0005.
5. Life expectancy: 10,000,000 operations.
6. Operations:

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a. Pickup: 20 mS.
b. Dropout: 4 mS.
c. Maximum Rate: Four operations per second.

7. Blade style, quick connect terminals.

D. Electrical:
1. Contacts:
a. Double-pole, double throw.
b. Rated thermal current: 15A.
c. Make: 60A.
d. Break: 6A.
2. Coil:
a. 120 VAC + 10, -20 percent.
b. Consumption.
1) Inrush: 2.85 VA.
2) Sealed: 1.9 VA.
3. Voltage:
a. Rated Insulation Voltage: 250V IEC-300V UL/CSA.
b. Dielectric Withstand Voltage:
1) Pole-to-Pole: 1500V.
2) Contact to Coil: 6000V.
3) Contact to Frame: 4000V.
4. Push-to-Test Operator.
5. Pilot light.

E. Relay Socket:
1. 11-blade.
2. Finger-safe terminal.
3. DIN rail mounted.
4. Double tier.
5. Retainer clip.
6. Relay identification snap-in markers.

2.09 RELAY - SOLID STATE

A. Manufacturer:
1. Allen Bradley Bulletin 700-SH.
2. IDEC RSS Series.
3. Or equal.

B. Agency Approvals:
1. UL Recognized.
2. CE Marked.

C. Electrical:
1. Input:
a. Voltage: 4-32VDC.
b. Impedance: 15mA, maximum, voltage dependent.
c. Pick-up voltage: 4VDC.
d. Drop-out Voltage: 1VDC.
e. Dielectric Strength: 2500VACrms.
f. Reverse voltage protection.
2. Output:
a. Continuous current: 10A.
b. Voltage range: 19-264VAC.
c. Contact: SPST - N.O.
d. Off State leakage: 5 mA max (at 100VAC).

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e. Turn-On/Turn-Off time; 0.5 cycle.

3. Features:
   a. Photo isolation.
   b. Dual SCR output.
   c. Built-in snubber.

2.10 RELAY - TIME DELAY

A. Manufacturer:
   1. Allen Bradley Bulletin 700-HS.
   2. IDEC, RTE Series.
   3. Finder 80 or 85 Series.
   4. Or equal.

B. Agency Approvals:
   1. UL Listed.
   2. CE Marked.

C. Mechanical:
   1. Insulation resistance: 100 Mohms, minimum.
   2. Dielectric strength: 1500VAC, 1 minute.
   3. Vibration resistance: 6N.
   4. Shock resistance: 500N.
   5. Operating temperature: -20 to 65 degrees C.
   6. Operating humidity: 45 to 85 percent, relative.
   7. Blade style: quick-connect terminals.

D. Electrical:
   1. Contacts:
      a. Two Form C double-pole, double-throw.
      b. 10A, 240VAC, resistive.
   2. Timing functions:
      a. Delay on make/interval.
      b. Delay on break/single shot.
      c. Range: 0.1 seconds - 10 minutes, or 0.1 minutes - 10 hours.
   3. Accuracy:
      a. Repeat: + 0.25 percent.
      b. Voltage: + 1.0 percent.
      c. Temperature error: + 2.0 percent.
      d. Setting error: + 10.0 percent.

E. Relay Socket:
   1. 11-blade.
   2. Finger-safe terminal.
   3. DIN rail mounted.
   4. Double tier.
   5. Retainer clip.
   6. Relay identification snap-in markers.

2.11 SURGE SUPPRESSOR - 24VDC/120VAC SIGNAL, PANEL MOUNTED

A. Manufacturer:
   1. Circuit Components Incorporated, Surge Control SPU Series.
      a. Base Module: SPU-xx-LM.
      b. Daugher Module: SPU-xx-CD-30/120.
   2. Or equal.

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B. Agency Approvals:
   1. UL Listed.

C. General Description:
   1. Performance exceeds highest class severity level of IEC/EN 61000-4-4 and 61000-4-5.
   2. Enhanced filtering to attenuate high frequency and bring equipment into compliance with IEEE /ANSI C37.90.1.
   3. Universal hardwired version for all I/O modules including AC, DC, contact output, current output and signal input.
   4. Multi-stage design provides the most effective suppression and filtering available, and requires no additional secondary protection.
   5. Sub-nano second response time stops failures due to lightning, spikes and over-voltage surges while filtering all other electrical noise.
   6. Plug-in replaceable daughter card modules contain all active surge suppression.
   7. Space efficient protector is hermetically sealed and suitable for the most harsh industrial environments.
   8. Universal DIN-Rail mounting allows easy installation on any standard DIN-Rail configuration.
   9. Automatic reset and fail safe design requires no maintenance. Eliminates “Out of Service” downtime and repair/replacement costs caused by damaging electrical surges.
   10. Protection for current loop instrumentation and low frequency signal/data lines.
   11. UL-497B listed for Data Models (60 VDC or less) UL file E205158.

D. Electrical:
   1. Signal Channels: 5, 10, 15, or 20.
   2. Operating: +/-30VDC.
   3. Maximum Operating Voltage: 33VDC.
   4. Maximum Operating Current: 0.5A.
   5. Clamping Action Turn-On: 37.1V.
   6. Maximum Clamping (8x20 micro-seconds): 52V.
   7. Maximum Surge Voltage: 6kV.
   8. Maximum Surge Current (8x20 micro-seconds): 2.5kA.
   9. Response Time: Less than 1 nanosecond.
   10. Operating & Storage Temperature: -40 to 85 degrees C.

2.12 SURGE SUPPRESSOR - 120VAC/208VAC/480VAC POWER, PANEL MOUNTED

A. Manufacturer:
   1. Phoenix Contact Plugtrab SEC Type 3.
   2. Or equal.

B. Agency Approvals:
   1. UL Listed.

C. General Description:
   1. ANSI/IEEE C62.11 for Category 'C' locations. The arrester shall provide protection between each phase conductor and ground. The Secondary Surge Arrester shall employ parallel MOV's and provide protection from Category 'C' level transient surges as defined in ANSI/IEEE C62.11, C62.34, C62.41.1 and C62.41.2 without degradation of components.
   2. The Maximum Continuous Operating Voltage (MCOV) shall be comply with the following:
      a. 120VAC, single phase system: 150VAC.
      b. 120/240VAC, single phase system: 150VAC.
      c. 120/208VAC, three phase system: 150VAC.
      d. 240VAC, three phase system: 275VAC.
      e. 480VAC, three phase system: 550VAC.
   3. The arrester housing shall be constructed of UV resistant polycarbonate or material of equal strength and UV resistance. All electrical connections shall be sealed in a UL component recognized epoxy to exclude moisture, dirt and corrosion. The encapsulation shall have a minimum UL Flame

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Class rating of 94V-0. A one-half inch threaded nipple and locknut shall be provided. Leads shall be a minimum of twelve gauge and eighteen inches in length.

4. When subjected to a 8 x 20 micro-second test impulse, the Peak Clamping Voltage shall comply with the following: be no greater than 480V for 1500A, 710V for 5,000A or 1,110V for 10,000A (4 x 10 micro-second).
    a. 120VAC, or 120/240VAC, single phase systems:
        1) 480VAC for 1500A (4 x 10 micro-second).
        2) 710V for 5,000A (4 x 10 micro-second).
        3) 1,110V for 10,000A (4 x 10 micro-second).
    b. 120/208VAC, 240VAC, or 277/480VAC, three phase systems:
        1) 1850VAC for 1500A (4 x 10 micro-second).
        2) 2320V for 5,000A (4 x 10 micro-second).
        3) 2660V for 10,000A (4 x 10 micro-second).

D. Electrical:
1. Technology: Parallel Metal Oxide Varistors (40 kA Line to Ground).
2. Configuration: Each line to ground/neutral.
3. Enclosure: Weatherproof and UV resistant NEMA 4 molded polycarbonate with metal threaded nipple.
4. Operational indicators: Monitoring circuits supervise components in each phase. Individual green LED for each phase indicates proper operation. LED's will turn OFF on failure of protection.
5. Encapsulation: UL component recognized epoxy potting compound. UL Flame class 94V-0; Relative Temperature Index: Electric - 90, Mechanical - 90.
6. Mounting: 1/2-inch x 20 threaded nipple.
7. Mounting bracket: Right angle aluminum bracket.
8. Wiring: 18-inch of 12 gauge stranded copper wire is pre-connected for each phase, neutral and ground.
9. Wire color code: Black - phase leads, White - ground/neutral lead.
10. Ambient operating temperature: -40 to 185 degrees F.

E. Manufacturer's Warranty:
1. 10 year limited.

2.13 TERMINAL BLOCK - INDICATING FUSED

A. Manufacturer:
1. Allen Bradley Bulletin 1492-H4 (AC) or 1492-H5 (DC).
2. Or equal.

B. Agency Approvals:
1. UL.
2. CSA.
3. IEC.

C. Specifications:
1. Voltage Rating: 300VAC/VDC.
2. Maximum Current: 12A.
3. Wire Range (Rated Cross Section): No.30 to no.12 AWG.
4. Leakage Current:
    a. 2 mA at 300VAC.
    b. 2 mA at 24VDC.
5. Working Voltage:
    a. 100 to 300VAC.
    b. 10 to 57VAC/VDC.
6. Fuse Size: 1/4 in x 1-1/4 in.
7. Wire Strip Length 0.38 in.
8. Tightening Torque: 3 to 7 lb-in.

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9. Density: 33 pcs./ft.
10. Insulation Temperature Range: -40 to 221 degrees F.
11. Accessories:
    a. Aluminum DIN Rail with Standoff Brackets.
    b. End Barrier and End Anchors.
    c. Side Jumper Insulating Sleeve.
    d. Marking Systems.

2.14 TERMINAL BLOCK - ISOLATING SWITCH

A. Manufacturer:
1. Allen Bradley Bulletin 1492-H7.
2. Or equal.

B. Agency Approvals:
1. UL.
2. CSA.
3. IEC.

C. Specifications:
1. Voltage Rating: 300VAC/VDC.
2. Maximum Current: 15A.
3. Wire Range (Rated Cross Section): No.30 to No.12 AWG.
4. Leakage Current:
    a. 2 mA at 300VAC.
    b. 2 mA at 24VDC.
5. Working Voltage:
    a. 100 to 300VAC.
    b. 10 to 57VAC/VDC.
6. Dummy Fuse Size: 1/4 in x 1-1/4 in.
7. Wire Strip Length 0.38 in.
8. Tightening Torque: 3 to 7 lb-in.
9. Density: 33 pcs./ft.
10. Insulation Temperature Range: -40 to 221 degrees F.
11. Accessories:
    a. Aluminum DIN Rail with Standoff Brackets.
    b. End Barrier and End Anchors.
    c. Side Jumper Insulating Sleeve.
    d. Marking Systems.

2.15 TERMINAL BLOCK - OPEN STYLE

A. Manufacturer:
1. Allen Bradley Bulletin 1492-CAM1.
2. Or equal.

B. Agency Approvals:
1. UL.
2. CSA.
3. IEC.

C. Specifications:
1. Voltage Rating: 600VAC/VDC.
2. Maximum Current: 65A.
3. Wire Range (Rated Cross Section): No.22 to No.8 AWG.
4. Wire Strip Length 0.38 in.
5. Tightening Torque: 10 to 16 lb-in.

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6. Density: 30 pcs./ft.
7. Insulation Temperature Range: -40 to 221 degrees F.
8. Accessories:
    a. Aluminum DIN Rail with Standoff Brackets.
    b. End Barrier and End Anchors.
    c. Side Jumper Insulating Sleeve.
    d. Marking Systems.

2.16 TRANSMITTER - ISOLATED DC TO DC

A. Manufacturer:
1. Wilkerson Instrument Co., Model MM4300A.
2. Or equal.

B. Agency Approvals:
1. UL Listed.

C. Construction:
1. 8-pin, relay socket.
2. Operating temperature: -10 to 60 degrees C.

D. Electrical:
1. Input: 4-20 mADC or 0-10VDC.
2. Input impedance:
    a. Voltage: 200 kOhms.
    b. Current 50 Ohms.
3. Output range:
    a. Voltage: 0 - 10 VDC, 2 kOhm minimum load.
    b. Current: 4-20 mADC, 24VDC compliance (1200 ohms/20 mADC).
4. Response time: Less than 100 ms.
5. Accuracy: + 0.1 percent of span.
6. Linearity: + 0.05 percent of span.
7. Common mode rejection: 120 dB.
8. Isolation:
    a. 500 megohms.
    b. 1000VAC.

E. Manufacturer's Warranty:
1. 10 year limited.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 20
INSTRUMENTATION DEVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Instrumentation Devices.
   1. Instrumentation Devices shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
      a. Instrumentation Devices, Lump Sum. When so provided, payment for Instrumentation Devices shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
      b. Instrumentation Devices, Inclusive. When no quantity is provided, Instrumentation Devices shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. ANSI/NFPA 70 - National Electrical Code and state amendments thereto.
      b. ANSI/IEEE C37.90 - IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus.
      c. ANSI/IEEE C62.11- IEEE Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits.
      d. ANSI/IEEE C62.34 - IEEE Standard for Performance of Low-Voltage Surge-Protective Devices (Secondary Arresters).
      e. ANSI/IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
   2. CE - European Community, Applicable Directives.
      a. EN50005 - for Terminal Markings.
      b. EN50081-1- Generic Emission Standard.
      c. EN50082-1 - Generic Immunity Standard.
      d. EN61000-4-4 - Electromagnetic compatibility (EMC). Testing and measurement techniques.
      e. EN61000-4-5 - Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test.
   3. Canadian Standards Association (CSA), Specifications and Standards, current edition:
      a. CSA C22.2, Industrial Control Equipment.
   4. CUL - Underwriter's Laboratories of Canada.
   5. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
      a. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
   6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
      a. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
      b. NEMA ICS 3 - Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC.
   7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
      a. UL508 - Industrial Control Equipment.
      b. UL508A - Industrial Control Panels.

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c. UL 913 - Intrinsically Safe Specification.
d. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
1. Section 26 90 00 - Process Instrumentation & Control.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

1.11 DESIGN REQUIREMENTS

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TYPE	TAG NUMBER	INSTRUMENT DESCRIPTION
26 90 11	XS-27-2-1	TRANSFER CONVEYOR ROLLER GATE LOCAL CONTROL STATION
F8	FE/FIT-19-1-1	POTABLE WATER FLOW METER/TRANSMITTER
L4	LE-6-5-1	CHEMICAL STORAGE TANK NO.1 LEVEL ELEMENT
L4	LE-6-5-2	CHEMICAL STORAGE TANK NO.2 LEVEL ELEMENT
L4	LIT-6-5-1	CHEMICAL STORAGE TANK NO.1 & NO.2 LEVEL TRANSMITTER
L7	LSH-6-7-1	CHEMICAL BUILDING FLOOD SWITCH
T7	TT-6-6-1	CHEMICAL BUILDING TEMPERATURE TRANSMITTER
Z2	ZS-6-6-1	CHEMICAL BUILDING ENTRY DOOR SWITCH

PART 2 PRODUCTS

2.01 F8 - CLAMP-ON FLOW METER, ULTRASONIC

A. Manufacturer:
1. Endress Hauser Proline Prosonic Flow P 500.
2. No Exceptions.

B. Sensor:
1. Ultrasonic flow measuring principle.
2. Measurement is independent of pressure, density, and conductivity.
3. Specified accuracy is maintained at an inlet run of only 2 x DN, even in the case of disturbed flow profiles.
4. 1/2" to 160" diameter range.
5. -40 to 1022 degrees Fahrenheit medium temperature.
6. Minimum primary rated NEMA 6P (IP68), or as indicated on the drawings.

C. Signal Converter:
1. Remote mounted signal converter rated NEMA 4X (IP66/67).
2. Measure variables include volume flow, sound velocity, flow velocity, and totalizer.
3. Maximum measurement error, Volume flow:
   a. +/-3% o.r. for DN 15.
   b. +/-2% o.r. for DN 25 to DN 200.
   c. +/-2% o.r. above DN 200.
4. Measuring range of 0 to 50 ft/s.
5. Outputs:
   a. 4.20mA HART (active/passive).
   b. 4.20mA (active/passive).
   c. Pulse / frequency / switch output (active/passive).
   d. Double pulse output (active/passive).
   e. Relay output.
6. Inputs:
   a. Status input.
   b. 4.20 mA input.
7. Power Supply:
   a. 24 VDC.
   b. 100 to 230 VAC.
   c. 24 VDC / 100 to 230 VAC (non-hazardous area).
8. Display:
   a. 4-line backlit display with touch control for actual flow rate, flow totalization, programming, and diagnostics.
   b. Read out in gallon/minute for rate and gallons for total.
   c. Be fully bi-directional for the display and outputs.
   d. Totalize plus flow, minus flow, and sum the difference.

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D. Installation:
1. Clamp on system consisting of sensor holder, sensor housing, and strapping bands for mounting without process interruption.
2. No cutting or penetration of the pipe shall be required.
3. The system shall include all necessary mounting hardware, cables, and accessories for complete installation.

2.02 L4 - LEVEL ELEMENT AND TRANSMITTER, RADAR

A. Manufacturer.
1. Level element:
a. Vegapuls C 21.
b. Or equal.
2. Level indicator/transmitter:
a. Vegamet 842
b. Or equal.

B. Specifications.
1. Power.
a. Nominal 24 Vdc with max. 550 Ohm.
b. Maximum 35 Vdc.
c. 4.20 mA/HART.
2. Output.
a. Range: 4 to 20 mA.
b. Accuracy: ±.08 IN.
c. Span: proportional or inversely proportional.
3. Performance.
a. Frequency: 80 ghz.
b. Measurement range: at least 49.2 ft.
c. Blanking distance: 0.3 m.
d. Accuracy: ± the greater of 0.1% of range or 10 mm.
e. Influence of ambient temperature: 0.006% / K.
f. Repeatability: ±5 mm.
g. Dielectric constant: år> 3 (for < 3 use waveguide antenna or.
h. Stillpipe).
i. Memory: non-volatile EEPROM, no battery required.
j. Failsafe: ma programmable high, low, or hold upon LOE condition.
4. Interface.
a. Analog output: 4 to 20 ma ± 0.02 ma accuracy.
b. Graph (representing level) available in four languages.
c. Communication: HART®, SDI-12, Modbus.
d. Configuration.
1) Bluetooth.
2) HART® handheld communicator.

C. Mechanical.
1. Enclosure (electronic):
a. Construction: PVDF.
b. Conduit entry: 1.5 NPT / 1 NPT.
c. Ingress protection: Type 6, IP66 / IP68.

D. Features.
1. Uni-Construction polypropylene rod antenna standard.
2. Easy installation and simple startup.
3. Programming using infrared intrinsically safe handheld.
4. Extremely high signal-to-noise ratio.
5. Auto False-Echo Suppression of fixed obstructions.

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E. Antenna.
1. Polypropylene rod: hermetically sealed construction, standard 100 mm shield for maximum 100 mm nozzle, or optional 250 mm long shield.

F. Remote Indicator / Transmitter:
1. Inputs / Outputs:
a. Two (2) 4.20mA sensor inputs.
b. Two (2) 0/4.20mA sensor outputs
c. Three (3) operating relay outputs.
d. One (1) failure relay output.
2. Ratings:
a. IP66/67
b. Type 4X
3. Display:
a. LCD matrix display, black and white.
b. Backlight with color change according to status.
4. Operating voltage:
a. 100.230 VAC (-15%, +10%) 50/60 Hz.
b. 24.65 VDC (-15%, +10%).
c. Max power consumption: 15VA, 5W.
5. Mounting system to wall mount indicator / transmitter.

G. Approvals.
1. General: CSAUS/C, FM, CE.
2. Radio: FCC, Industry Canada, and European (R&TTE).
3. Hazardous:
a. Europe: ATEX II 1G EEx ia IIC T4.
b. USA: FM Class 1, Div. 1, Groups A, B, C, D; Class II, Div. 1, Groups E, F, G; Class III; intrinsically safe with suitable barrier).
c. Canada: CSA Class I, Div. 1, Groups A, B, C, D; Class II, Div. 1, Group G; (intrinsically safe with suitable barrier).

2.03 L7 - LEVEL SWITCH, DRYWELL FLOAT

A. Manufacturer.
1. Contegra Model FS 202.
2. Or equal.

B. Operation: the switch is actuated by a magnet located in the float. As the float rises and falls, the magnetic field passing the switch (in the stem) causes the switch to actuate. The switch operates in either the "normally open" or "normally closed" mode. Selecting the mode is accomplished by removing the retaining clip and reversing the float on the stem.

C. Construction:
1. PVC, PBT and Buna N construction for chemical resistance.
2. Selectable relay contacts - N.O or N.C.
3. Reed switch for reliable extended service.
4. Large float displacement.
5. Hermetically sealed reed switch located inside the stem.

D. The float switch assembly (including float, guide, tube and junction box) shall be constructed to NEMA 4X standards. The assembly shall be watertight and submersible to the bottom of the junction box. Unit shall be pre-wired, the only connections required are located in the junction box. Provide mounting hardware as shown on the drawings.

E. Switch operation shall be reliable under submergence, pressure, or long-term inactivity. Switch shall be normally closed, rated 60 watts. Switching arrangement shall be reversible by inverting the float. Load relay shall be provided in control panel receiving float signal.

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F. Where float switch is located in hazardous location, installation shall be intrinsically safe, suitable for use in Class I Division I atmospheres in accordance with the National Electrical Code. Installation shall include an intrinsically safe relay located in the control panel receiving the float signal.

2.04 T7 - TEMPERATURE TRANSMITTER, AMBIENT

A. Manufacturer:
1. ACI.
2. or Equal.

B. Equipment Description: Two wire temperature transmitter with local RTD.

C. References:
1. NEMA.
2. FM.
3. UL.

D. Environmental Conditions.
1. Sensor Ambient Temperature Limits: -58 - 392 degrees F.
2. Transmitter Operating Range: 32 - 158 degrees F.

E. Process Conditions: Measurement of exterior ambient temperature.

F. Conduit connection - 1/2" NPT.

G. Power Supply - 7-35V DC with no polar sensitivity.

H. Input - 2-wire Platinum 100/1K Ohm Class A RTD I. Output - 2-wire, Linear 4-20mA DC.

I. Performance:
1. Linearity +/- 0.5% of full range span.
2. Sensor Accuracy +/- 0.06% at 32 degrees F.
3. accuracy: +/- 0.1% of span.
4. Standardization: DIN-EIC-751.

J. Enclosure - NEMA 4x.

2.05 Z2 - SECURITY DOOR SWITCH, MAGNETIC

A. Manufacturer:
1. GE Sentrol 1078.
2. or equal.

B. Construction:
1. Recessed magnetic sensor.
2. Rare earth magnet.
3. Special design for steel mounting.
4. Self-lock mounting.
5. Rugged construction.
6. 15/16-inch diameter hole required.
7. UL approved for specific fire.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 60
ETHERNET NETWORKING EQUIPMENT

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Ethernet Networking Equipment.
   1. Ethernet Networking Equipment shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Conditions – Division 1.
      a. Ethernet Networking Equipment, Lump Sum. When so provided, payment for Ethernet Networking Equipment shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Conditions - Division 1.
      b. Ethernet Networking Equipment, Inclusive. When no quantity is provided, Ethernet Networking Equipment shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
      a. ANSI/ISA-5.1-1984 - Instrumentation Symbols and Identification.
      b. ANSI/ISA-5.3-1983 - Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.
      c. ANSI/ISA-95.00.01-2000 - Enterprise Control System Integration, Part 1: Models and Terminology.
      d. ANSI/ISA-TR99.00.01-2004, Security Technologies for Manufacturing and Control Systems.
      e. ANSI/ISA-TR99.00.02-2004, Integrating Electronic Security into the Manufacturing and Control Systems Environment.
   2. Telecommunications Industry Association (TIA), Electronic Industries Alliance (EIA), Specifications and Standards, current edition:
      a. TIA/EIA-568-A - Commercial Building Telecommunications Wiring.
      b. TIA/EIA-569-A - Commercial Building Standards for Telecommunications Pathways and Spaces.
      c. TIA/EIA-606 - Documentation.
      d. TIA/EIA-607 - Commercial Building Bonding and Grounding Requirements.
      e. TIA/EIA TSB-67 - Transmission Performance for Field Testing of Unshielded Twisted Pair Cabling Systems.
      f. TIA/EIA TSB-72 - Centralized Optical Fiber Cabling Guidelines.
      g. TIA/EIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant.
      h. TIA/EIA-429-AAA - Detail Specification for 62.5 - UM Core Diameter/125-UM Platting Diameter Class 1A Multimode, Graded Index Optical Wave Guide Fibers.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of.

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1. Section 26 90 00 - Process Instrumentation & Control.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for Ethernet networking equipment:
1. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.
2. Identify all software licensing requirements.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for Ethernet Networking Equipment:
1. As-built printout of all software configuration including data tables, passwords, and other parameters.
2. Connection diagrams for each individual piece of equipment.
3. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
4. Provide copy of written warranty.
5. Complete test reports for fiber optic cable. Provide a fiber test form which includes the following:
    a. Date and time of:
        1) Fiber installation.
        2) Fiber termination.
        3) Testing.
    b. Testing equipment used information including:
        1) Make.
        2) Model.
        3) Date of calibration.
    c. Name of person performing test and the installers.
    d. dB loss of each connector installed.
    e. dB loss of each fiber segment.
    f. End to end attenuation.
    g. Optical Time Domaine Reflectometer (OTDR) Signature trace.
    h. Cable shall be tested at the following frequencies:
        1) 850 nm.
        2) 1300 nm.
6. Complete test report for category 6 cabling. Provide test form which includes the following:
    a. Date and time of:
        1) Cable installation.
        2) Cable termination.
        3) Testing report.
    b. Testing equipment used information including:
        1) Make.
        2) Model.

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3) Date of calibration.

c. Name of person performing test and the installers.

d. Provide in spreadsheet format. Cable number with test reporting of cable length at near-end crosstalk and attenuation at frequency MHz at 1, 4, 10, 20 and 100. Also indicate room number of each jack.

7. Submit software license certificates, manufacturer provided software documentation, and software installation media.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 INDUSTRIAL ETHERNET NETWORK SWITCH, UNMANAGED

A. Manufacturer:
1. N-TRON Corp. Model 116TX.
2. or equal.

B. General.
1. High Reliability/Availability.
2. Extended Environmental Specifications.
3. Rugged DIN-Rail Enclosure.
4. High Performance.
5. MTBF greater than 128.1 years.
6. Ease of Use.
a. Plug & Play Operation.
b. Auto-sensing 10/100BaseT.
c. Auto-sensing Full/Half Duplex.
d. Auto Cable Sensing (MDIX).
e. Unmanaged Operation.
f. Compact DIN-Rail Package.
7. Increased Performance.
a. Full Wire Speed Capable.
b. Full Duplex Capable.
c. Eliminates Network Collisions.
d. Increases Network Determinism.

C. Switch Properties.
1. Number of MAC Addresses: 4,000.

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2. Aging Time: Programmable.
3. Latency Min.: 2.2 us.
4. Backplane Speed: 2.6Gb/s.
5. Switching Method: Store & Forward.

D. Shock & Vibration.
1. Shock: 15g @ 11ms.
2. Vibration/Seismic: 1g, 9-150Hz, Triaxial.

E. Electrical.
1. Input Voltage: 10-30 VDC.
2. Input Current: 200 mA@ 24V.
3. Heavy-duty, industrial power supply, rack-mounted.

F. Environmental.
1. Operating Temperature: 0 to 60 degrees C.
2. Storage Temperature: -40 to 70 degrees C.
3. Operating Humidity: 10 to 95 percent, non-condensing.
4. Operating Altitude: 0 to 10,000 ft.

G. Network Media.
1. 10BaseT: >Cat5 Cable.
2. 100BaseTX: >Cat6 Cable.

H. Connectors.
1. 10/100BaseT: sixteen (16) RJ-45 Copper Ports.
2. Serial Port: Com Parameters 9600,n,8,1.

I. Recommended Wiring Clearance:
1. Front: 2-inch.
2. Side: 3-inch.

J. Emissions and Safety Approvals:
1. FCC Part 15 Class A.
2. UL Listed (US & Canada).
3. CLASS I, DIV 2, GROUPS A,B,C,D, T4A.
4. CE: EN55011,EN61000-6-2 and -6-4.
5. EN61000-4-2, 3, 4, 5, 6, 11, EN61010-1.
6. Class III, Pollution Degree2, Installation Category I.

2.02 INDUSTRIAL ETHERNET NETWORK SWITCH, MANAGED WITH FIBEROPTIC UPLINK PORT

A. Manufacturer:
1. N-TRON Corp. Model 710FX2.
2. or equal.

B. General.
1. High Reliability/Availability.
2. Extended Environmental Specifications.
3. Rugged DIN-Rail Enclosure.
4. High Performance.
5. MTBF greater than 2M Hours (measured).
6. Ease of Use.
    a. Plug & Play Operation.
    b. Auto-sensing 10/100BaseT.
    c. Auto-sensing Full/Half Duplex.
    d. Auto Cable Sensing (MDIX).
    e. Unmanaged Operation.

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f. Compact DIN-Rail Package.

7. Increased Performance.
   a. Full Wire Speed Capable.
   b. 100BaseFX Fiber Uplink.
   c. Full Duplex Capable.
   d. Eliminates Network Collisions.
   e. Increases Network Determinism.

C. Switch Properties.
1. Number of MAC Addresses: 4,000.
2. Aging Time: Programmable.
3. Latency Min.: 2.2 us.
4. Backplane Speed: 2.6Gb/s.
5. Switching Method: Store & Forward.

D. Shock & Vibration.
1. Shock: 200g @ 10ms.
2. Vibration/Seismic: 50g, 5-200Hz, Triaxial.
3. Note: Unit must be bulkhead mounting to achieve these levels.

E. Electrical.
1. Redundant Input Voltage: 10-30 VDC.
2. Input Current: 200 mA @ 24V.
3. Heavy-duty, industrial power supply, rack-mounted.

F. Environmental.
1. Operating Temperature: -40 to 85 degrees C (for -S option 509FX) -20 to 70° C Operating, -40 to 85° C Storage.
2. Storage Temperature: -40 to 85 degrees C.
3. Operating Humidity: 10 to 95 percent, non-condensing.
4. Operating Altitude: 0 to 10,000 ft.

G. Network Media.
1. 10BaseT: >Cat3 Cable.
2. 100BaseTX: >Cat5 Cable.
3. 100BaseFX.
   a. Multimode: 50-62.5/125µm.
   b. Singlemode: 8-10/125µm.

H. Fiber Transceiver Characteristics.
1. Fiber Length: 2km.
2. TX Power Min: -19dBm.
3. RX Sensitivity Max: -32dBm.
4. Wavelength: 1310nm.

I. Connectors.
1. 10/100BaseTX: Eight (8) RJ-45 Copper Ports.
2. 100BaseFX: One (1) SC Duplex Port.
3. Serial Port: Com Parameters 9600,n,8,1.

J. Recommended Wiring Clearance:
1. Front: 5-inch.
2. Side: 3-inch.

K. Emissions and Safety Approvals:
1. FCC Part 15 Class A.
2. UL Listed (US & Canada).
3. CLASS I, DIV 2, GROUPS A,B,C,D, T4A.

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4. CE: EN55011,EN61000-6-2 and -6-4.
5. EN61000-4-2, 3, 4, 5, 6, 11, EN61010-1.
6. Class III, Pollution Degree2, Installation Category I.

2.03 MCC STP CONTROL CABLE

A. Manufacturer:
1. Belden DataTuff7953-A.

B. General.
1. Non-plenum rated 4 pair STP (shielded twisted pair) cable, 23 AWG, solid bare copper, FEP insulated, bonded-pairs, ripcord, flexible PVC jacket. Jacket is sequentially marked at two foot intervals.
2. Supports Category 6 applications such as 1000 Base TX. Ideal for use in high bandwidth applications such as gigabit Ethernet.
3. Multimedia applications include AES/EBU digital audio and RS-422 machine control.
4. Support NTSC and PAL composite serial digital video and NTSC/PAL component serial digital video.
5. UL tested for use with high speed audio-video systems in accordance with FCC Class A digital devices at a fundamental frequency of 135 MHz.
6. Suitable for "noisy" environments such as running next to power cables and transformers.

C. Physical Characteristics:
1. Temperature range: -20 TO 75 deg. C.
2. Insulation material: FEP.
3. Aluminum Foil-Polyester Tape.
4. Jacket material: PVC.
5. Maximum pulling tension: 40 lbs.
6. Minimum conductor OD: 0.020-in.
7. Minimum insulation OD: 0.035-in.
8. Minimum bend radius: 0.25-in.
9. Flame test: UL 1581 Vertical Tray.
10. Color code:
    a. Pair 1: white/blue & blue.
    b. Pair 2: white/orange & orange.
    c. Pair 3: white/green & green.
    d. Pair 4: white/brown & brown.

D. Electrical Characteristics:
1. Maximum operating voltage: 600 V rms.
2. Mutual capacitance (pF/100-m): 5.6 nominal.
3. Nominalvelocity of propagation: 70 percent.
4. Propogation Delay (Skew) (nS/100-m): 30 nominal.
5. Velocity of Propagation at 10 MHz (percent): 72 nominal.
6. Capacitance unbalance (pF/100-m): 90.0 maximum.
7. DCR at 20C (Ohms/100-m): 7.7 maximum.
8. DCR unbalance (percent): 3.0 maximum.

2.04 UTP CONTROL CABLE

A. Manufacturer:
1. Belden DataTwist 3600.
2. Or equal.

B. General:
1. Non-plenum rated 4 pair UTP (unshielded twisted pair) cable, 23 AWG, solid bare copper, FEP insulated, bonded-pairs, ripcord, flexible PVC jacket. Jacket is sequentially marked at two foot intervals.

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2. Supports Category 6 applications such as 1000 Base TX. Ideal for use in high bandwidth applications such as gigabit Ethernet.
3. Multimedia applications include AES/EBU digital audio and RS-422 machine control.
4. Support NTSC and PAL composite serial digital video and NTSC/PAL component serial digital video.
5. UL tested for use with high speed audio-video systems in accordance with FCC Class A digital devices at a fundamental frequency of 135 MHz.
6. Suitable for "noisy" environments such as running next to power cables and transformers.

C. Physical Characteristics:
1. Temperature range: -20 TO 75 deg. C.
2. Insulation material: FEP.
3. Jacket material: PVC.
4. Maximum pulling tension: 40 lbs.
5. Minimum conductor OD: 0.020-in.
6. Minimum insulation OD: 0.035-in.
7. Minimum bend radius: 0.25-in.
8. Flame test: UL 1581 Vertical Tray.
9. Color code:
   a. Pair 1: white/blue & blue.
   b. Pair 2: white/orange & orange.
   c. Pair 3: white/green & green.
   d. Pair 4: white/brown & brown.

D. Electrical Characteristics:
1. Maximum operating voltage: 300 V rms.
2. Mutual capacitance (pF/100-m): 5.6 nominal.
3. Nominalvelocity of propagation: 70 percent.
4. Propogation Delay (Skew) (nS/100-m): 30 nominal.
5. Velocity of Propagation at 10 MHz (percent): 72 nominal.
6. Capacitance unbalance (pF/100-m): 90.0 maximum.
7. DCR at 20C (Ohms/100-m): 7.7 maximum.
8. DCR unbalance (percent): 3.0 maximum.

E. Usage:
1. Instrumentation & Control system UTP cable.

2.05 UTP PATCH CABLE

A. Manufacturer:
1. Belden DataTwist 3600.
2. Or equal.

B. General:
1. Non-plenum rated 4 pair UTP (unshielded twisted pair) cable, 23 AWG, solid bare copper, FEP insulated, bonded-pairs, ripcord, flexible PVC jacket. Jacket is sequentially marked at two foot intervals.
2. High flexibility patch cordage. RJ-45 compatible for either T568A or T568B configurations.
3. Design minimizes changes in electrical characteristics due to bending and kinking associated with patch cables.
4. Patch cable impedance is matched with DataTwist 3600 horizontal cables to reduce signal reflections caused by impedance mismatches and decrease system return loss.
5. Resistant to attenuation increases due to high humidity environments.

C. Physical Characteristics:
1. Temperature range: -20 TO 80 deg. C.
2. Insulation material: FEP.
3. Jacket material: PVC.
4. Maximum pulling tension: 40 lbs.

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5. Minimum conductor OD: 0.020-in.
6. Minimum insulation OD: 0.035-in.
7. Minimum bend radius: 0.25-in.
8. Flame test: UL 1581 Vertical Tray.
9. Color code:
    a. Pair 1: white/blue & blue.
    b. Pair 2: white/orange & orange.
    c. Pair 3: white/green & green.
    d. Pair 4: white/brown & brown.

D. Electrical Characteristics:
1. Maximum operating voltage: 300 V rms.
2. Mutual capacitance (pF/100-m): 5.6 nominal.
3. Nominal velocity of propagation: 70 percent.
4. Propogation Delay (Skew) (nS/100-m): 30 nominal.
5. Velocity of Propagation at 10 MHz (percent): 72 nominal.
6. Capacitance unbalance (pF/100-m): 90.0 maximum.
7. DCR at 20C (Ohms/100-m): 7.7 maximum.
8. DCR unbalance (percent): 3.0 maximum.

E. Usage:
1. Instrumentation & Control system UTP patch cable.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 SOFTWARE CONFIGURATION SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

B. A and C

3.05 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.06 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to execute the grading for this project.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Structural Excavation for Structures - Division 31

C. Trenching and Backfilling - Division 31

D. Erosion and Sedimentation Controls - Division 31

E. Topsoil Placement and Grading - Division 32

F. Seeding - Division 32

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (NONE)

PART 3 EXECUTION

3.01 PROTECTION OF EXISTING UTILITIES

A. Locate existing underground utilities in the areas of work before starting grading operations and provide adequate means of protection during earthwork operations. Should uncharted or incorrectly charted piping or other utilities be encountered during grading, consult the Engineer immediately for directions on how to proceed. Cooperate with the Owner, and public and private utility companies in keeping their respective services and facilities in operation.

B. Repair damaged utilities to the satisfaction of the utility owner.

3.02 PRESERVATION OF TREES AND SHRUBS

A. Trees and shrubs to be preserved shall be thoroughly protected from scarring or other injury during grading operations. Excavation operations shall not disturb the original ground around trees within a distance of one

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foot or twice the diameter of the tree, whichever is greater. Exposed roots resulting from excavation shall be cut cleanly and covered with humus-bearing soil.

3.03 GRADING

A. General. All areas within the project limits shall be graded to the finished grades, lines and details less an allowance for topsoil and/or sod depth, pavement, base and structures.

B. Construction Methods. Grading shall be performed in accordance with Sections 205, 206, 207, and 208, of the State of Wisconsin, Department of Transportation Standard Specifications. If borrow is needed to provide the grades and elevations required, a borrow area will be selected by the Owner. The borrow area shall be restored to smooth lines, topsoiled with a minimum of 6 inches of salvaged topsoil and seeded.

C. Tolerance. Finish earth grades shall be in reasonably close conformity with the lines, grades and thickness shown on the contract drawings or established by the Engineer with particular concern for drainage and appearance. Finish earth grades along buildings or structures, under and adjacent to pavements and in drainageways shall be within 0.10 foot of those staked or shown on the contract drawings. Grades in all other areas shall be within 0.50 foot unless drainage considerations require more accuracy.

3.04 DRAINAGE

A. During construction, ditches and channels shall be drained by keeping the excavation areas and embankment sloped to the approximate section of the final earth grade. If existing surface drainage must be interrupted, temporary drainage shall be provided.

B. Construction in and adjacent to flowing streams shall be performed to avoid washing, sloughing or deposition of materials into the channel which may obstruct or impair stream flow, or which may result in contamination and/or silting of the stream.

C. Precautions shall be taken to preserve, protect, and continue service of all existing tile drains, sewers, and other subsurface utilities; repair any damage to drains, sewers, and utilities.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 31 23 13
SUBGRADE PREPARATION

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all material, equipment, and labor required to execute the earthwork for this project in accordance with Sections 201 through 214 of the State of Wisconsin, Department of Transportation Standard Specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Erosion and Sedimentation Controls - Division 31

C. Aggregate Base and Subbase - Division 32

D. Topsoil Placement and Grading - Division 32

E. Seeding - Division 32

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 PRESERVATION OF TREES AND SHRUBS

A. Trees and shrubs to be preserved shall be thoroughly protected from scarring or other injury during grading operations. Excavation operations shall not disturb the original ground around trees within a distance of one foot or twice the diameter of the tree, whichever is greater. Exposed roots resulting from excavation shall be cut cleanly and covered with humus-bearing soil.

3.02 UNCLASSIFIED EXCAVATION AND GRADING

A. Excavation to subgrade shall be performed to provide a finished subgrade prepared for the application of crushed aggregate, curb and gutter, sidewalks and topsoil as shown on the typical section.

B. Also included is the removal and disposal of existing stumps, trees, miscellaneous structures and rubble as shown on the contract drawings and any other obstructions encountered which interfere with the proposed

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construction. Stumps shown on contract drawings to be removed from terraces or backslopes shall be shredded to a minimum of 6 inches below finish subgrade or otherwise removed by the Contractor.

C. The Contractor shall adjust all valve boxes, manhole frames, and other utility appurtenances to within 1 inch of the final grade as shown on the contract drawings or as staked in the field by the Engineer.

3.03 FILLING

A. All suitable excavated material shall be used for roadway construction, and at other places shown on the drawings.

B. Fill shall be spread in successive uniform horizontal layers not exceeding 9 inches in depth over entire area before compaction. Each layer shall be worked to break down clods over 6 inches in size and to secure uniform moisture content. Where filling in 9 inch layers is not feasible, as in the case of filling in water or over steep slopes, construct fill in one layer to the minimum elevation at which equipment can be operated. Above this elevation, the fill shall be constructed in layers of the specified depth.

C. Compact each layer of fill material to the following percentage of maximum dry density per modified proctor (ASTM D1557).
   1. 91 percent for fine grained soils (more than 50 percent passing the No. 200 sieve).
   2. 93 percent for coarse-grained soils (less than 50 percent passing the No. 200 sieve).

3.04 PREPARATION OF SUBGRADE

A. The preparation of the subgrade shall consist of bringing the area to be paved to a subgrade conforming to the required grade and cross section, of uniform density, ready to receive the base course. This is to be accomplished by excavating or backfilling as needed, shaping, watering as required, or permitting to dry to proper consistency, and rolling the entire area with an approved self-propelled roller weighing not less than 8 tons. Shaping and rolling shall be continued until the subgrade has been properly prepared and shows that no further compaction of any practical benefit would result from continued compaction. The subgrade shall be tested as to cross section, crown, and elevation. After being properly prepared, it shall be so maintained until the base course is constructed. A completed subgrade shall be maintained sufficiently in advance of the base course operations to permit proper control. Any part of the subgrade area not accessible to a roller shall be thoroughly compacted by hand or mechanical compaction in a manner acceptable to the Engineer. This work shall be in accordance with Section 211 of the State of Wisconsin, Department of Transportation Standard Specifications.

3.05 UNSTABLE SUBBASE/EXCAVATION BELOW SUBGRADE (EBS)

A. Deposits of frost-heave material, unstable soils, topsoil containing considerable amounts of organic matter, or other undesirable foundation material shall be removed from the area within the roadbed depths as shown on the drawings or as directed by the Engineer and shall be replaced as directed by the Engineer in the field.

B. Contractor shall notify the Engineer of any questionable material. The work shall be performed in accordance with Section 205 of the State of Wisconsin, Department of Transportation, Standard Specifications.

3.06 DRAINAGE

A. During construction, ditches and channels shall be drained at all times by keeping the excavation areas and embankments sloped to the approximate section of the final earth grade. If existing surface drainage must be interrupted, temporary drainage shall be provided.

B. Construction in and adjacent to flowing streams shall be performed to avoid washing, sloughing or deposition of materials into the channel which may obstruct or impair stream flow, or which may result in contamination and/or silting of the stream.

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C. Precautions shall be taken to preserve, protect, and continue service of all existing tile drains, sewers, and other subsurface utilities; repair any damage to drains, sewers and utilities.

3.07 TESTING

A. A testing laboratory will perform compaction and density tests at locations determined by the Owner's Authorized Representative. Where tests indicate that the subgrade does not conform to the compaction density specified, the subgrade shall be replaced or re-worked until it does conform.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 31 23 16.16
STRUCTURAL EXCAVATION FOR STRUCTURES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable Provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   2. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor - Part 1926 Regulations, Current Edition.
   3. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall include all excavation, backfill and compaction for structures and other miscellaneous excavation, backfill and compaction required but not designated under other sections.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Subgrade Preparation - Division 31

C. Trenching and Backfilling - Division 31

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 INSITU BACKFILL MATERIAL

A. Previously excavated soil or material free of organic debris, clay balls, and aggregate larger than 1-1/2 inches as approved by the Engineer.

2.02 IMPORTED GRANULAR FILL AND GRANULAR FOUNDATION

A. Imported granular fill and granular foundation shall be sand conforming to State of Wisconsin, Department of Transportation, Standard Specifications Section 209.2.2, Grade No. 1 Granular Backfill or well-graded sand and gravel conforming to State of Wisconsin, Department of Transportation, Standard Specifications Section 305.2.2.1 1-1/4 inch dense graded base with not more than eight percent (8 percent) by weight passing a No. 200 sieve.

2.03 PIPE EMBEDMENT

A. Embedment for pipe lines under footings shall be Class B for rigid pipe and Class II for flexible pipe, as applicable for the pipe material to be installed, as specified by ASTM C12 and ASTM D2321 respectively.

PART 3 EXECUTION

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3.01 GENERAL CLASSIFICATION

A. Excavation and trenching of all materials encountered under this contract will be unclassified without regard to type, difficulty to remove, or suitability for use in the construction.

3.02 BARRICADES

A. Provide sufficient barricades and protective devices adjacent to excavations to safeguard against injury. Provide and maintain sufficient safety lanterns at walks, roadways and parking areas to provide safety at night.

3.03 EXCESS MATERIAL

A. To the extent needed, all suitable excavated materials shall be used for foundation backfill and site grading. The suitability of materials for specific purposes shall be determined by the Engineer. All surplus or unsuitable excavated materials will be designated as waste and used only for site grading.

3.04 EXCAVATION

A. Excavate to achieve necessary dimensions, lines, grades and cross sections. Notify the Engineer of any remaining pockets of organic or unsuitable soil, debris, existing foundations or poorly compacted fill soils. Unsuitable materials shall be removed and replaced with compacted granular fill or backfill material. Bottoms of trenches shall be excavated to proper grade so that pipes will be supported on a firm bed of undisturbed natural earth or suitable, compacted backfill.

3.05 UNAUTHORIZED EXCAVATION

A. Consists of removal of materials beyond indicated elevations or dimensions without specific direction of the Engineer. Notify the Engineer when unauthorized excavations are made.

3.06 STABILITY OF EXCAVATION

A. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Provide shoring and bracing to retain banks and prevent collapse of excavations as necessary to safeguard workmen, prevent movement of adjacent ground, and avoid damage to existing improvements.

3.07 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees Fahrenheit.

3.08 PIPE EMBEDMENT

A. Embedment pipe lines under footings shall be performed in accordance with the methods required as Class B for rigid pipe and Class II for flexible pipe, as applicable for the pipe material to be installed, as specified by ASTM C12 and ASTM D2321 respectively.

B. Where fill is required to raise the subgrade to elevations required, it shall be made in horizontal layers not to exceed 8 inches in depth and compacted as specified as herein.

3.09 BACKFILLING AND COMPACTION

A. Place backfill to bring excavations to natural grade unless otherwise noted. Backfill within foundation walls and outside foundation walls to a distance of 10 feet outside the building line and under pavements and walks shall be spread and compacted uniformly in 6 inch to 8 inch lifts to at least 95 percent maximum dry density per modified proctor (ASTM D1557).

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B. Site backfill placed outside a distance 10 feet from the building line shall be spread uniformly in 12 inch maximum lifts and trench backfill and similar work shall be with approved excavated material or granular backfill compacted in 8 inch maximum lifts to 93 percent dry density per modified proctor (ASTM D1557).

C. Backfill shall not be placed against any concrete structure which retains earth until the concrete has been in place 14 days or until test cylinders show the concrete strength to be at least 3000 pounds per square inch, nor shall high-early-strength concrete structures be backfilled before 6 days after the day of pouring or until test cylinders show the strength of the concrete to be at least 3000 pounds per square inch. Concrete structures which have earth on both sides (i.e., footings, frost walls, etc.), may be backfilled uniformly on both sides after the concrete has been in place 4 days, or 2 days for high-early-strength concrete. In no case shall backfilling start before required curing and protection, surface finishing, dampproofing, and waterproofing of the work to be covered by backfilling has been completed. When so permitted by the Engineer, footings may be backfilled uniformly on all sides to the top of such footing immediately upon removal of forms.

D. Contractor shall provide all necessary equipment required to obtain specified compaction. Compaction by travel of grading equipment is not considered adequate for uniform compaction. Small vibratory compactors are required wherever fill is placed adjacent to foundation walls, footings and piers.

E. Backfilling shall be so performed as to prevent wedging action against the structure. Slopes within ten feet of the structure shall be stepped, terraced, or otherwise treated as necessary to prevent slippage and wedging of the backfill.

F. Water shall not be used to expedite settlement of the backfill except to adjust moisture content to optimize compaction. The groundwater level shall be kept below the level of the lift of material being compacted.

3.10 SAMPLING

A. All required sampling, preparing of specimens, and testing except as modified by these specifications shall be performed by an independent laboratory and paid for by the Owner. The laboratory shall meet the requirements of ASTM E329. The Engineer shall determine when compaction tests shall be made.

3.11 TESTING

A. Any testing required because of failure of backfill to meet specification requirements shall be paid for by the Contractor. Test reports shall be sent to the Contractor with copies to the Engineer.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Building excavation.

1.02 RELATED WORK

A. Section 01 40 00 - Quality Requirements: Inspection of bearing surfaces and compaction testing.

B. Section 31 23 23 - Backfill and Compaction for Buildings.

1.03 PROTECTION

A. Protect benchmarks from equipment and vehicular traffic.

B. Protect above and below grade utilities which are to remain.

C. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

D. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

E. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

F. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Reference the Foundation Exploration Report in Division 01 of this specification manual for a description of the existing soils on site.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum. Coordinate with 01 31 13 - Project Coordination.

B. Identify known underground utilities. Stake and flag locations.

C. Identify and flag surface and aerial utilities.

D. Notify utility company to remove and relocate utilities.

E. Maintain and protect existing utilities remaining which pass through the work area.

3.02 EXCAVATION

A. Excavate subsoil required for building foundations, construction operations, and other work.

B. Machine slope banks to angle of repose or less until shored.

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C. Excavation shall not interfere with normal 45 degree bearing splay of any foundation.

D. Hand trim excavation and leave free of loose matter.

E. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume.

F. Correct unauthorized excavation at no cost to Owner.

G. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Architect/Engineer.

H. Stockpile excavated material in area designated on site and remove excess subsoil not being reused, or not re-usable from site.

I. Excavation for building foundations shall extend to footing bearing.

3.03 DEWATERING

A. Water collected in footing trenches from surface run-off or seepage of groundwater shall be removed by sump pump or other conventional dewatering method prior to placement of foundation concrete.

B. Any soil softened by standing water shall be removed prior to resuming construction activities.

C. Site grades shall be maintained during construction to prevent flow toward open excavations and the construction area.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under the provisions of Section 01 40 00.

B. An independent inspection and testing firm shall observe and perform field compaction tests on the bearing surfaces to determine if the existing soils are adequate for a bearing surface for the proposed structure. If the existing soils are found not to be adequate, the independent firm shall provide recommendation on the course of action required to correct the situation. The building foundation has been designed for an allowable soil bearing capacity of 2,500 psf.

END OF SECTION

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SECTION 31 23 23
BACKFILL AND COMPACTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Backfilling to subgrade elevations around building foundations.

B. Compaction of existing subsoil prior to backfilling.

C. Compaction requirements.

1.02 RELATED WORK

A. Section 01 40 00 - Quality Requirements.

B. Section 31 23 16 – Excavation for Buildings.

1.03 REFERENCES

A. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 5.5 lb 2.49 kg Rammer and 12-inch Drop.

C. ANSI/ASTM D1557 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10-pound Rammer and 18-inch Drop.

PART 2 PRODUCTS

2.01 COMMON FILL MATERIALS

A. Type A: Subsoil; Existing, free of all topsoil and organic material, roots, gravel larger than 3-inch size, and debris may be used to backfill around building foundations.

B. Type B: Imported granular sand, conforming to the gradations required in Section 209 of the State of Wisconsin Department of Transportation Standard Specifications.

C. Type C: Imported borrow, aggregate base course, ¾-inch dense graded base, crushed stone or crushed gravel conforming to the gradations required in Section 305.2.2.1 of the State of Wisconsin, Department of Transportation, Standard Specifications.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify foundation or basement walls are braced to support surcharge forces imposed by backfilling operations.

B. Verify areas to be backfilled are free of debris, snow, ice, or water, and ground surfaces are not frozen.

3.02 BACKFILLING

A. Backfill areas to contours and elevations. Use unfrozen materials.

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B. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.

C. Place and compact fill materials in continuous layers not exceeding 8 inches loose depth.

D. Maintain optimum moisture content of backfill materials to attain required compaction density.

E. Backfill simultaneously on each side of unsupported foundation walls.

F. Slope grade away from building minimum 2 inches in 10 feet unless noted otherwise.

G. Make changes in grade gradual. Blend slopes into level areas.

H. Remove surplus backfill materials from site.

I. Leave stockpile areas completely free of excess fill materials.

3.03 TOLERANCES

A. Top Surface of Backfilling: Plus or minus 1 inch.

B. Allow adequate space for topsoil or paving.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under the provisions of Section 01 40 00.

B. An independent inspection and testing firm shall perform field compaction tests on the compacted backfill materials.

C. If compaction tests on backfill material indicate work does not meet specified requirements, remove work, replace, and retest at no cost to Owner.

3.05 SCHEDULE OF LOCATIONS

A. The paragraphs below identify location, fill material to be used and compaction expressed as a percentage of maximum density with ANSI/ASTM D1557.

B. Interior Slab-On-Grade: One 6-inch minimum layer of Type C directly under the slab and Type B or C for fill to raise the grade up to that point, each lift compacted to 95 percent.

C. Around Foundations Within the Building Area: Type B, each lift compacted to 95 percent.

D. Fill Under Grass Areas at Exterior Side of Perimeter Foundation Walls: Type A or B, compacted to 90 percent, compacted to 95 percent within 10 feet of foundation walls.

E. Fill Under Concrete Paving at Exterior Side of Perimeter Foundation Walls: Type B, compacted to 95 percent.

F. Fill Under Asphalt Paving at Exterior Side of Perimeter foundation Walls: Type B, compacted to 95 percent.

G. Fill and Base Course Under Concrete Sidewalks: Type B or C, provide 6-inch thick layer, compact to 95 percent.

END OF SECTION

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SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   2. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor, Part 1926 Regulations, Current Edition.
   3. Wisconsin Administrative Code (WAC), Department of Natural Resources, Environmental Protection, Regulations, Current Edition.
   4. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall include all excavating, trenching, and backfilling for utilities as indicated from the contract drawings and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Structural Excavation for Structures - Division 31

C. Erosion and Sedimentation Controls - Division 31

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 INSITU BACKFILL MATERIAL

A. Previously excavated soil free of organic debris, clay balls, and aggregate larger than 1-1/2 inches as approved by the Engineer.

2.02 IMPORTED GRANULAR BACKFILL (TRUCKED BACKFILL) MATERIAL

A. Imported granular fill (trucked backfill) shall be sand conforming to State of Wisconsin, Department of Transportation, Standard Specifications Subsection 209.2.2, Grade No. 1 Granular Backfill or well-graded sand and gravel conforming to Subsection 305.2.2.1 of said State Standard Specification 1-1/4 inch dense graded base with not more than eight percent (8 percent) by weight passing a No. 200 sieve.

PART 3 EXECUTION

3.01 SURFACE OBSTRUCTIONS

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A. Structures, sidewalk, driveways, curb and gutter, trees, shrubs, lawns, signs, fences, utilities, survey monuments, pavements, culverts and other appurtenances which are adjacent to the right-of-way or work easements, shall be carefully protected against damage. In the event of damage or inadvertent injury or removal of these surface features by failure of the Contractor to exercise reasonable precautions or proper construction techniques, he shall bear the full cost and responsibility for resulting damages and shall replace or repair such damage as early as possible. No allowance for extra payment or time lost will be allowed for such interferences that the Contractor could have suspected or anticipated during pre-bid site inspection and interpretation of the bidding documents.

B. Clearing, grubbing, and removal of all pavements, sidewalks, curbs, signs, poles, fences, etc., shall be done only as necessary for the completion of the work. Brush, trees, shrubs, concrete, rubble, and other removals, which are not intended to be replaced, shall be disposed of by the Contractor off the work site.

C. Obstructions, which are intended to be reset, shall be stored and protected by the Contractor. Fences, signs, mailboxes, trees, shrubs, structures, and similar features requiring removal, shall be restored to their original position except where permanent removal is indicated.

D. Monuments for land surveys encountered in the path of work shall be carefully protected from movement. Should removal be necessary, the Contractor shall notify the Engineer in advance. The Contractor will be held responsible for re-establishing monuments lost due to his negligence or failure to notify the Engineer at least 24 hours in advance of disturbing.

3.02 SUBSURFACE OBSTRUCTIONS

A. The approximate location and size of sewers, drains, culverts, gas mains, water mains, survey monuments, electric and telephone conduits and other underground structures shown on the drawings are based on records available to the Owner or surface markings indicating their existence.

B. The Contractor shall use caution in excavating and trenching so that the exact location of underground structures, both known and unknown, may be determined; he shall be held responsible for the repair of such structures when broken or otherwise damaged during construction.

C. The Contractor shall make arrangements with the utility companies for any relocation of interfering utilities. No extra cost due to unexpected delays or coordination work shall be incurred on the Owner except for authorized utility alterations performed by the Contractor as provided below.

D. When the Engineer permits the Contractor to make a change to avoid a utility relocation, the Engineer shall determine whether the change constitutes extra work as defined in the General Conditions.

E. Any underground utilities or other structures, which the Contractor wishes to have moved to facilitate construction, shall be arranged with the owner of such structures. The Contractor shall pay all costs of the accommodation.

F. In the event that there is any question as to whether any of the above enumerated obstructions, underground utilities or other structures cross or pass through the space occupied by the completed structures of this contract, the Engineer's decision shall be binding upon the Owner and the Contractor.

G. During the construction of the pipe lines, it may be necessary to cross under certain sewers, drains, culverts, water lines, gas lines, electric conduits and other underground structures. Where necessary, the flow in drains or culverts shall be diverted so that the excavation is kept dry during the progress of the construction work. Every effort shall be made to prevent damage to such underground structures. Wherever such structures are disturbed or broken, they shall be restored to good condition at no additional cost to the Owner.

H. The Contractor shall use sand or gravel backfill beneath said structures. This backfill shall be deposited and thoroughly compacted by mechanical means in layers not to exceed 6 inches in depth.

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3.03 EXCAVATION

A. General. All excavation of every description and of whatever substances encountered shall be performed to the depths indicated or as otherwise specified.

1. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted as specified. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations and any water accumulated therein shall be removed by pumping or by other approved methods.
2. Sheeting and shoring shall be placed as may be necessary for the protection of the work and for the safety of personnel. Unless otherwise indicated, excavation shall be by open cut.

B. Trench Excavation. Trenches shall be of the necessary width for proper laying of pipe and shall conform to WAC requirements. The banks of pipe trenches shall conform to OSHA requirements and the Contractor is responsible for all safety requirements of said codes.

1. Care shall be taken not to overexcavate. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe. Bell holes and depressions for joints shall be dug after the trench bottom has been graded, and in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing.
2. Except as hereinafter specified for wet or other unstable material, overdepths shall be backfilled as and with materials specified for, backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such material shall be overexcavated to a depth to allow for construction of a stable pipe bedding. The trench shall be backfilled to the proper grade with suitable approved materials.
3. Trench Width. The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not be less than 6 inches nor exceed 8 inches on either side of the pipe, unless otherwise approved by the Engineer in writing. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work.
4. Excavation for Appurtenances. Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches clear space between the outer surface of structure and the bank or timber that may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed will be considered unauthorized and shall be refilled with sand, gravel, or concrete, as directed, at no additional cost to the Owner.
5. Embedment. Embedment for utilities shall be as specified in the respective utility specification section.

C. Protection and Removal of Utility Lines. The Contractor shall notify all affected utility companies at least three consecutive working days preceding his construction operations to coordinate his work regarding poles, wires, valve boxes and other surface obstructions and to determine the location of gas, water main, power, light, telephone or telegraph conduit or service connection thereto or any other subsurface structure that crosses or passes through the space occupied by any of the proposed improvements. The Contractor shall make advance arrangements with the utility companies for any relocation of interfering utilities so as not to delay construction.

D. Interruptions of Services. Interruptions of utility services to existing buildings or facilities which become necessary either directly or indirectly due to work required under this contract shall be coordinated with the Owner through the Engineer. If the down time for connections is limited by them as to duration and time (weekend, nights or holidays), the Contractor shall perform the work during the designated period at no additional cost to the Owner.

3.04 BACKFILLING

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A. Types of Backfill. Backfill for sanitary sewers, water mains, storm sewers, culverts, and drainpipes is the material placed between the bedding and the ground surface. Debris, frozen material, organic matter, unstable material, or stones greater than 8 inches in diameter shall not be suitable for backfill. Large clods and stones not exceeding 8 inches in diameter, when allowed for use as backfill, shall not be placed within two feet of the top of the pipe. Backfill shall be of the following types:

1. Type I Backfill:
   a. Type I backfill shall be used where shown on the contract drawings or stated in Special Procedures - Division 01, and unless directed otherwise shall extend from the top of the embedment to the underside of surface restoration.
   b. Type I backfill shall be used under and around all existing underground structures, tunnels, conduits, and pipes crossing the excavation. Such backfill shall extend underneath and on all sides to a structure, tunnel, conduit or pipe.
   c. Type I backfill shall be selected fill material consisting of granular subbase course, base course or approved existing sand. The backfill material shall be mechanically compacted in 6-inch layers, from a distance of one foot above the pipe to the surface. The degree of compaction shall be to 95 percent maximum dry density per modified proctor (ASTM D1557).
2. Type II Backfill:
   a. Type II backfill shall be used where shown on the contract drawings or stated in Special Procedures - Division 01.
   b. Type II backfill shall be suitable excavated material, or other approved material, placed in uniform layers and mechanically compacted. The following compaction percentages based on the maximum dry density per modified proctor (ASTM D1557) for the materials are required:
      1) For fine grained soils (more than 50 percent passing the No. 200 sieve).
         Zone III: From bottom of surface restoration to 3 feet below - 91 percent
         Zone II: From bottom of Zone III to top of the embedment - 88 percent
         Zone I: Specified as embedment
      2) For coarse grained soils (less than 50 percent passing the No. 200 sieve).
         Zone III: From bottom of surface restoration to 3 feet below - 93 percent
         Zone II: From bottom of Zone III to top of the embedment - 90 percent
         Zone I: Specified as embedment
3. Type III Backfill:
   a. Type III backfill shall be used in all areas where shown on the Plans or stated in Special Procedures - Division 01. Backfill material shall be suitable excavated material placed, from top of embedment to the bottom of surface restoration, in 12 to 18 inch layers and consolidated by jetting, spading, tamping, or puddling, to the approval of the Engineer, to insure complete filling of the trench.
4. Type IV Backfill:
   a. Utilize Type III Backfill with the following jetting: at least a 1-1/2 inch jetting hose, equipped with a regulating valve which permits the hydrant valve to be fully open during use, with a minimum 1-1/2 inch diameter pipe nozzle at least 6 feet long shall be used. During the flooding operation, the nozzle shall be inserted as deeply into the backfill as is possible without damaging the sewers, water mains, or foundations. The insertions shall be made at intervals of 5 feet or less and maintained until the backfill is saturated. Depressions caused by flooding shall be backfilled until there is no further settlement.

B. After Settlement. Should after settlement occur, succeeding any of the above backfilling methods, the Contractor shall scarify the surface of the fill material and place additional fill material in the same manner as herein described so that the surface elevation conforms to that shown on the Plans. No additional compensation shall be allowed for repairing filled areas where after-settlement occurs.

C. Backfill Placement. The excavated space around and above underground structures, tunnels, conduits and pipes not filled with embedment material and where select fill backfill is not shown or specified may be backfilled by machine.

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D. Backfilling work shall be done in such a way as to prevent dropping of material directly on top of any conduit or pipe through any great vertical distance. In no case shall backfilling material from a bucket be allowed to fall directly on a structure or pipe and in all cases, the bucket shall be lowered so that the shock of falling earth will not cause damage.

E. Lumps shall be broken up and if there are any stones, pieces of crushed rock or lumps, which cannot be readily broken up, they shall be distributed throughout the mass so that all interstices are solidly filled with fine material. Stones, lumps and clods shall also be placed to maintain a 2 foot minimum separation distance from the top of the pipe or structure. No frozen material shall be used for backfilling.

PART 4 MEASUREMENT AND PAYMENT (N/A)

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SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Natural Resources (WDNR), Conservation Practice Standards, Current Edition.
   2. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover providing the necessary materials, equipment and labor to control erosion and sedimentation controls by the methods specified herein. If no specific quantities are shown on the contract drawings, the Contractor shall use whatever quantities are necessary to prevent sediment transport off the job site, into permanent manmade storm water conveyances or management facilities or to Waters of the State.

B. The Contractor will be required to provide erosion control as per the current edition of the applicable State of Wisconsin, Department of Natural Resources (WDNR), Conservation Practice Standards. Copies of these standards can be obtained by contacting the following:

State of Wisconsin Department of Natural Resources
Non-Point Source and Land Management Section
101 South Webster Street, P.O. Box 7921
Madison, WI 53707-7921

or by visiting the following website:
http://dnr.wi.gov/topic/stormwater/standards/const_standards.html

C. The Engineer has prepared an erosion control plan for this project. The intent of this plan is to identify erosion control provisions for the construction site that comply with local, state, and federal regulations. The Contractor shall submit for approval by the appropriate regulatory agency any changes to the Erosion Control Plan, prior to beginning any construction on the project which may cause erosion in the portion of the site where the change to the Erosion Control Plan is proposed.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Grading - Division 31

C. Subgrade Preparation - Division 31

D. Structural Excavation for Structures - Division 31

E. Trenching and Backfilling - Division 31

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1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 TOPSOIL

A. Topsoil shall be fertile, friable, natural loam surface soil, reasonably free of subsoil, clay lumps, brush, weeds and free of roots, stumps, stones larger than 2 inches in any dimension, and other matter harmful to plant growth. Topsoil to supplement insufficient topsoil on the site shall originate from local sources, but not from bogs or marshes.

2.02 LIME

A. Lime used for soil amendment shall be agricultural grade limestone ground sufficiently fine so that 80 percent passes a No. 8 sieve. Lime shall contain 80 percent calcium carbonate equivalent. Moisture shall not exceed 10 percent.

2.03 FERTILIZER

A. Fertilizer used in conjunction with seeding shall be dry, free-flowing granular fertilizer suitable for application by agricultural fertilizer spreaders or blower equipment, or non-volatile liquid commercial fertilizer, having an analysis of 20-10-10 (Nitrogen-Phosphoric Acid-Potash), or equal, unless use of phosphorus based fertilizers are banned by the community where the work is to be completed. In such communities, an analysis of 20-0-10, or equal, shall be used. Fertilizer having other analysis shall be applied at a rate to achieve at least the individual following amounts of nutrient per unit area:

Nutrient	Application Rate (Per Acre)	Application Rate (Per 1000 Sq. Ft.)
Nitrogen (N)	100 pounds	2.3 pounds
Phosphoric Acid (P_2O_5)	50 pounds	1.2 pounds
Potash (K_2O)	50 pounds	1.2 pounds

2.04 SEEDING FOR CONSTRUCTION SITE EROSION CONTROL

A. Seeding for Construction Sites shall conform with Wisconsin DNR Conservation Practice Standard 1059.

B. Seed mixtures shall conform to one of the following:
1. WisDOT, 2003. State of Wisconsin Standard Specifications For Highway and Structure Construction. Section 630, Seeding.
2. United States Department of Agriculture – Natural Resource Conservation Service Field Office Technical Guide Section IV, Standard 342, Critical Area Planting.
3. UWEX Publication A3434 Lawn and Establishment & Renovation.

C. All seed shall conform to the requirements of the Wisconsin Statutes and of the Administrative Code Chapter ATCP 20.01 regarding noxious weed seed content and labeling.

D. Seed mixtures that contain potentially invasive species or species that may be harmful to native plant communities shall be avoided.

E. Seed shall not be used later than one year after the test date that appears on the label.

F. Seed shall be tested for purity, germination and noxious weed seed content and shall meet the minimum purity and germination requirements as prescribed in the current edition of Rules for Testing Seed, published by the Association of Official Seed Analysts.

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2.05 MULCH FOR CONSTRUCTION SITES

A. Mulching for construction sites shall conform with Wisconsin DNR Conservation Practice Standard 1058.

B. Mulch shall consist of natural biodegradable material such as plant residue (including but not limited to straw, hay, wood chips, bark and wood cellulose fiber), or other equivalent materials of sufficient dimension (depth or thickness) and durability to achieve the intended effect for the required time period.

C. Mulch shall be environmentally harmless to wildlife and plants. Materials such as gravel, plastic, fabric, sawdust, municipal solid waste, solid waste byproducts1, shredded paper, and non-biodegradable products shall not be used.

D. Mulch shall be free of diseased plant residue (i.e., oak wilt), noxious weed seeds, harmful chemical residues, heavy metals, hydrocarbons and other known environmental toxicants.

E. Marsh hay shall not be used as mulch in lowland areas but may be used on upland sites to prevent the spread of invasive, nonnative species (i.e., reed canary grass) commonly found in marsh hay.

F. Straw and hay mulch that will be crimped shall have a minimum fiber length of 6 inches.

G. Wood chips or wood bark shall only be used for sites that are not seeded.

2.06 EROSION MAT

A. Non-Channel Erosion Mat products shall conform with Wisconsin DNR Conservation Practice Standard 1052.

B. Channel Erosion Mat products shall conform with Wisconsin DNR Conservation Practice Standard 1053.

C. Erosion mat shall conform to the requirements of the State of Wisconsin, Department of Transportation, Product Acceptability List (PAL) for Erosion Control Revegetative Mat (ECRM) and Turf-Reinforcement Mat (TRM).

D. For mats that utilize netting, the netting shall be bonded to the parent material to prevent separation of the net for the life of the product.

E. For urban class mats the following material requirements shall be adhered to:
   1. Only 100% organic biodegradable netted products are allowed, including parent material, stitching, and netting.
   2. The netting shall be stitched with biodegradable thread/yarn to prevent separation of the net from parent material.
   3. All materials and additive components used to manufacture the anchoring devices shall be completely biodegradable as determined by ASTM D 5338.
   4. Mats with photodegradable netting shall not be installed after September 1st.
   5. Steel wire pins or staples shall not be used in lawns.

2.07 SEEDING

A. Seeding shall conform to Seeding - Division 32.

2.08 STRAW BALE EROSION BARRIERS

A. Straw Bale (Sediment Bale Barriers) shall conform with Wisconsin DNR Conservation Practice Standard 1055.

B. Bales used for erosion control shall be either hay or straw, shall have rectangular surfaces, and shall be tightly bound with twine, not wire. The material in the bales shall be reasonably free of grain, weed seed and mold, and shall be dry and suitable for the purpose intended.

C. The minimum cross sectional area for wood stakes shall be 2.0 by 2.0 inches nominal.

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D. The minimum diameter of steel (rebar) stakes shall be one-half inch.

2.09 SEDIMENT CONTROL FENCE (SILT FENCE)

A. Silt Fence shall conform with Wisconsin DNR Conservation Practice Standard 1056.

B. Silt fence shall be in accordance with Section 628.2.6 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction.

C. Wood Posts:
1. Wood Posts used to support the fabric shall be at least 2 inch x 2 inch in cross-section and shall be a minimum of 12 inches longer than the height of the silt fence. Posts shall be made from kiln-dried hickory or Oak.
2. Staples used to attach silt fence to wood posts shall be at least 0.5-inches in length.

D. Steel Supports:
1. Steel posts shall be at least 5 feet long with a strength of 1.33 pounds per foot and shall have projections for the attachment of fasteners.
2. The silt fence fabric shall be attached in at least three places on the upslope side with 50 pound plastic tie straps or wire fasteners.

E. Silt fence shall have a support cord.

F. The Contractor shall furnish upon request a manufacturer's Certificate of Compliance that the geotextile fabric as furnished meets the above requirements.

G. Silt Fence shall be installed in accordance with Wisconsin DNR Conservation Practice Standard 1056.

2.10 STONE DITCH CHECKS

A. Stone Ditch Checks shall be installed in accordance with Wisconsin DNR Conservation Practice Standard 1062.

2.11 LAND APPLICATION OF POLYACRYLAMIDE

A. Land Application of Polyacrylamide shall be performed in accordance with Wisconsin DNR Conservation Practice Standard 1050.

2.12 STONE TRACKING PAD

A. Stone Tracking Pads shall be established in accordance with Wisconsin DNR Conservation Practice Standard 1057.

B. The aggregate for tracking pads shall be 3 to 6 inch clear or washed stone. All material to be retained on a 3-inch sieve.

2.13 VEGETATIVE BUFFERS

A. Vegetative Buffers for Construction shall be established in accordance with Wisconsin DNR Conservation Practice Standard 1054.

B. Prior to land disturbance the perimeter of vegetative buffers shall be flagged or fenced to prevent equipment from creating ruts, compacting the soil and to prevent damage to existing vegetation.

C. Trees should not be cut down to establish a vegetative buffer. Other erosion control measures are preferred.

2.14 DUST CONTROL

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A. Dust Control measures shall be implemented in accordance with Wisconsin DNR Conservation Practice Standard 1068.

B. Asphalt and petroleum based products shall not be used for dust control.

C. Mulch or seed and mulch may be applied to protect exposed soil from wind erosion according to the provisions of WDNR Conservation Practice Standard 1058 Mulching for Construction Sites and 1059 Seeding for Construction Site Erosion Control.

D. Polymers may be used for dust control according to the provisions of WDNR Conservation Practice Standard 1050 Erosion Control Land Application of Polymers.

E. Tackifiers and Soil Stabilizers Type A – Products must be selected from the WisDOT Erosion Control PAL.

F. Solid board fences, snow fences, burlap fences, crate walls, bales of hay and similar material may be used to control air currents and blown soil.

2.15 STORM DRAIN INLET PROTECTION

A. Storm Drain Inlet Protection shall conform Wisconsin DNR Conservation Practice Standard 1060.

B. All fabrics used as part of an inlet protection device must be selected from the list of approved fabrics certified for inlet protection, Geotextile Fabric, Type FF in the current edition of the WisDOT Product Acceptability List (PAL).

C. Inlet Protection Barriers include, but are not limited to, straw bales, sandbags, other material filled bags and socks, and stone weepers.

D. Manufactured bags, when used, shall conform to the standards below:
   1. Minimum Size 14 x 26 inches
   2. Grab Tensile strength of fabric, ASTM D-4632 = 95 lb. min.
   3. UV stability, ASTM D-4355 = 70 % min.
   4. Fabric shall be sewn together with double stitching.

E. Straw Bale installation shall conform to the criteria outlined in the WDNR Conservation Practice Standard (1055) Sediment Bale Barrier (Non-Channel).

F. Stone weeper installation shall conform to the criteria in WDNR Conservation Practice Standard (1063) Sediment Trap.

2.16 DITCH CHECK (CHANNEL)

A. Ditch Checks for erosion and sediment control in drainage ditches and channels shall conform Wisconsin DNR Conservation Practice Standard 1062.

B. Stone ditch checks shall be constructed of a well-graded angular stone, a D50 of 3 inch or greater, sometimes referred to as breaker run or shot rock.

C. Manufactured products listed in WisDOT's PAL are also acceptable for temporary ditch checks.

D. Silt fence and single rows of straw bales are not permitted.

2.17 LAND APPLICATION OF ANIONIC POLYACRYLAMIDE (POLYMERS, PAM).

A. Land Application of Anionic Polyacrylamide (PAM) shall conform Wisconsin DNR Conservation Practice Standard 1050.

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B. Anionic PAM mixtures shall be environmentally benign, harmless to fish, aquatic organisms, wildlife, and plants. Anionic PAM mixtures shall be non-combustible.

C. Cationic PAM shall not be used at any level. Anionic PAM mixtures shall have ≤0.05% free acrylamide monomer by weight as established by the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA).

D. The manufacturer or supplier shall provide a product expiration date for anionic PAM mixtures based on product expiration date of PAM in pure form. PAM shall not be used if the expiration date will be reached prior to establishment of vegetation in areas where PAM is to be used.

E. Contractor shall store and mix polymer in accordance with manufacturer or supplier written instructions.

PART 3 EXECUTION

3.01 EROSION CONTROL REQUIREMENTS

A. Temporary and permanent erosion control measures shall be performed by the Contractor. The Contractor shall control water pollution, erosion, and siltation through the use of intercepting embankments, berms, dikes, dams, settling basins, slope paving, ditch checks, riprap, mulches, erosion mats, seeding, sodding, plantings and other erosion control devices or methods.

B. The Contractor shall submit for approval his plan of operations for accomplishing temporary and permanent erosion control work relating to grubbing, grading, paving and other work which might create erosion.

C. The area of erosive land exposed to the elements by grubbing, excavation, borrow and fill operations at any one time shall be minimized to the maximum extent practicable and the duration of such exposure prior to final trimming, finishing and seeding or application of temporary erosion control measures shall be as short as practicable. Construction in and adjacent to rivers, streams, lakes, or other waterways shall be performed in such a manner as to avoid washing, sloughing or deposition of materials into such waterways which would obstruct or impair the flow thereof thus endangering the roadway or stream banks, or which would result in undue or avoidable contamination, pollution or siltation of such waterways.

D. The Owner or Designated Representative shall have full authority to suspend or limit grading and other operations pending adequate performance of such permanent erosion control measures as finish grading, topsoiling, mulching, matting and seeding and any temporary erosion control measures ordered by the Engineer.

E. Grubbing and grading operations shall be performed in proper sequence with other work to minimize erosion. Intercepting ditches or dikes shall be constructed as soon as practical after clearing and grubbing operations are completed and prior to or during the operations of excavating the cuts. Where erosion is likely to be a problem, the permanent erosion control measures shall follow immediately after the grading operations if conditions permit, unless the Engineer shall authorize temporary erosion control measures.

F. Water pumped from the site shall be treated by temporary sedimentations basins, grit chambers, sand filters, upslope chambers, hydro-cyclones, swirl concentrators, or other appropriate controls designed and used to remove total suspended solids (TSS) to 40 mg/l or less for the highest dewatering pumping rate. If the water is demonstrated to contain less than 40 mg/l TSS during dewatering operations, then no control is needed before discharge. Water may not be discharged in a manner that causes erosion of the site or receiving channels. Construction Site Dewatering activities shall be conducted in accordance with Wisconsin DNR Conservation Practice Standard 1061.

G. The Contractor shall take all possible precautions to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by street cleaning (not flushing) before the end of each workday.

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H. All storm drain or culvert inlets shall be protected with appropriate erosion control practices as identified in the appropriate Conservation Practice Standard. Channelized runoff from adjacent areas passing through the site shall be diverted around disturbed areas, if practical. Otherwise, the channel shall be protected. Sheet flow runoff from adjacent areas greater than 10,000 square feet in area shall also be diverted around disturbed areas unless shown to have resultant runoff velocities of less than 0.5 ft/sec across the disturbed area for one-year design storms having a duration of from 0.5 to 24 hours. Diverted runoff shall be conveyed in a manner that will not erode the conveyance and receiving channels.

I. All disturbed ground left inactive for seven (7) or more days shall be stabilized by seeding or sodding (only prior to October 15) or by mulching or covering, or other equivalent control measure.

J. For sites with less than 10 acres disturbed at one time, sediment control fences, hay bales, or equivalent control measures shall be placed along all sideslope and downslope sides of the site. If a channel or area of concentrated runoff passes through the site, sediment control fences shall be placed along the channel edges to reduce sediment reaching the channel.

K. Any soil or dirt storage piles containing more than ten cubic yards of material should not be located with a downslope drainage length of less than 25 feet to a roadway or drainage channel. If remaining for more than seven (7) days, they shall be stabilized by mulching, vegetative cover, tarps, or other means. Erosion from piles which will be in existence for less than seven (7) days shall be controlled by placing hay bales or sediment control fence barriers around the pile. In-street utility repair or construction soil; or dirt storage piles located closer than 25 feet to a roadway or drainage channel must be covered with tarps or a suitable alternative control must be used if exposed for more than seven (7) days, and storm drain or culvert inlets must be protected with straw bales or other appropriate filtering barriers (CPS 1060).

3.02 TEMPORARY SEEDING

A. Seeding for Construction Sites shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1059.

B. Temporary Seeding (Cover Crop) - Areas needing protection during periods when permanent seeding is not applied shall be seeded with annual species for temporary protection. See table below for seeding rates of commonly used species. The residue from this crop may either be incorporated into the soil during seedbed preparation at the next permanent seeding period or left on the soil surface and the planting made as a no-till seeding.

Species	Lbs/Acre	Percent Purity
Oats	131[1]	98
Cereal Rye	131[2]	97
Winter wheat	131[2]	95
Annual Ryegrass	80[2]	97

1 Spring and summer seeding

2 Fall seeding

C. Permanent Seeding - Rates shall be based on pounds or ounces of Pure Live Seed (PLS) per acre. If a nurse crop is used in conjunction with permanent seeding, the nurse crop shall not hinder establishment of the permanent vegetation. A nurse crop shall be applied at 50% its temporary seeding rate when applied with permanent seed.

D. Inoculation - Legume seed shall be inoculated in accordance with the manufacturer's recommendations. Inoculants shall not be mixed with liquid fertilizer.

E. Sowing

1. Seed grasses and legumes no more than 1/4 inch deep. Distribute seed uniformly. Mixtures with low seeding rates require special care in sowing to achieve proper seed distribution.
2. Seed may be broadcast, drilled, or hydroseeded as appropriate for the site.

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3. Seed when soil temperatures remain consistently above 53°F. Dormant seed when the soil temperature is consistently below 53°F (typically November 1st until snow cover). Seed shall not be applied on top of snow.

F. Turf seedlings must not be mowed until the stand is at least 6 inches tall. Do not mow closer than 3 inches during the first year of establishment.

G. Alternate plans must be submitted for approval.

3.03 APPLICATION OF STRAW OR HAY MULCH

A. Mulching for Construction Sites shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1058.

B. Application Rate:
1. Mulch shall cover a minimum of 80% of the soil surface for unseeded areas. For seeded areas, mulch shall be placed loose and open enough to allow some sunlight to penetrate and air to circulate but still cover a minimum of 70% of the soil surface.
2. Mulch shall be applied at a uniform rate of 1½ to 2 tons per acre for sites that are seeded, and 2 to 3 tons per acre for sites that are not seeded. This application results in a layer of ½ to 1½ inches thick for seeded sites, and 1½ to 3 inches thick for sites not seeded.
3. Wood chips or wood bark shall be applied at a rate of 6 to 9 tons per acre to achieve a minimum of 80% ground cover. This application should result in a layer of wood chips or wood bark ½ to 1½ inches thick.

C. In areas where mulch is to be placed over seed, mulch shall be placed within 24 hours of seeding.

D. Mulch Anchoring Methods - Anchoring of mulch shall be based on the type of mulch applied, site conditions, and accomplished by one of the following techniques:
1. Crimping: Immediately after spreading, the mulch shall be anchored by a mulch crimper or equivalent device consisting of a series of dull flat discs with notched edges spaced approximately 8 inches apart. The mulch shall be impressed in the soil to a depth of 1 to 3 inches.
2. Polypropylene Plastic, or Biodegradable Netting: Apply plastic netting over mulch application and staple according to manufacturer's recommendations.
3. Tackifier: Tackifier shall be sprayed in conjunction with mulch or immediately after the mulch has been placed. Tackifiers must be selected from those that meet the WisDOT Erosion Control Product Acceptability List (PAL). Asphalt based products shall not be applied.
    a. The tackifiers shall be applied at the following minimum application rates per acre:
        1) Latex-Base: mix 15 gallons of adhesive (or the manufacturer's recommended rate which ever is greater) and a minimum of 250 pounds of recycled newsprint (pulp) as a tracer with 375 gallons of water.
        2) Guar Gum: mix 50 pounds of dry adhesive (or the manufacturer's recommended rate which ever is greater) and a minimum of 250 pounds of recycled newsprint (pulp) as tracer with 1,300 gallons of water.
        3) Other Tackifiers: (Hydrophilic Polymers) mix 100 pounds of dry adhesive (or the manufacturer's recommended rate which ever is greater) and a minimum of 250 pounds of recycled newsprint (pulp) as a tracer with 1,300 gallons of water.

3.04 PLACING EROSION MAT

A. Installation instructions shall be supplied by the manufacturer. The Contractor shall install the mat in accordance with the manufacturer's recommendations and in accordance with Section 628.2 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, and the State of Wisconsin, Department of Transportation general requirements for erosion mat except as may be modified herein.

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B. Erosion control revegetative mats shall be installed after all topsoiling, fertilizing, liming and seeding is complete.

C. The mat shall be in firm and intimate contact with the soil. It shall be installed and anchored per the manufacturer's recommendation.

D. The mat shall be unrolled and draped loosely, without stretching, so that continuous ground contact is maintained. In ditches, mat shall be unrolled and applied parallel to the direction of drainage. On slopes, mat shall be applied parallel to the slope direction.

E. Turf-reinforcement mat shall be installed in conjunction with the topsoiling operation and shall be followed by Erosion Control Revegetative Mat installation.

F. At time of installation, document the manufacturer and mat type by retention of material labels and manufacturer's installation instructions. Retain this documentation until the site has been stabilized.

G. In channels and on slopes, each upslope and each downslope end of each piece of mat shall be placed in a 4-inch trench, stapled on 12-inch centers, backfilled and tamped. Where one roll ends and second roll starts, the upslope piece shall be brought over the end of the downslope roll so that there is a 12 inch overlap, placed in a 4 inch trench, stapled on 12 inch centers, backfilled and tamped. In channels, erosion mats shall extend for whichever is greater: upslope one-foot minimum vertically from the ditch bottom or 6 inches higher than the design flow depth.

H. On slopes, where two or more widths of mat are applied, the two edges shall be overlapped according to the manufacturer's installation instructions and stapled at 18 to 24 inch intervals along the exposed edge of the lap joint. The body of the mat shall be stapled in a grid pattern with staples 3 feet on center each way.

I. Where heavy concentrations of water or extremely erodible soil conditions exist, as noted on the contract drawings, erosion checks shall be installed at intervals of 50 feet, or less. Such a check shall consist of a 4-inch deep trench perpendicular to the flow direction across the entire width of the fabric. The mat shall be stapled at 9-inch intervals along the bottom of the trench across the entire width of the mat. The trench shall then be backfilled and tamped.

J. If anchoring devices become loosened, or if any fabric loosens, is torn or undermined, repairs shall be made immediately without additional compensation.

K. Erosion mat when used in conjunction with fertilizing and seeding done for surface restoration, shall be installed immediately after fertilizing and seeding operations have been completed. Straw or hay mulch shall not be used under the fabric.

L. Erosion mat shall at a minimum be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.
   1. If there are signs of rilling under the mat, install more staples or more frequent anchoring trenches. If rilling becomes severe enough to prevent establishment of vegetation, remove the section of mat where the damage has occurred. Fill the eroded area with topsoil, compact, reseed and replace the section of mat, trenching and overlapping ends per manufacturer's recommendations. Additional staking shall be provided where rilling was filled.
   2. If the reinforcing plastic netting has separated from the mat, remove the plastic and if necessary replace the mat.
   3. Maintenance shall be completed as soon as possible with consideration to site conditions.

3.05 VEGETATIVE BUFFERS

A. Vegetative Buffers for Construction shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1054.

B. Trees should not be cut down to establish a vegetative buffer.

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C. A stand of dense vegetation shall be maintained to a height of 3 – 12 inches.

D. Vegetative buffers shall at a minimum be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period. Vegetative buffers shall be inspected for proper distribution of flows, sediment accumulation and signs of rill formation.

E. If the vegetative buffer becomes silt covered, contains rills, or is otherwise rendered ineffective, other perimeter sediment control measures shall be installed. Eroded areas shall be repaired and stabilized. Repair shall be completed as soon as possible with consideration to site conditions.

3.06 PLACING HAY BALE BARRIERS

A. Straw Bale (Sediment Bale Barriers) shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1055.

B. Sufficient bales shall be on the site to create the necessary barriers prior to the start of groundbreaking operations. The bales shall be stacked and covered with plastic sheeting until required for use.

C. At a minimum, sediment bale barriers shall be placed in a single row, lengthwise on the contour, with the ends of adjacent sediment bale barriers tightly abutting one another. The holes between bales shall be chinked (filled by wedging) with straw, hay or equivalent material to prevent water from escaping between the bales.

D. The maximum allowable slope lengths contributing runoff to a sediment bale barrier are specified below:

Slope	Barrier Row Spacing
< 2%	100 feet
2 to 5%	75 feet
5 to 10%	50 feet
10 to 33%	25 feet
33 to 50%	20 feet
> 50%	Not Permitted

E. Sediment bale barriers shall not be placed perpendicular to the contour.

F. The end of the sediment bale barrier shall be extended upslope to prevent water from flowing around the barrier ends.

G. Installed sediment bale barrier shall be a minimum of 10 inches high and shall not exceed a maximum height of 20 inches from ground level.

H. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a sediment bale barrier and the length of the proposed barrier to a minimum depth of 4 inches. After bales are staked and chinked, the excavated soil shall be backfilled and compacted against the barrier. Backfill to ground level on the down slope side. On the upslope side of the sediment bale barrier backfill to 4 inches above ground level.

I. At least two wood stakes, “T” or “U” steel posts, or 1/2 inch rebar driven through at equidistance along the centerline of the barrier shall securely anchor each bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes shall be driven a minimum 12-inches into the ground to securely anchor the sediment bale barriers.

J. Bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings.

K. Sediment bale barriers shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

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L. Damaged or decomposed sediment bale barriers, any undercutting, or flow channels around the end of the sediment bale barriers shall be repaired.

M. Sediment shall be properly disposed of once the deposits reach 1/2 the height of the sediment bale barrier.

N. Sediment bale barriers and anchoring devices shall be removed and properly disposed of when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

O. Any sediment deposits remaining in place after the sediment bale barrier is no longer required shall be dressed to conform to the existing grade, prepared, and seeded.

3.07 CONSTRUCTION OF SEDIMENT CONTROL FENCE (SILT FENCE)

A. Silt Fence shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1056.

B. When installed as a stand-alone practice on a slope, silt fence shall be placed on the contour. The parallel spacing shall not exceed the maximum slope lengths for the appropriate slope as specified:

Slope	Fence Spacing
< 2%	100 feet
2 to 5%	75 feet
5 to 10%	50 feet
10 to 33%	25 feet
> 33%	20 feet
> 50%	Not Permitted

C. Silt fences shall not be placed perpendicular to the contour.

D. The ends of the fence shall be extended upslope to prevent water from flowing around the ends of the fence.

E. When attached to wooden posts the silt fence fabric shall be stapled, using at least 0.5-inch staples, to the upslope side of the posts in at least 3 places.

F. When attached to steel supports the silt fence fabric shall be attached in at least three places on the upslope side with 50 pound plastic tie straps or wire fasteners. To prevent damage to the fabric from fastener, the protruding ends shall be pointed away from the fabric.

G. The maximum spacing of posts for nonwoven silt fence shall be 3 feet and for woven fabric 8 feet.

H. Where joints are necessary, each end of the fabric shall be securely fastened to a post. The posts shall then be wrapped around each other to produce a stable, secure joint or shall be overlapped the distance between two posts.

I. On the terminal ends of silt fence the fabric shall be wrapped around the post such that the staples are not visible.

J. A minimum of 20 inches of the post shall extend into the ground after installation.

K. Anchoring – Silt fence shall be anchored by spreading at least 8 inches of the fabric in a 4 inch wide by 6 inch deep trench, or 6 inch deep V-trench on the upslope side of the fence. The trench shall be backfilled and compacted. Trenches shall not be excavated wider and deeper than necessary for proper installation.

L. Removal – Silt fences shall be removed once the disturbed area is permanently stabilized and no longer susceptible to erosion.

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M. Silt fences shall at a minimum be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24 hour period.

N. Damaged or decomposed fences, undercutting, or flow channels around the end of barriers shall be repaired or corrected.

O. Sediment shall be properly disposed of once the deposits reach 1/2 the height of the fence.

3.08 STONE TRACKING PAD

A. Stone Tracking Pads shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1057.

B. The tracking pad shall be installed prior to any traffic leaving the site.

C. The aggregate shall be placed in a layer at least 12 inches thick. On sites with a high water table, or where saturated conditions are expected during the life of the practice, stone tracking pads shall be underlain with a WisDOT Type R geotextile fabric to prevent migration of underlying soil into the stone.

D. Tracking pads and tire washing stations shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

E. The tracking pad performance shall be maintained by scraping or top-dressing with additional aggregate.

F. A minimum 12-inch thick pad shall be maintained.

3.09 STORM DRAIN INLET PROTECTION

A. Storm Drain Inlet Protection shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1060.

B. The contributing drainage area to the inlet protection device shall be one acre or less. In instances were a larger contributing drainage area exists, runoff shall be routed through a properly designed sediment trapping or settling device upstream of inlet.

C. Other than Type D inlet protection devices, no gaps shall be left in the material used that would allow the flow of water to bypass the inlet protection device.

D. Filter Fabric Barrier Criteria - See Inlet Protection Detail
   1. Inlet protection Type A devices shall be utilized around inlets and unpaved areas until permanent stabilization methods have been established. Type A devices shall be utilized on inlets prior to installation of curb and gutter or pavement, and where safety considerations are not compromised on the site.
   2. Type B shall be utilized after the casting and grate are in place.
   3. Type D shall be utilized in areas where other types of inlet protection are identified as incompatible with roadway and traffic conditions, causing possible safety hazards when ponding occurs at the inlet. Type D shall only be used after castings are in place on top of the inlet boxes.
   4. Type D inlet protection shall conform to the standard drawing as shown in the contract drawings. There shall be a three-inch space between the bag and the sides of the inlet to prevent the inlet sides from blocking the overflow; and shall only be used in inlets deeper than 30 inches from the top of grate to bottom of the inlet. If such clearance is not available, cinch or tie the sides of the bag (with rope or ties) to provide clearance.

E. Criteria Applicable to the Post-Paving/Curbing Phase of Construction
   1. Inlet protection Types B, C, and D are applicable to post paving construction. See Inlet Protection Detail.
      a. Type B shall be utilized on inlets without curb box.

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b. Type C shall be utilized on street inlets with curb heads. A 1½ inch x 3½ inch (37 mm by 87 mm) minimum, piece of wood shall be wrapped and secured in the fabric and placed in front of the curb head as shown in the contract drawings. The wood shall not block the entire opening of the curb box and be secured to the grate with wire or plastic ties.

c. Type D.

F. Remove inlet protection devices once the contributing drainage area is stabilized with appropriate vegetation or impervious area.

G. Inlet protection shall be at a minimum inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

H. Sediment deposits shall be removed and the inlet protection device restored to its original dimensions when the sediment has accumulated between 1/3 to 1/2 the design depth of the device, or when the device is no longer functioning as designed. Removed sediment shall be deposited in a suitable area and stabilized.

I. Any material falling into the inlet shall be removed.

3.10 DITCH CHECK (CHANNEL)

A. Ditch Checks for erosion and sediment control in drainage ditches and channels shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1062.

B. Ditch checks shall be utilized during rough grading and shall be removed once the final grading and channel stabilization is applied, unless intended to be part of a permanent storm water management plan.

C. Channel erosion mat or other nonerodible materials shall be placed at the base of a ditch check, and extended a minimum of 6 feet, to prevent scour and washing out the toe of the ditch check. DNR Conservation Practice Channel Erosion Mat (1053) contains criteria for the placement of erosion mat in this location.

D. Stone ditch checks may be underlain by a nonwoven geotextile fabric to ease installation and removal. If the geotextile fabric is extended, it can serve purpose specified in item 3.11 C above.

E. Chink or seal stone and rock ditch checks to minimize the flow through the ditch check.

F. For added stability, the base of a stone or rock ditch check shall be keyed into the soil to a depth of 6-inches.

G. Ditch checks shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24 hour period.

H. Unless incorporated into a permanent storm water management system, ditch checks shall be removed once the final grading and channel stabilization is applied.

I. Maintenance shall be completed as soon as possible with consideration to site conditions.

3.11 DUST CONTROL

A. Dust Control measures shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1068.

B. Polymers may be used in areas that do not receive vehicle traffic. Dry applied polymers must be initially watered for activation to be effective for dust control. Polymers shall be utilized in accordance with the provisions of WDNR Conservation Practice Standard 1050 Erosion Control Land Application of Polymers.

C. Tackifiers and Soil Stabilizers Type A – Products must be installed at rates conforming to the WisDOT Erosion Control PAL.

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D. Chlorides shall be applied according to the most recent version of the WisDOT Standard Specifications for Highway and Bridge Construction.

E. Barriers - Barriers shall be placed at right angles to prevailing wind currents at intervals of about 15 times the barrier height.

F. Areas that have dust control practices shall at a minimum be inspected daily.

3.12 LAND APPLICATION OF ANIONIC POLYACRYLAMIDE (POLYMERS).

A. Land Application of Anionic Polyacrylamide (polymers) shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1050.

B. Application rates shall not exceed manufacturer's written application rate recommendations that shall not exceed the WDNR use restrictions.

C. Maximum application rates, in parts per million (ppm or mg/L or mg/kg), shall be determined by multiplying 1.4 by the number of pounds applied per acre. This number shall be less than or equal to the WDNR use restriction. Repeated applications of anionic PAM mixtures may be applied, if necessary, to ensure adequate effectiveness.

D. The application method shall provide uniform coverage to the target area and avoid drift to non-target areas.

E. When used on bare soil, without seed or mulch, anionic PAM mixtures shall be used on slopes 2.5:1 or flatter.

F. Anionic PAM mixtures shall not be applied to channel bottoms.

G. The applicator of anionic PAM mixture shall document, at the time of application, the following: name of applicator, application rate per acre, date applied, product type, weather conditions during application, and method of application. Copies of this documentation shall be entered into the contractor's monitoring log or project diary and made available upon request.

H. Unused liquid anionic PAM mixtures shall be minimized. Excess material shall not be applied at a rate greater than the maximum application rate. Disposal shall not occur in storm water conveyance systems (i.e., storm sewer manholes, storm sewer inlets, ditches, and culverts).

I. PAM shall not be used within 30 feet of surface waters of the state.

J. Maintenance will consist of reapplying anionic PAM mixtures to disturbed areas, including high use traffic areas, which interfere in the performance of this practice.

K. AnionicPAM mixtures should be reapplied in areas where wind or rill erosion is apparent and whenever an area has been graded, driven upon, or otherwise disturbed since the anionic PAM mixture was last applied.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 32 11 23
AGGREGATE BASE AND SUBBASE

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material equipment and labor required to construct a dense compacted base course composed of one or more courses or layers of coarse aggregate, fine aggregate and binder or filler blended to produce an intimate mixture of the required gradation and stability, in accordance with Sections 301 and 305 of the State of Wisconsin, Department of Transportation, Standard Specifications. This work shall also consist of a furnishing all material equipment and labor required to place breaker run and select crushed material for this project in accordance with Sections 301, 311 and 312 of the State of Wisconsin, Department of Transportation, Standard Specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Subgrade Preparation - Division 31

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 DENSE GRADED BASE

A. Materials furnished and used in this work shall consist of coarse and fine aggregate with sufficient binder to produce a stable base for the surfacing. Base materials shall be free from vegetative or organic matter, shale and lumps of clay. Dense graded base shall be crushed stone or crushed gravel conforming to the gradations required in Section 305.2.2.1 of the State of Wisconsin, Department of Transportation, Standard Specifications, unless indicated otherwise in Special Procedures - Division 01 or on the contract drawings.

PART 3 EXECUTION

3.01 DENSE GRADED BASE

A. Each layer of base shall be compacted over the entire area per Section 301.3 and 305.3 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Each layer shall also be compacted and consolidated to the degree that there will be no appreciable displacement of it laterally or longitudinally under compaction equipment or a fully loaded tandem dump truck.

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C. Where aggregate base is being placed on top of existing gravel, the existing gravel shall be scarified to a depth of three inches prior to placement of additional base.

D. Aggregate base course beneath and within 10 feet of a structure shall be compacted to 95 percent maximum dry density per modified proctor (ASTM D1557).

E. The aggregate base shall be graded, shaped and rolled to the finished cross section template shown on the contract drawings and to the satisfaction of the Engineer.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 32 13 10
CONCRETE SIDEWALK, STEPS AND DRIVEWAYS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to execute the concrete sidewalk, driveway and step work for this project.

B. This work shall be in accordance with Section 602 of the State of Wisconsin, Department of Transportation, Standard Specifications, and as indicated on the contract drawings and specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Quality Control - Division 01

C. Maintenance of Existing Conditions - Division 02

D. Cast-in-Place Concrete - Division 03

E. Subgrade Preparation - Division 31

F. Aggregate Base and Subbase - Division 32

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts to relate the materials supplied to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 CONCRETE

A. Concrete for sidewalk, steps and driveways shall be as specified in Cast-in-Place Concrete - Division 03 of these specifications.

2.02 BASE MATERIAL

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A. Base material shall be as specified in Aggregate Base and Subbase - Division 32 of these specifications or conform with Section 305 of the State of Wisconsin, Department of Transportation, Standard Specifications.

2.03 DETECTABLE WARNING FIELDS

A. Detectable warning fields shall be included in the current WisDOT Prequalified Product List.

2.04 CURING COMPOUND

A. Curing compound shall be as specified in Cast-in-Place Concrete - Division 03 of these specifications.

PART 3 EXECUTION

3.01 BASE PREPARATION - GRADING

A. Prepare foundation by excavating to the lines, grades and cross section as required. All soft or unstable material shall be removed and replaced with sand or aggregate base course material compacted to a relative field density of 95%, based on the Modified Proctor Density, ASTM D1557. Proof-roll subbase to check for unstable areas needing additional compaction. Finish to a true and firm surface.

B. If not listed as a separate bid item, minor clearing and grubbing shall be considered incidental to the respective concrete work.

C. Disposal locations for all excess or unsuitable excavated material shall be subject to Owner approval.

3.02 BASE MATERIAL

A. A minimum thickness of 4 inches of compacted aggregate base course or granular subbase course material is required under sidewalks and steps, unless indicated otherwise on the contract drawings or Special Procedures - Division 01.

3.03 SIDEWALK

A. Sidewalks shall be constructed to a uniform depth of 4 inches except at alleys and driveways where they shall be constructed to a uniform depth of 6 inches unless otherwise noted.

B. Sidewalks shall slope toward the roadway at 1 foot vertical per 50 feet horizontal (2 percent).

C. The concrete shall be placed on a moist foundation, deposited to the required depth, and consolidated and spaded sufficiently to bring the mortar to the surface, after which it shall be struck off and finished to a true and even surface.

D. The final floating shall be done with a wooden float. Before the mortar has set, the surface shall be brushed or lightly broomed, perpendicular to the direction of travel or as shown on the contract drawings. Before the concrete is given the final surface finish, the surface of the walk shall be checked with a ten-foot straightedge, and any areas which show a variation or departure from the testing edge of more than 1/4 inch shall be corrected by adding or removing concrete as necessary while the concrete is still plastic.

E. Concrete sidewalks may be constructed with suitable, approved slip-form equipment when permitted by the Engineer. The wood floating may be omitted when a suitable finish is produced by the slip-form equipment.

F. Ramps for individuals with disabilities shall be constructed at the locations and in accordance with the details and dimensions shown on the contract drawings, these specifications and the Americans with Disabilities Act (ADA). Ramps shall include detectable warning fields installed per manufacturer's recommendations.

G. Where reinforcement is required, it shall conform to and be placed in accordance with the details shown on the contract drawings.

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H. Joints for sidewalks, including transverse joints, longitudinal joints, contraction joints, expansion joints and joint felts and filler materials shall conform to the requirements of Section 602.3.2.5 of the State of Wisconsin, Department of Transportation, Standard Specifications, except as modified herein.

1. Sidewalks shall be divided into sections not less than 3 feet nor more than 12 feet, unless otherwise indicated on the contract drawings. Transverse joints shall be spaced at 6 foot intervals.
2. Prefabricated expansion joint of 1/2-inch thickness shall be placed where steps or sidewalks abut curbs, pavements, steps, or existing sidewalk. Prefabricated expansion joint of 1 inch thickness shall be placed where sidewalk abuts buildings, retaining walls, or other rigid structures. Expansion joints shall be provided on each side of driveways and at uniform intervals of not more than 96 foot centers for sidewalk construction.
3. Extend joint fillers full-width and depth of joint and not less than 1/4-inch or more than 1/2-inch below finished surface. Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Trim top edge of filler to conform to profile of concrete.

3.04 CURING COMPOUND

A. Curing compound shall be applied at the recommended coverage requirement and application rate of the manufacturer. The compound shall be applied by sprayer as soon as all free water has disappeared after finishing operations.

B. If the coating is damaged within 72 hours of its application, the damaged surfaces shall be resprayed immediately.

3.05 ADJUSTING UTILITY APPURTENANCES

A. Valves and curb stop boxes shall be adjusted to finished grade of new construction in a manner that the new construction will not interfere with the proper operation of the facility. Catch basins, manholes and inlet covers shall be adjusted to the required elevation by adjusting the top of the existing structure by removing or adding adjusting rings and reinstalling the fixtures firmly in place.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 32 91 19.13
TOPSOIL PLACEMENT AND GRADING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all material, equipment, and labor required to salvage and/or furnish, haul, place, and prepare topsoil for this project in accordance with Section 625 of the State of Wisconsin, Department of Transportation Standard Specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Erosion and Sedimentation Controls - Division 31

C. Grading - Division 31

D. Subgrade Preparation - Division 31

E. Seeding - Division 32

1.05 SUBMITTALS

A. Submit a sample of the topsoil material prior to placement. Topsoil material shall be approved by the Owner or Engineer prior to placing on the project.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 TOPSOIL

A. Topsoil shall conform to Section 625 of the State of Wisconsin, Department of Transportation, Standard Specifications.

PART 3 EXECUTION

3.01 PRESERVATION OF TREES AND SHRUBS

A. Trees and shrubs to be preserved shall be thoroughly protected from scarring or other injury during placement and grading operations. Excavation operations shall not disturb the original ground around trees within a distance of one foot or twice the diameter of the tree, whichever is greater. Exposed roots resulting from excavation shall be cut cleanly and covered with humus-bearing soil.

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B. When necessary or required by the Contract Documents, trees or shrubs around which embankment is placed shall be protected by tree wells built in accordance with Detailed Drawings or as laid out in the field by the Owner or Engineer.

3.02 PLACEMENT AND GRADING

A. General. Topsoil shall be placed in accordance with Subsection 625.3 of the State of Wisconsin, Department of Transportation Standard Specifications.

B. Grading. The Contractor shall grade in back of the curb or walk to provide a smooth surface and a 4:1 maximum slope unless shown otherwise on the plan. Graded surfaces shall be covered with topsoil to finished grade as shown on the typical sections.

C. Utility Adjustment. The Contractor shall adjust all valve boxes, manhole frames, and other utility appurtenances to within 1 inch of the final grade as shown on the contract drawings or as staked in the field by the Engineer.

D. All areas disturbed by the Contractor's activities and intended for seeding shall be topsoiled to the depth of 4-inches, unless shown otherwise on the Contract Drawings.

E. All areas disturbed by the Contractor's activities and intended for cultivation of vegetation other than turf shall be topsoiled to the depth of the original topsoil, unless shown otherwise in the Contract Drawings.

F. Construction in and adjacent to flowing streams shall be performed to avoid washing, sloughing or deposition of materials into the channel which may obstruct or impair stream flow, or which may result in contamination and/or silting of the stream.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to execute the seeding for this project. All areas disturbed by the construction and not covered with pavement, aggregate base course, sod, or other structures shall be seeded, fertilized and mulched.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Subgrade Preparation - Division 31

D. Trenching and Backfilling - Division 31

E. Erosion and Sedimentation Controls - Division 31

F. Topsoil Placement and Grading - Division 32

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to these specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 SEED

A. Seed shall conform to Section 630 of the State of Wisconsin, Department of Transportation, Standard Specifications.
   1. Mixture. Unless specified otherwise, the Contractor utilize the following seed mixtures:
      a. Lawn areas shall be No. 40
      b. Slope areas shall be No. 20
      c. Native areas and pond slopes shall be No. 75 unless otherwise specified.
   2. Nurse crop shall be annual oats prior to September 1. Nurse crop shall be winter wheat or annual ryegrass for the remainder of the year.

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2.02 FERTILIZER

A. Fertilizer shall contain the following percentages by weight:

Nitrogen	(N)	20%
Phosphorus	(P)	10%
Potash	(K)	10%

B. If local ordinances restrict the use of phosphorus in fertilizer, the local restrictions shall supersede the above percentages.

2.03 MULCH

A. Mulching shall consist of any straw, hay, wood excelsior fiber or other suitable material of a similar nature, which is substantially free of noxious weed seeds and objectionable foreign material.

2.04 WATER

A. Water shall be clean and free of impurities or substances that might injure the seed or grass.

PART 3 EXECUTION

3.01 SEEDING

A. Seeding shall be done in conformance with Subsection 630.3 of the State of Wisconsin, Department of Transportation, Standard Specifications. Seed shall be sown at a rate of four pounds per 1,000 square feet unless otherwise specified.

B. A nurse crop shall be sown with the seeding at a rate of four pound per 1000 square feet of area.

3.02 FERTILIZER

A. Apply fertilizer in conformance with Section 629 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Deliver fertilizer to site in original unopened containers showing manufacturer's name, guaranteed analysis and weight. Store in a weatherproof location and use only when dry and free flowing. Apply fertilizer at rate of 10 pounds per 1000 square feet and evenly mix into top 2 inches of topsoil.

C. At the Contractor's option, the Contractor may perform soil tests and apply fertilizer based on the results.

3.03 MULCHING

A. This work shall consist of furnishing, placing, and anchoring a mulch cover over seeded areas.

B. Construction shall be done in conformance with Section 627 of the State of Wisconsin, Department of Transportation, Standard Specifications.

C. In existing developed areas, mulching shall be done in such a manner to prevent dust and mulch from being deposited on non-seeded areas. Acceptable methods are by hand or a small chopper/mulcher with a controlled discharge.

3.04 ACCEPTANCE

A. The work will be considered acceptable after a 3-inch uniform stand of grass is attained and all gullies, rivulets, and washouts have been repaired to the satisfaction of the Engineer. The Contractor shall request the Engineer's inspection and acceptance will be made in writing when the above conditions have been complied with. Contractor shall make all corrective actions necessary to attain acceptance.

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3.05 WATERING

A. If weather conditions are not suitable establishing turf, the seeded areas shall be watered twice weekly. Water shall be applied uniformly and in such a manner as not to waterlog the topsoil, dislodge the seed, or cause erosion.

B. If water is provided by a water utility, the Contract shall maintain a record of the amount of water obtained and provide it to the utility.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 40 23 36
WASTEWATER PROCESS PIPING SYSTEM

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Iron and Steel Institute (AISI), Specifications and Standards, Current Edition.
   2. American National Standards Institute (ANSI) Specifications and Standards:
      a. ANSI A13.1 - American National Standard for Marking of Exposed, Accessible, Process Equipment, Piping and Control Devices, Current Edition.
      b. ANSI/AWWA C104/A21.04 - American Water Works Association Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water, Current Edition.
      c. ANSI/AWWA C110/A21.10 - American Water Works Association Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch for Water, Current Edition.
      d. ANSI/AWWA C111/A21.11 - American Water Works Association Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings, Current Edition.
      e. ANSI/AWWA C115/A21.15 – American Water Works Association Standard for Flanged Ductile Iron Pipe, Current Edition.
      f. ANSI/AWWA C151/A21.51 - American Water Works Association Standard for Ductile-Iron Pipe, Centrifugally Cast for Water, Current Edition.
      g. ANSI/AWWA C153/A21.53 - American Water Works Association Standard for Ductile-Iron Compact Fittings, 3-inch through 24-inch, and 54-inch through 64-inch, for Water Service, Current Edition., Current Edition.
      h. ANSI/AWWA C200/A22.00 - American Water Works Association Standard for Steel Water Pipe, 6-inches in Diameter and Larger, Current Edition.
      i. ANSI/AWWA C203/A22.03 - American Water Works Association Standard for Coal Tar Protective Coatings and Linings for Steel Water Pipe Lines - Enamel and Tape - Hot Applied, Current Edition.
      j. ANSI/AWWA C205/A22.05 - American Water Works Association Standard for Cement Mortar Protective Lining and Coating for Steel Water Pipe, 4-inch and Larger, Shop Applied, Current Edition.
      k. ANSI/AWWA C301/A23.01 - American Water Works Association Standard for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, Current Edition.
      l. ANSI/AWWA C509/A25.09 - American Water Works Association Standard for Resilient-Seated Gate Valves for Water and Sewerage Systems, Current Edition.
      m. ANSI/AWWA C600/A26.00 - American Water Works Association Standard for Installation of Ductile-Iron Water Main and Their Appurtenances, Current Edition.
      n. ANSI/AWWA C606/A26.06 - American Water Works Association Standard for Grooved and Shouldered Joints, Current Edition.
      o. ANSI/AWWA C900/A29.00 - American Water Works Association Standard for Polyvinyl Chloride Pressure Pipe and Fabricated Fittings, 4-inch through 12-inch, for Water Distribution, Current Edition.
   3. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM A48 - Specification for Gray Iron Castings, Current Edition.
      b. ASTM A53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless, Current Edition.
      c. ASTM A74 - Specification for Cast Iron Soil Pipe and Fittings, Current Edition.
      d. ASTM A536 - Specification for Ductile Iron Castings, Current Edition.
      e. ASTM A667 - Specification for Centrifugally Cast Dual Metal (Gray and White Cast Iron) Cylinders, Current Edition.

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f. ASTM A865 - Specification for Threaded Couplings, Steel, Black and Zinc-Coated (Galvanized) Welded and Seamless, for Use in Steel Pipe Joints, Current Edition.
g. ASTM B62 - Specification for Composite Bronze or Ounce Metal Castings, Current Edition.
h. ASTM B88 - Specification for Seamless Copper Water Tube, Current Edition.
i. ASTM B641 - Specification for Seamless and Welded Copper Distribution Tube (Type D), Current Edition.
j. ASTM B687 - Specification for Brass-, Copper-, and Chromium- Plated Pipe Nipples, Current Edition.
k. ASTM C828 - Practice for Low Pressure Air Test of Vitrified Clay Pipe Lines (4 to 12-in.), Current Edition.
l. ASTM D1785 - Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120, Current Edition.
m. ASTM D2000 - Classification System for Rubber Products in Automotive Applications, Current Edition.
n. ASTM D2239 - Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter, Current Edition.
o. ASTM D2241 - Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series), Current Edition.
p. ASTM D2321 - Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe, Current Edition.
q. ASTM D2447 - Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80 Based on Outside Diameter, Current Edition.
r. ASTM D2464 - Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80, Current Edition.
s. ASTM D2466 - Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40, Current Edition
t. ASTM D2467 - Specification for Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80, Current Edition
u. ASTM D2564 - Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems, Current Edition.
v. ASTM D2672 - Specification for Joints for IPS PVC Pipe Using Solvent Cement, Current Edition.
w. ASTM D2683 - Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing, Current Edition.
x. ASTM D2855 - Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings, Current Edition.
y. ASTM D3350 - Specification for Polyethylene Plastics Pipe and Fittings Materials, Current Edition.
z. ASTM D3915 - Specification for Poly(Vinyl Chloride) (PVC) and Related Plastic Pipe and Fitting Compounds for Pressure Applications, Current Edition.
aa. ASTM F437 - Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80, Current Edition.
bb. ASTM F438 - Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40, Current Edition.
cc. ASTM F439 - Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80, Current Edition.
dd. ASTM F441 - Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80, Current Edition.
ee. ASTM F442 - Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, (SDR-PR), Current Edition.
ff. ASTM F493 - Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe and Fittings, Current Edition.
gg. ASTM F1055 - Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing, Current Edition.
hh. ASTM F1056 - Specification for Socket Fusion Tools for Use in Socket Fusing Joining Polyethylene Pipe and Tubing, Current Edition.

4. Commercial Standards (CS) U.S. Department of Commerce Standards, Current Edition.
5. Factory Mutual (FM), Specification and Standards, Current Edition.

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6. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover the furnishing of all materials, equipment, supervision and labor necessary to install all process piping (gravity and pressure piping), compressed air piping, vacuum piping, water piping, sludge piping, sanitary sewer piping, storm sewer piping, chemical piping, discharge piping, valves, castings, and appurtenances. This section shall not apply to electrical conduit or piping for heating and ventilating.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements – Division 00 (All Sections)

B. Submittals – Division 01

C. High Performance Coating - Division 09

D. Trenching and Backfilling - Division 31

E. Wastewater Process Valves and Specialties - Division 44

F. Rotary Lobe Sludge Pumps - Division 44

G. Solids Waste Processing Equipment - Division 44

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer of wastewater processing piping shall have a minimum of 10 years of experience in the construction of municipal and industrial piping and appurtenances and shall conform to the required ratings and certifications as indicated.

B. All products specified within this section shall be manufactured in North America.

2.02 PIPE, GENERAL

A. All piping shall conform to the sizes shown on the contract drawings and shall be of the type and quality as scheduled, unless otherwise designated on the contract drawings.

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2.03 WASTEWATER PROCESS PIPE

A. Exposed Process Pipe

1. Polyvinyl Chloride (PVC). Pipe shall meet the requirements of ASTM D1785, for Schedule 40 or Schedule 80. Joint construction shall be threaded or solvent welded, as preferred by the Contractor. Joints constructed of threaded couplings and fittings shall meet the requirements of ASTM D2464, ASTM D2466, and ASTM D3915 as they apply. Joints constructed of socket-type couplings and fittings and solvent welded shall meet the requirements of ASTM D2467, ASTM D2564, ASTM D2672, and ASTM D2855, as they apply.
2. Chlorinated Polyvinyl Chloride (CPVC). Pipe shall meet the requirements of ASTM F441, for Schedule 40 or Schedule 80. Joint construction shall be threaded or solvent welded, as preferred by the Contractor. Joints constructed of threaded couplings and fittings shall meet the requirements of ASTM D3915 and ASTM F437, as they apply. Joints constructed of socket type couplings and fittings and solvent welded shall meet the requirements of ASTM D2855, ASTM F438, ASTM F439 and ASTM F493, as they apply.
3. Galvanized Steel. Pipe shall meet the requirements of ASTM A53, Schedule 40 or ASTM A120, Schedule 40 or 80. Joint construction shall be threaded. Joints constructed of thread couplings and malleable iron fittings shall meet the requirements of ASTM A865. All exposed and interior galvanized steel pipe shall be field-painted in accordance with High Performance Coatings – Division 09 of these specifications.
4. Ductile Iron (DI). Pipe shall meet the requirements of ANSI/AWWA C115/ A21.15; Class 53. Joint construction shall be flanged type with required bolts and full face gasket, meeting the requirements of ANSI/AWWA C111/ A21.11. Fittings shall be ductile iron, meeting the requirements of ANSI/ AWWA C110/A21.10. Where stainless steel bolts are used, they shall be installed with a heavy coating of anti-seize compound. Standard cement mortar lining shall meet the requirements of ANSI/AWWA C104/A21.04. All exposed ductile iron pipe shall be factory primed in accordance with High Performance Coating - Division 09 of these specifications.
5. Copper (CU). Pipe shall meet the requirements of ASTM B88 and ASTM B641 for rigid seamless tubing. The name or trademark of the manufacturer, and type shall be permanently and plainly marked on the pipe at intervals not greater than 1-1/2 feet. Fittings shall be cast brass meeting the requirements of ASTM B62 and ASTM B687 having an alloy composition of 85 percent copper, 5 percent tin, 5 percent zinc and 5 percent lead, having uniformity in wall thickness and strength, and free of any defects. Installation shall be in accordance with governing plumbing codes.
6. Stainless Steel (SST): Pipe shall be Schedule 40 or Schedule 80 wall thicknesses and meet requirements of ASTM A-312. Pipe shall be Type 316/316L with welded or threaded end SST flanges rated for 150 pound standard with full face gaskets. Flange type shall be compatible with connecting piping/equipment flanges. Fittings shall be type 316/316L Schedule 40 wall thickness meeting the requirements of ASTM A403 and ANSI B16.9. Fittings shall have welded end connections to type 316 stainless steel, 150 pound rated with end flanges. Tap connections shall be type 316 stainless steel weldolet type with small end NPT connections where specified. Flange bolts shall be high strength type 304 stainless steel and shall be installed with a heavy coating of anti-seize compound.
7. Dried Solids for Pelletization Flexible Hose: Hose shall have a clear, flexible PVC tube core with smooth interior and high-tensile strength reinforcement. The hose shall be rated for 28-inch Hg vacuum, 60 psi working pressure, and shall be suitable for -4 to 150 degree F temperatures.
    a. Provide suitable end connections for attachment to the piping, ports, and equipment required for this project. Where compatible end terminations allow, provide stainless steel worm-gear clamping devices or stainless steel bridge clamps. Form leaktight hose end connections at all terminal points, in addition to the mechanical end fasteners described herein, provide FRP tape where necessary.
8. Dust Collection Ductwork: Ductwork shall be fabricated for dust air transfer under operating vacuum pressures of -5.0 inch W.C. to -25 inch W.C. Ductwork maximum leakage shall not exceed 6 cfm per 100 feet of duct length.
    a. Ductwork shall be a clamp together design using a rolled edge with a single lever clamp. Duct, fittings, and clamps shall be galvanized steel ASTM A 527 with a temperature rating of 400 degrees F. Duct pipe wall thickness shall be a minimum of 18-gauge for 3-inch diameter.
    b. All duct and fittings shall be fused together with laser fully weld process along the entire longitudinal seams, each section and fitting shall be checked and tested for welding flaws or

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gaps and corrected to ensure structural integrity. The rolled edges at each end shall be die-formed after this inspection by rolling each end of the pipe simultaneously.

c. Rolled edges shall provide structural support at ends of duct and stiffener effect increases duct support spacings to 12 feet.

d. Special joint end clamps shall contain a Nitrile rubber gasket to result in leakage tight sealing under suction negative pressure conditions of up to -25-inch W.C. at 150 degrees F. Galvanized or stainless steel clamps shall be constructed with an over-center, spring lever action for quick connecting of duct ends. Use retaining pin in handle and an eyelet on clamp as safety features to ensure the handle does not come undone. Internal seal shall be compressed to cover both rolled beads for optimum sealing in a full 360 degree pattern. Provide caulking to enhance the clamp sealing efficiency and reduce joint leakage below specified tolerances.

e. The manufacturer's construction quality standards shall certify that air flow leakage rate at each assembled joint shall not exceed 0.35 cfm at -15-inches W.C. vacuum.

f. Branch fittings shall be concentric in dimensional design and tapered. Joints shall be lapped, continuous welded.

g. Provide 22-gauge galvanized steel adjustable nipple with O-ring where ductwork fit requires this feature. Provide hose adapter fittings for attaching dust hoses to the ductwork.

h. Elbows of 45 and 90 degrees shall be segmented and of 1.0 CLR for 3-inch through 7-inch diameters; 24 gauge thickness minimum.

i. Contractor shall paint the exterior of the installed ductwork in accordance with Section 09 96 00.

j. Acceptable manufacturers: Nordfab Ducting with Quick Fit (QF) joint clamps (ductingsystems.com), mechanical contractor fabricated, or Engineer-approved equal.

9. Dust Collection Flexible Connector Piping: Piping shall be flexible thermoplastic rubber or neoprene-coated duct hose suitable for carrying dust and compressed air. The hose shall be rated for 25-inch Hg vacuum where the inlet from the transfer conveyor at the new slide gate valve connects to the Dust Collection ductwork.

a. The hose shall meet the following requirements:

1) Thermoplastic rubber or 2-ply polyester-neoprene coated duct hose reinforced with a spring steel wire helix, smooth interior surfaces, abrasion and UV resistant.

2) Flexible with a bend radius of 3-inches or less for all sizes 3-inch diameter or smaller, and suitable for -30 to 250 degree F temperatures.

3) Minimum hose weight of 0.35 pounds per foot for 3-inch diameters.

4) Provide suitable end connections for attachment to the piping and equipment required for this project. Where compatible end terminations allow, provide stainless steel worm-gear clamping devices or stainless steel bridge clamps. Form leaktight hose end connections at all terminal points, in addition to the mechanical end fasteners described herein, provide FRP tape where necessary.

b. Acceptable manufacturers: Hosecraft USA of Chicago, IL, or approved equal.

B. Buried Process Pipe

1. Copper (CU). Pipe shall meet the requirements of ASTM B88 and ASTM B641 for Type "K" soft annealed seamless tubing. The name or trademark of the manufacturer, and type shall be permanently and plainly marked on the tubing at intervals not greater than 1-1/2 feet. Fittings shall be cast brass meeting the requirements of ASTM B62 and ASTM B687 having an alloy of 85 percent copper, 5 percent tin, 5 percent zinc and 5 percent lead, having uniformity in wall thickness and strength, and free of any defect which may affect serviceability. Connections shall be made with flared flanged joints or compression type joints. Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer.

2.04 PIPING IDENTIFICATION

A. Identify all process piping with its process designation and direction of flow; identify with semi-rigid, snap-on acrylic-plastic identification markers at 15 foot intervals, at each change of direction, and adjacent to each point it passes through a wall, floor or ceiling; comply with ANSI and OSHA pipe mark requirements.

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B. Identify pipes less than 1 inch in diameter with brass tags, 1-1/2 inch in diameter with depressed 1/4 inch high black enamel-filled letters, securely fastened at 5 foot intervals.

2.05 WALL SLEEVES AND WALL PIPES

A. Wall sleeves and wall pipes shall conform to the requirements of the process piping as indicated on the contract drawings and as specified as follows:
   1. Cast Iron: ASTM A48, Class 30B
   2. Ductile Iron: ASTM A536, Grade 60-40-18
   3. Mechanical Joint: ANSI/AWWA C111/A21.11
   4. Integral cast or welded intermediate wall collar

B. Wall pipes shall be used at all locations where pipes penetrate new concrete walls.

2.06 MODULAR RUBBER WALL SEAL

A. Modular rubber wall seal shall be mechanical type, consisting of inter-locking synthetic rubber links. The elastomeric element shall be sized and selected per manufacturer's recommendation and have the following properties as designated:
   1. Standard service application (-40 degrees F to 250 degrees F) EPDM: ASTM D2000 M3BA510.
   2. Hydrocarbon service application (-40 degrees F to 210 degrees F)
      Nitrile: ASTM D2000 M1BF510
   3. High temperature or fire seal application (-67 degrees F to 400 degrees F)
      Silicone: ASTM D2000 M1GE505

B. Assembly of synthetic rubber links connected with stainless steel bolts. When the bolts are tightened, pressure plates shall compress the rubber links to fill the annular space between the pipe and the wall sleeve to form a watertight seal.

C. Modular rubber wall seals shall be used where pipes penetrate existing concrete walls and as otherwise indicated on the contract drawings. Use of modular rubber seals in any other locations shall require written approval of the Engineer.

D. Modular rubber wall seal shall be Link-Seal, manufactured by Thunderline Corporation or equal.

2.07 FLANGE ADAPTERS

A. Flange adapters shall consist of a flange, gasket and set screws. The flange shall be ductile iron, ASTM A536, Grade 65-45-12. The gasket shall be SBR Buna-S, suitable for use with wastewater. The set screws shall be AISI 4140 steel, Tensile 190,000 psi minimum, heat treated to Rockwell C42-50 and zinc plated for corrosion resistance. Set screws on sizes 2 inch through 16 inch shall have a breakaway head that shears at the recommended torque leaving a square head.

B. All flange adapters shall have a minimum working pressure equal to the pipe on which they are installed.

C. Flange adapters shall be Uni-Flange, manufactured by the Ford Meter Box Company, Inc. or equal.

D. Flange adapters shall only be installed as shown on the contract drawings or where approved by the Engineer.

2.08 FLANGED ADAPTER COUPLING

A. Flanged adapter coupling shall consist of exposed cast iron or steel sleeve type coupling with body sleeve, follower, and gaskets to connect plain end pipe to flanged connection. Sleeve piece shall be gray iron ASTM A126 Class B, malleable iron ASTM A47, or steel ASTM A53 or A512.
   1. Pressure gasket sealed for 150 psig rating, elastometer rated for wastewater, sludge, and chemicals
   2. Fasteners shall be low alloy high strength steel.
   3. Provide anchor boss on coupling with multiple anchor studs rated for 150 psig and thrust restraint.

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4. Shop coat of fusion bonding epoxy coating.

B. Acceptable Products: Smith-Blair Model 912 or 913, Ford Meter Co. Style FCA, or approved equal.

2.09 BEVELED AND FULL FLANGE FILLERS

A. Provide ductile iron beveled or full flange fillers at all flanged locations where necessary to obtain piping closure or alignment in the piping system for horizontal and vertical transitions.

2.10 FLEXIBLE STAINLESS STEEL PIPING

A. Provide the specified lengths of flanged end stainless steel flexible piping to allow expansion and contraction upstream and downstream from the high pressure compressed air piping to the pneumatic operators.

B. Each flexible stainless steel piping length shall be arranged and configured in the piping system to allow up to 3.0-inches of expansion and up to 3.0-inches of contraction, which shall include linear compression and extension and lateral deflection as a result of thermal changes and equipment movement relative to the piping locations.

C. Flexible piping shall be type 321 or type 316 stainless steel corrugated hose (inner) and shall be type 321 stainless steel or 316 stainless steel double braided hose (outer) with carbon steel 150 pound ANSI flange ends. At 600 degrees F the working pressure shall be 200 psig for 6-inch diameter and provide 30-inch centerline bend radius, and shall be working pressure 250 psig at 600 degrees F for 4-inch diameter and provide a 24-inch centerline bend radius, and shall be 300 psig for 3-inch diameter or smaller and provide a minimum 18-inch centerline bend radius. At 8-inch diameter, the working pressure shall be 240 psig at 250 degrees F or less and provide a 36-inch centerline bend radius.

D. Flexible piping shall be driptight and vapor tight without any loss of liquid at dynamic (flowing) pressure and at static pressure conditions.

E. The Contractor shall provide 3/4-inch diameter galvanized steel piping from the air supply to within two feet of each pneumatic operator. The final 24-inch length shall be 1/4-inch diameter flexible single or double braided 150 psig rated stainless steel hose assembly with NPT union connection to each pneumatic operator.

F. Acceptable Manufacturers: US Hose Corporation (ushosecorp.com), Metraflex (metraflex.com), Flexicraft Industries, or approved equal.

2.11 PIPE HANGERS

A. Pipe hangers shall consist of ceiling flange threaded rod, and adjustable clevis type hanger constructed of carbon steel.

2.12 PIPE SUPPORTS

A. Pipe supports where ceiling mounted to concrete surfaces shall consist of a base flange, support rod with threaded ends for height adjustment, and a saddle type or stanchion type support as required.

B. Pipe supports shall be wall-mounted brackets where pipelines are located within 3-feet of walls. Maintain minimum of 7-foot clearance under supports.
1. Provide U-bolt attachment, roller, or pipe saddle above the bracket.
2. Where clearance is limited, suspend clevis hanger from wall bracket.
3. Provide floor-mounted type support stands with adjustable pipe column, circular cradle, and floor attachment flange where wall or ceiling mount are not feasible and maintenance access will not be interrupted.
4. Pipe supports shall include U-bolt attachment above pipe crown to prevent movement out of the support device due to pressure surge forces, water flotation, or external forces.

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C. Install hangers and supports as required to support piping shown on plans; conform to American Standard Code for Pressure Piping, ANSI B31.1. Provide galvanized or stainless structural steel members required for supporting or anchoring piping and accessories.
   1. Exterior and underwater pipe supports shall be type 316 stainless steel.
   2. Pipe supports in wet atmosphere or corrosive chemical areas, shall be type 316 stainless steel.
   3. Interior room locations not subject to wet or corrosive conditions shall have pipe supports of hot-dipped galvanized steel construction.
   4. Pipe supports underwater inside tanks shall include an adjustable U-bolt style yoke attached to the pipe saddle support to prevent pipe movement out of the saddle support.

D. Design and locate supports, anchors, rollers and guides and show on shop drawing submittal subject to acceptance of Engineer.
   1. Absence of pipe support and details on the drawings shall not relieve the Contractor of responsibility for providing supports.
   2. Maintain equipment maintenance clearance around all equipment and operator and equipment removal egress paths throughout all Rooms.
   3. Provide pipe supports at all pumps and equipment connections to prevent pipe load transfer to the pump and equipment.
   4. Provide pipe supports under all valves, and at all locations in wet wells and valve vaults where waterstop seals are required, to prevent damage to waterstop seals.

2.13 EXPANSION JOINTS

A. Expansion joints shall be of the bellow type with filled arches suitable for temperatures of minus 20 degrees F to plus 180 degrees F equipped with limit bolts to restrict maximum extension.

2.14 LEAD

A. Lead for caulking joints in cast iron soil pipe shall be soft, malleable, conforming to Federal Spec QQ-L-156 for Lead, Caulking, Type 1. The producer's name or trademark must be marked on each piece.

2.15 YARN

A. Yarn for cast iron soil pipe joints shall be closely twisted, dry, unoiled jute, hemp or oakum.

2.16 PIPELINE TAPS

A. Pipeline Tapping Saddles: Sizes ½ inch through 3 inch diameter, provide double-strap bronze body saddle with gasket and two stainless steel clamping bands, assembly rated for 150 psig. Provide saddles at all locations, unless indicated otherwise on the drawings.

2.17 CORPORATION STOPS

A. Provide bronze body 150 psig rated corporation stop.
   1. Connect into tapping saddle on each pipeline.
   2. Size as called out in the drawings.

2.18 CHEMICAL INJECTION ASSEMBLY

A. Chemical injection assembly shall be used at the 6-inch injection location on the sludge feed line in the pipe tunnel. This injection assembly is for injecting ferric chloride from the existing ferric chloride line in the pipe tunnel to the sludge feed line.

B. Provide one (1) PVC chemical injection assembly for insertion into a 1-inch bronze body corporation stop. The seal shall prevent chemical contact with the corporation stop body.

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C. Chemical Injector shall include spring-loaded poppet check valves to seal and prevent flow discharge when pump is stopped or when the injector is dissembled for service. PVC body shall be rated for 150 psig and Hastelloy C springs, standard assembly typical of those supplied at website: USABluebook.com

2.19 CONNECTIONS BETWEEN EXISTING PIPELINES AND NEW BURIED PIPE SECTIONS AND AT OTHER LOCATIONS SPECIFIED.

A. Provide bolted flexible couplings (BFC) to connect existing piping and new pipe sections, fittings, and valves together. Provide joint restraint at all new fittings and valves on both/all directions from the bolted flexible coupling.

B. Bolted flexible couplings (BFC):
1. Use ductile iron (DI) slip ring sleeve type rated for 150 psig with rubber gaskets, tightening DI flanges and high strength bolts and nuts, Smith-Blair Model 442, or approved equal. Provide minimum sleeve length of 12 inches to allow minimum overlap on each pipe end of 5.50 inches. All air piping couplings shall have elastomeric gaskets rated for 210° F.
2. Where different pipe sizes are encountered, provide transition coupling to properly fit both pipe sizes.
3. Provide minimum of four (4) tie-rods for each coupling to securely restrain the coupling to the adjacent pipe fitting or restraint collar.
4. Provide corrosion-resistant epoxy coating on coupling and bolts.

C. Provide dielectric isolators between pipes of different metallic make up.

D. Cover bolted flexible couplings with polyethylene sheeting.

2.20 WASTEWATER PROCESS PIPING SCHEDULE

SCHEDULE OF PROCESSES AND PIPING MATERIALS					
		Joints and Couplings			
System	Material	Interior	Exterior	Underground	Notes
Water (3 inches and larger)	CPVC, Schedule 80	Solvent	Solvent	-- --	
	Copper	Bonded or ProPress	Bonded or ProPress	-- --	
	Ductile Iron	Flanged with Gasket	Flanged with Gasket	-- --	
Water (2 inches and smaller)	Copper	See Spec	See Spec	See Spec	Flexible Tubing for Underground; Rigid Tubing for Exposed
Chemical	PVC, Schedule 80	Solvent	Solvent	Solvent	
Treatment Process	Ductile Iron	Flanged with Gasket	Flanged with Gasket	Push-on or Mechanical	

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SCHEDULE OF PROCESSES AND PIPING MATERIALS					
		Joints and Couplings			
System	Material	Interior	Exterior	Underground	Notes
High Pressure Compressed Air	Galvanized Steel (all sizes)	Flanged joints where specified, otherwise threaded joints may be used on 3 inch and less	N/A	N/A	Minimum Schedule 80, flange gaskets & threaded joint sealant temp rating of 350 degrees F.
High Pressure Compressed Air	Stainless Steel Corrugated Inner and Double Braided Hose Outer	See special spec requirements	N/A	N/A	See specs. Transition from galvanized steel to pneumatic actuators.
Dried Solids for Pelletization (Transfer Conveyor and Tote Discharger w/ Inclined Screw to Gentle Roll Screener)	Flexible PVC tube core and high-tensile strength reinforcement	See special spec requirements	N/A	N/A	See specs.
Dried Solids for Pelletization	Stainless Steel, Type 316	Welded	N/A	N/A	Process piping from Bucket Elevator to Pelletizer Feed Inlet Hopper
Dust Collection Ductwork	Galvanized Steel	See special spec requirements	N/A	N/A	See specs
Dust Collection Flexible Connector Hose	Thermoplastic rubber or neoprene-coated duct hose	See special spec requirements	N/A	N/A	See specs
Sludge	Ductile Iron	Flanged with Gasket	Flanged with Gasket	Push-on or Mechanical	

PART 3 EXECUTION

3.01 MATERIAL HANDLING

A. All pipe shall be carefully unloaded so it will not be chipped, cracked or have the surface coating damaged. It shall be carefully stored so it is in no way damaged or made unsuitable for its purpose. Pipe shall not be skidded upon the ground. Damaged pipe shall be immediately removed from the work site.

3.02 PIPE INSTALLATION

A. Primary line and elevation will be provided by the Engineer. Line and elevation will be established in the field, which, in conjunction with information on the contract drawings, will be sufficient control for the work. The Contractor shall be responsible for preserving the control stakes, marks or nails and if disturbed, shall pay the actual cost of replacement. Notice shall be given one week in advance to give the Engineer enough time to set the control. The Contractor shall transfer line and elevation from the primary control by approved methods. Such methods may vary at different locations to achieve the desired degree of accuracy.

B. Pipes shall be laid with ends abutting and true to line and elevation. Joints shall be full depth or rigidly fixed and located for proper alignment of piping. Pipe suspended or exposed shall be placed at the elevations indicated and supported as shown on the drawings. Any work which has been disturbed or which does not

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conform to line and elevation before final acceptance shall be removed and reconstructed by the Contractor at his expense.

C. Pipes shall be fitted together and matched to form a smooth and uniform invert. Pipes shall be laid with straight alignment such that one can see through the pipe between two adjacent manholes. No pipe shall be laid in water or when in the opinion of the Engineer trench conditions are unsuitable. The ends of the pipe line shall be clean and protected from the entrance of foreign materials by means of covering or plugging. All pipe must cleaned before laying and no joints made under water. Immediately before placing each pipe with a gasket, the spigot and bell end of the mating pipes shall be coated with an approved lubricating material.

D. Pipes shall be installed with the minimum depth of cover as called for on the contract drawings or as defined in Special Procedures - Division 01 of these specifications.

E. Manufacturer's recommended installation procedures shall be followed.

3.03 PERMISSIBLE LEAKAGE

A. Leakage is not permissible on any exposed line or any line that will be placed under pressure or suction. The Contractor shall at his own expense locate and repair the defective joints until the leakage is within the limits described above.

B. Leakage of buried gravity flow lines shall be limited to an exfiltration or leakage infiltration rate not to exceed 200 gallons per inch of pipe diameter per mile per day for any section of the system. Should any test of combined sections of pipe disclose leakage greater than that specified, or if individual sections show leakage greater than the specified limit, the Contractor shall at his own expense locate and repair the defective joints until the leakage is within the limits described above.

3.04 TESTING

A. General. The following tests shall be performed by the Contractor in the presence of the Engineer. The Contractor shall be responsible for providing all labor, materials and equipment for the testing.

B. Exfiltration or Leakage Test. The buried gravity flow lines shall be measured for exfiltration or leakage infiltration at points designated by the Engineer. The tests for exfiltration or leakage infiltration shall be conducted in a manner as approved by and under the direction of the Engineer. Exfiltration or leakage infiltration shall be measured using either the water test or the low pressure air test. The buried gravity flow lines shall have a rate of exfiltration or leakage infiltration less than 200 gallons per inch of pipe diameter per mile per day.

1. Water Test. The test shall be performed using a minimum positive head of 2 feet of water. Maximum allowable exfiltration shall be 200 gallons per inch of pipe diameter per mile per day.
2. Low Pressure Air Test. Sewer lines shall be air tested in accordance with ASTM C828, entitled "Standard Practice for Low Pressure Air Test of Vitrified Clay Pipe Lines: or NCPI Bulletin entitled "Low Pressure Air Test for Sanitary Sewers" or "Cherne Discussion No. 6 - Air Test Specifications". The air test shall be made in the presence of the Engineer. All equipment necessary for said air test shall be provided by the Contractor and approved by the Engineer.

C. Deflection Test. All buried polyvinyl chloride pipe installations shall be tested for deflection by using a rigid ball or mandrel and shall be performed in accordance with ASTM D2321 and without the use of mechanical pulling devices. Deflection may not exceed 5 percent if tested within 30 days of placement of final backfill or 7.5 percent if tested more than 30 days after final backfill is placed. Final backfill must be in place prior to testing.

D. Pressure Test. All pressure lines shall be tested until successfully meeting the requirements of ANSI/AWWA C600/A26.00, latest edition, for pressure and leakage testing excepting exposed lines which are allowed no leakage. Temporary capping and thrust restraint of open lines will be required for testing.

1. Air piping shall be air tested at 15 psig, for 90 minutes without loss. Contractor shall make adequate provision to release the air pressure safely upon the conclusion of the test.

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E. Acceptance. If any of the tests are not met, the Contractor shall, at his own expense, determine the source of the problem and repair or replace all defective materials.

3.05 PIPE HANGERS AND SUPPORTS

A. Piping hangers and their supports shall be sized per the pipe manufacturer's requirements for the process fluid carried, but in no case shall this be less than 3/4 inch wide, 18 gauge steel strap or ring type hangers secured by screw fasteners. Hangers in contact with uninsulated copper tubing or brass piping shall be electrolytically coated and shall be sized accordingly for the outside diameter of the pipe.

B. The location of the hangers and supports shall be coordinated with the structural work to assure that the structural members will support the intended load. In lieu of separate hangers or supports, the Contractor shall submit for approval a detailed drawing of the type of hanger or support he proposes to furnish for handling and supporting multiple pipes.

3.06 HORIZONTAL PIPING

A. Hangers and their supports shall be installed at intervals specified below, at locations not more than 3 feet from ends of each runout and not over 1 foot from each change in direction of piping. Hangers shall be adjustable type. Hangers and supports shall be spaced as follows:

1. Schedule 40 or Schedule 80 Plastic Pipe. The maximum spacing between supports for pipe carrying liquids less than 100 degrees F shall be as follows:

Nominal Pipe Size (In.)	Maximum Span (Ft.)
1/2 thru 1	4
1-1/4 thru 2	5
2-1/2 thru 4	6
6	7
8 and 10	8
12	9
14 and 16	10

2. Steel Pipe. The maximum spacing between supports shall be as follows:

Nominal Pipe Size (In.)	Maximum Span (Ft.)
1/2 thru 1-1/4	7
1-1/2	9
2	10
2-1/2	11
3	12
3-1/2	13
4	14
5	16
6	17
8	19

3. Iron Pipe. Pipe shall be supported near each hub or hubless joint.

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4. Copper Tubing. The maximum spacing between supports shall be as follows:

Normal Pipe Size (In.)	Maximum Span (Ft.)
3/8 thru 3/4	5
1	6
0.75	7
1-1/2 and 2	8
1.5	9
3	10
2.5	11
4	12

3.07 VERTICAL PIPING

A. Plastic vertical piping shall be banded at intervals determined by the vertical load involved. Riser clamps shall be supported on spring hangers. Short risers shall include a saddle at the bottom and may require an additional hanger at the top. Longer risers may require over-sized U-bolts or similar devices to prevent lateral motion.

B. Steel vertical piping shall be banded at intervals determined by the vertical load involved. Riser clamps shall be supported on spring hangers. Short risers shall include a saddle at the bottom and may require an additional hanger at the top. Longer risers may require over-sized U-bolts or similar devices to prevent lateral motion.

C. Iron vertical piping shall be supported at each floor and at intervals determined by the vertical load involved. Riser clamps shall be supported on spring hangers. Short risers shall include a saddle at the bottom and may require an additional hanger at the top. Longer risers may require over-sized U-bolts or similar devices to prevent lateral motion.

D. Copper vertical tubing shall be bonded at intervals determined by the vertical load involved. Riser clamps shall be supported on spring hangers. Short risers shall include a saddle at the bottom and may require an additional hanger at the top. Longer risers may require over-sized U-bolts or similar devices to prevent lateral motion.

3.08 FIXTURE SUPPORTS

A. Wall hung fixtures, hanger plates, support arms or mounting lugs shall be fastened to the wall by through bolts where appearance of the bolts is not objectionable. Exposed bolt heads in finished areas shall be hexagonal and painted. Exposed nuts shall be chromium plated hexagonal cap nuts. Washers shall be painted or chromium plated to match bolt heads or nuts.

3.09 WALL AND FLOOR PENETRATIONS

A. All wall and floor penetrations for below grade structures and water retraining structures shall have wall pipes or modular rubber seals as shown on the contract drawings.

B. Pipe penetrations for slab on grade floors shall be wrapped with 15 pound asphalt impregnated felt.

3.10 THRUST RESTRAINTS

A. Provide all pressure pipelines with concrete thrust blocking at all bends, tees, caps, plugs and changes in direction.

B. All bends, tees, caps, plugs and changes in direction under structures shall have both restrained joints and thrust blocks.

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C. Concrete thrust blocks shall be poured against firm, undisturbed ground, with a minimum size as shown on the contract drawings. Where it is not possible to pour thrust blocks against undisturbed ground, thrust blocks shall be poured against backfill compacted to 95 percent modified proctor density. All fittings shall be wrapped in polyethylene prior to placement of concrete thrust blocks. Thrust blocks shall be formed in such a way that joints will be kept free of concrete.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 44 42 00.11
POTABLE WATER SYSTEM

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American National Standards Institute (ANSI), Specifications and Standards, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   3. American Water Works Association (AWWA), Specifications and Standards, Current Edition.
   4. National Electrical Manufacturers Associations (NEMA), Specifications and Standards, Current Edition.
   5. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover providing and installing all required equipment and appurtenances for a complete Potable Water system in accordance with the contract drawings and specifications. The Contractor shall provide all labor and materials necessary to complete the work.
   1. Contractor shall provide insulation on all tank surfaces to prevent temperature gain to the well water.

B. The drawings and specifications are intended to include general details for a complete equipment installation for the purposes specified. The Contractor shall be responsible for all details which may be necessary to properly install, adjust and place in operation the complete installation.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Electrical - Division 26

D. Wastewater Process Piping System - Division 40

E. Wastewater Process Valves and Specialties - Division 44

F. SUBMITTALS

G. The Contractor shall submit such Submittals and/or catalog cuts required for the construction and installation of the equipment. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications.

H. The Contractor shall provide a list of all instrumentation and control equipment components to be provided, (only those components required not included in the facility control panel, catalog cuts, and descriptive information for each component).

I. Submittals shall indicate the intended equipment arrangement, major support requirements, plot area, and process flow.

1.05 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

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A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review, an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 OPERATING CRITERIA

A. The Contractor shall modify the Potable water system to maintain operating pressure at a minimum of 60 psig and a maximum of 90 psig at the discharge from the pressure tank when the Well Pump is operating.

B. PRESSURIZING SYSTEM

C. One (1) vertical welded steel tank, factory primed.
1. Constructed, tested, and stamped in accordance with Section VIII, Division 1 of ASME Code, rated for 125 psig working pressure.
2. Precharged in the field to 100 psig operation, designed for full acceptance, when operated from 55 to 95 psig.
3. Pressure tank shall provide a useful minimum drawdown volume of 422 gallons of water storage capacity during a power outage when operated between 95 psig and 55 psig.
4. Tank Features: Replaceable, heavy-duty butyl bladder of minimum 0.10-inch thickness, ANSI/NSF 61 rated, 3-inch NPT system tank connections; air chamber charging valve.
5. Tanks supported by steel legs or integral ring mount base.

D. Design Requirements
1. The Contractor shall furnish and install one (1) WELL-X-TROL Pressurized ASME Tank, Model No. WX 456-C, by AMTROL, Inc., or engineer approved equal. The specified operating conditions and specifications are as follows:
   Lead Pump cut in, in gauge pressure = 60 PSIG
   Lead Pump cut out, in gauge pressure = 90 PSIG
   Total WELL-X-TROL Tank Volume per unit = 422 gallons minimum
   Tank minimum Dimensions: 48-inch diameter x 82 inches height
2. Pressure Switches and Transmitter
3. Refer to Division 26 for additional requirements.
4. Contractor to coordinate and provide necessary piping and tap from potable water system to re-located existing pressure switches and transmitter inside Potable Water System Control Panel.
5. Tank Accessories
6. Tank accessories shall include compressed air inlet, gauges, minimum 3-inch water inlet/outlet.

2.02 PIPING

A. Refer to Wastewater Process Piping System - Division 40 for piping specifications.

B. Refer to Wastewater Process Valves - Division 44 for valve specifications.
1. PAINTING

C. Refer to High Performance Coatings - Division 09 of these specifications.

PART 3 EXECUTION

3.01 PRESSURIZING SYSTEM INSTALLATION

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A. Install the water pressurizing system components as indicated on the contract drawings, functional descriptions in this Section, and in accordance with the manufacturer's instructions.
   1. Provide and connect piping, valves, accessories and controls as indicated herein and as required to insure a complete, operable system.

B. Provide well pump controls to operate at the following pressure settings:
   1. VFD drive shall control system pressure to maintain the operating setpoint at 75 psig.
   2. Start well pump operation (on) at 60 psig, and stop well pump (off) at 90 psig
   3. Low pressure alarm at 50 psig, high pressure alarm at 100 psig

C. EQUIPMENT START-UP

D. The equipment shall be started by a factory-trained representative certified for each separate item of equipment, who shall certify to the Engineer that all equipment is properly installed and the plant operator has been instructed concerning proper operation and maintenance.

E. A written report covering the representative's activities and installation approval shall be submitted to the Engineer. This report shall cover all inspections and outline in detail any deficiencies in the installation.

F. The manufacturer and contractor shall provide services in accordance with Equipment Startup – Division 01

3.02 SYSTEM TEST AND ADJUSTMENT

A. A field performance test shall be conducted by the Contractor with data obtained during pumping at the operating points for comparison with pump curves.

B. Operate the well water pump and pressurizing system continuously and automatically to cycle the well pump on and off, test for a minimum period of 4 hours. Operate piping system outlet use points to demonstrate proper pump controls and ability of the equipment to maintain system pressure within the specified operating range. Demonstrate system high pressure and low flow shutdown settings. Make necessary adjustments in accordance with the manufacturer's instructions.

C. In the event a component fails to perform as specified or is proven defective during operation, correct all deficiencies and retest. Testing shall be conducted in the presence of and to the satisfaction of the Engineer.

D. Any defects in the equipment or failure to meet the guarantees or requirements of the specifications shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the contract shall be final.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 44 42 56.73
ROTARY LOBE SLUDGE PUMPS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Iron and Steel Institute (AISI), Specifications and Standards, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   3. American Welding Society (AWS), Specifications and Standards, Current Edition.
   4. Institute of Electrical and Electronics Engineers (IEEE) Specifications and Standards, Current Edition.
   5. National Electrical Manufacturers Associations (NEMA), Specifications and Standards, Current Edition.
   6. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover providing and installing complete, three (3) rotary lobe pumps. Two (2) pumps, named the Sludge Feed Press Pumps, shall be installed in the existing digester building west side basement on the existing progressive cavity pump concrete bases. One (1) pump, named the Dewatering Press Feed Pump, shall be installed in the existing sludge processing building basement on a new concrete base. Contractor shall remove and dispose of the existing progressive cavity pumps and install the new pumps in the location as shown on the Contract Drawings and specified herein.

B. The work shall include all labor and materials necessary to provide a complete operating pumping system.

C. Suction and discharge piping and appurtenances to the pumping system shall be provided as shown on the Contract Drawings and specified in Section 40 23 36 – Wastewater Process Piping System.

D. Motor control shall be by Division 26.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements – Division 00 (All Sections)

B. Submittals - Division 01

C. Metal Fabrications - Division 05

D. Anchor Bolts - Division 05

E. Electrical - Division 26

F. Wastewater Process Piping System - Division 40

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1.05 SUBMITTALS

A. The Contractor shall submit such Shop Drawings and/or catalog cuts required for the construction and installation of the equipment. These drawings shall be accurate in every detail and shall contain all information necessary to relate the pumping equipment to the specifications. Shop drawings shall include characteristics and performance of each pump, including pump head, capacity, horsepower demand, and pump efficiency for points as specified under performance criteria (over the whole variable speed range) and shall contain all motor information.

B. The Contractor shall provide a list, catalog cuts and descriptive information of all instrumentation and control equipment components to be provided with the pumps.

C. Shop drawings shall be submitted which indicate the internal control schematics/wiring diagrams and remote equipment, such as motor starters, level sensors, etc. Shop drawings shall be submitted which indicate equipment and terminal block layout for interconnections to remote equipment.

D. Shop drawings shall indicate the intended equipment arrangement, major support requirements, plot area, and process flow.

E. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications. Contractor shall submit the Equipment Commission Report – see Section 01 75 16.

1.06 OPERATION AND MAINTENANCE MANUAL

A. The manuals shall include operating and maintenance literature for all components provided, including cut sheets, performance data, diagrams, and maintenance schedules. The submitted literature shall be of sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review, an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All equipment and parts shipped to the job site shall be properly protected from the elements so that no damage or deterioration occurs from the time of delivery to the time when the installation is complete and the units are placed into operation.

B. Manufacturer shall define the requirements to properly protect the equipment and parts shipped to the job site.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Rotary lobe pumps shall be Model FL 776 series (Sludge Feed Pumps) and Model FL 518 series (Dewatering Press Feed Pump) manufactured by Boerger, or Engineer-approved equal.

2.02 GENERAL

A. Rotary lobe pumps shall pump aerobically digested sludge at the solids concentrations listed for each pump.

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B. Rotary lobe pumps shall meet the following general requirements:

1. All fluid-wetted parts including mechanical seal shall be replaceable through the quick release front cover without disassembly of the pump unit or connecting pipe system.
2. Pumps with seal water requirements are not acceptable.
3. Pumps shall be designed to temporarily run dry.
4. Pumps shall operate in either direction.
5. Gearbox and intermediate chamber oil drain shall be easily accessible with side mounted drain screw.
6. Equipment shall be suitable for continuous operation at maximum fluid temperature of 105 degrees F at all operating speeds specified and without external cooling fluid.
7. Sludge pumping equipment shall be suitable for 24-hour continuous operation at all operating speeds specified.
8. Adequately size motor horsepower so each pump is non-overloading throughout entire pump performance curve.
9. Mechanical equipment, including drives and electric motors shall be supplied and installed in accordance with applicable OSHA regulations. The noise level of motors, unless otherwise noted, shall not exceed 85 dBA measured 3 meters from the unit under free field conditions while operating on utility power.
10. Equipment shall be free from shock, vibration, cavitation, overheating, and noise while operating at specified conditions.
11. Stainless steel nameplates giving the name of the MANUFACTURER, the pump serial number, material code, and all other pertinent data shall be attached to each pump and motor.

2.03 PERFORMANCE CRITERIA

A. A total of three (3) rotary lobe feed pumps and associated accessories shall be supplied. Two (2) of the pumps, named the Sludge Feed Pumps, will pump aerobically digested sludge from the west aerobic digesters over to the east digester for storage or directly to the belt presses for thickening/dewatering. One (1) pump, named the Dewatering Press Feed Pump, will pump aerobically digested sludge from the east digester to the belt presses for dewatering.

B. The Sludge Feed Pumps shall be capable of operating at infinitely variable speeds and shall meet the following design requirements:

Quantity:	2
Design flow range	100 gpm to 500 gpm to belt presses or storage
Fluid pumped	Aerobically digested sludge
Constant or Adjustable Speed	Adjustable Speed (Variable Frequency Drive)
Normal Operating Pressure	35 psi @ 400 gpm
Maximum Operating Pressure	70 psi @ 500 gpm
Sludge Percent Solids	0.5 to 3.0 %
Pump Drive Configuration	In-Line
Maximum Pump Speed	288 rpm @ 500 gpm
Pump Displacement	227 gallons per 100 revolutions, minimum
Minimum Motor Horsepower	50 HP
Motor Speed	1775 rpm
Suction Connection Type	Flanged Pipe
Discharge Connection Type	Flanged Pipe
Pump Model	Boerger Model FL 776

C. The Dewatering Press Feed Pump shall be capable of operating at infinitely variable speeds and shall meet the following design requirements:

Quantity:	1
Design flow range	50 gpm to 250 gpm to belt presses
Fluid pumped	Aerobically digested sludge
Constant or Adjustable Speed	Adjustable Speed (Variable Frequency Drive)
Normal Operating Pressure	30 psi @ 230 gpm
Maximum Operating Pressure	50 psi @ 340 gpm

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Sludge Percent Solids	1.0 to 5.0 %
Pump Drive Configuration	In-Line
Maximum Pump Speed	296 rpm @ 340 gpm
Pump Displacement	150 gallons per 100 revolutions, minimum
Minimum Motor Horsepower	25 HP
Motor Speed	1750 rpm
Suction Connection Type	Flanged Pipe
Discharge Connection Type	Flanged Pipe
Pump Model	Boerger Model FL 518

2.04 PUMP CONSTRUCTION

A. Pump Casing and Protection Plates:
1. Shall be manufactured from a single block of Cast Iron, ASTM A48 Gr 40, with a hardness of 264 Brinell.
2. Split case pump designs bolted together are not acceptable.
3. Rear of pump casing and front cover shall be protected with replaceable wear plates with a hardness of 550 Brinell.
4. Front cover protection plate shall be reversible.
5. Pump casing shall be equipped with radial pump casing protection plates with a hardness of 550 Brinell.
6. Quick release cover shall be held in place by four eye nuts.

B. Rotors:
1. Sludge Feed Pumps and Dewatering Press Feed Pump:
   a. Rotors shall be tri lobe screw rotor design with individually replaceable rotor tips. Rotors without tips shall not be acceptable.
   b. Rotors shall be cast iron core, ASTM A46, Grade 40, with a harness of 230-260 Brinell.
   c. Rotor tips shall consist of a non-sludge-wetted mechanical steel core coated with abrasion-resistant Buna-N Durometer hardness 72.
   d. Rotors shall be keyed to shaft with one central screw to a cylindrical thread inside the shaft.
   e. Cast iron core of rotor shall be equipped with a female thread to enable removal of rotor from shaft with ease.
   f. Length of rotor shall not exceed its diameter.

C. Shafts:
1. Shafts shall be non-sludge-wetted.
2. Rotor/shaft connection shall be lubricated with hydraulic oil from an intermediate chamber to ensure an oil exposure of the entire shaft.
3. Shafts shall be carbon steel. AISI 4140.

D. Mechanical Seal:
1. Pumps shall be fitted with maintenance free mechanical seals with hardened Duronit V seal faces.
2. Seals shall be operating in a common oil-filled intermediate chamber (Quench for lubrication and cooling). Purge systems for the seals are not acceptable.
3. Rotating holding bush shall be in a definite radial position by the keyway that also holds the rotor in place. Seal designs that open when a rotor gets replaced are not acceptable.
4. Threaded connection of the holding bush to the shaft shall allow infinite alignment changes to the preload of the mechanical seal. No sleeves shall be necessary for the mechanical seal set up.
5. Design of the pump shall allow removal and replacement of the seal via the front cover.

E. Gearbox / Timing Gear / Bearings
1. Bearings and timing gear shall be located in a common oil-filled cast iron gearbox, fitted with a built in sight class to monitor oil level.
2. Timing gear shall maintain non-contact between the rotors.
3. Bearing life to be designed for L-10 bearing life rating of 100,000 hours.

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F. Pump and Drive Base:
   1. Pump and drive shall be fitted on a common base made of hot dipped galvanized steel.
   2. Provide suitable bolt and grout holes to facilitate mounting at the side.
   3. Provide stainless steel bolt down cover over exposed drive shaft/coupling between motor and pump.

G. Motor and Drive Unit:
   1. Each unit shall consist of a pump / geared motor configuration and supplied with an in-line reducer.
   2. Motor horsepower as specified on Pump Schedules herein.
   3. Motor Speed: 1800 rpm maximum.
   4. Each motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   5. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a single pole / single throw relay for monitoring in SCADA.
   6. Motor for use with variable frequency drives shall be constructed to NEMA MG1 Part 31 standards.
   7. Refer to Electrical - Division 26 for additional motor requirements.

2.05 SPARE PARTS

A. The following shall be provided:
   1. One (1) set of specialty tools.
   2. One (1) set of axial protection plates for each size pump.
   3. One (1) set of mechanical seals for each size pump.
   4. One (1) set of O-rings for each size pump.

2.06 PAINTING

A. Manufacturer is responsible for surface preparation, priming and finish coating of ferrous metal components in plant prior to shipment. Provide manufacturer-recommended coatings appropriate for the application.

2.07 WARRANTY

A. The manufacturer shall warrant, in writing, that all equipment supplied shall be free from defects in material and workmanship, for a period of two years from the date of start-up. If any part of the equipment should prove to be defective during the warranty period, the MANUFACTURER, at no expense to the OWNER, shall replace the part.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's written instructions and approved submittals.

3.02 EQUIPMENT START-UP

A. Startup and post startup shall be in accordance with 01 75 16 Equipment Start Up.

B. The equipment shall be started by a factory-trained representative who shall certify to the Engineer that all equipment is properly installed and the operator has been instructed concerning proper operation and maintenance. Equipment start-up reports shall be submitted to the Engineer prior to project close out.

C. Start-up services shall be a minimum of one day.

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3.03 FIELD PERFORMANCE TEST

A. Each pump shall be tested after installation to check the guaranteed performance. The Contractor shall furnish and install all gauges and accessories required for this test and shall run each pump as directed by the Engineer. The Contractor shall provide field data taken from at least three different operating points for comparison with pump curves. The Contractor shall record the individual shutoff head for each pump for comparison with pump curves. The Contractor shall also record amp readings in each leg for each pump to check for motor imbalance and excessive amp draw by the motor. The Contractor shall be responsible for all adjustments or replacements necessary.

B. Any defects in the equipment or failure to meet the guarantees or requirements of the specifications shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the contract shall be final. If the Contractor fails or refuses to make these corrections or if the improved equipment, when tested shall again fail to meet the guarantees of the Contractor, the Owner, notwithstanding its ownership of work and materials which have entered into the manufacture of said equipment, shall have the option of rejecting said equipment or of accepting the same at such reduced price as may be agreed upon by the parties hereto.

3.04 OPERATOR TRAINING

A. Upon satisfactory completion of the start-up and calibration, a representative of the manufacturer shall be provided to instruct the Owner's personnel in the proper operation and maintenance of the equipment. The manufacturer's representative who will be providing the instruction shall have prior operation, maintenance, and instructing experience acceptable to the Engineer. The contractor shall submit the individual's name and qualifications to the Engineer for approval at least one week prior to the scheduled operating and maintenance instruction sessions. The Engineer reserves the right to require the replacement of the manufacturer's representative who is providing operating and maintenance instruction if the services are found inadequate.

B. Training services shall be a minimum of one day.

3.05 POST START-UP VISIT

A. Six months following equipment installation, a factory-trained representative from the equipment manufacturer or equipment manufacturer’s authorized representative shall return to the project site for a one-day post start-up visit. The purpose of the visit is to answer operator questions and check the system for proper operation.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 44 42 73.10
CHEMICAL STORAGE TANKS

PART 1 GENERAL

1.01 USE OF AMERICAN IRON AND STEEL

A. This project is receiving funding through the State of Wisconsin Clean Water Fund Program (CWFP) from the US Environmental Protection Agency (EPA), with appropriations from H.R. 3547 "Consolidated Appropriations Act, 2014". All iron and steel products must comply with the "Use of American Iron and Steel" clause of this Act and applicable waivers. All iron and steel products used in the project must be produced in the United States, and manufacturer certifications of the location of the manufacturing process involved with the production of steel and iron materials will be required.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. D638 Tensile Properties of Plastics
      b. D883 Standard Definitions of Terms Relating to Plastics
      c. D1505 Density of Plastics by the Density-Gradient Technique
      d. D1525 Test Method for Vicat Softening Temperature of Plastics
      e. D1693 ESCR Specification Thickness 0.125" F50-10% Igepal
      f. F412 Standard Terminology Relating to Plastic Piping Systems
   2. ANSI Standards: B-16.5, Pipe Flanges and Flanged Fittings
   3. Building Code: International Building Code, IBC 2018/2021
   4. ARM: Low Temperature Impact Resistance (Falling Dart Test Procedure)
   5. NSF/ANSI Standard 61, AWWA – Drinking Water System Components
   6. ASTM D-1998, Standard Specification for Polyethylene Upright Storage Tanks

1.04 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing two (2), single wall, self-supporting, tanks of high density cross-linked polyethylene with an integrally molded flanged outlet (IMFO®) for storage of liquid alum.

1.05 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Wastewater Process Piping Systems - Division 40

D. Chemical Phosphorus Removal System - Division 44

1.06 SUBMITTALS

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A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Contractor shall submit the Equipment Data Form – see Section 01 33 00.

C. Contractor shall submit the Equipment Commission Report – see Section 01 75 16.

D. Contractor shall submit the Factory Test Report.

E. Contractor shall provide the following additional information:
   1. Integrally molded flanged outlet IMFO® tank and Fitting Material
      a. Resin Manufacturer Data Sheet
      b. Fitting Material
      c. Gasket style and material
      d. Bolt material
   2. Dimensioned Tank Drawings
      a. Location and orientation of molded in fitting (IMFO®), openings, fittings, accessories, restraints and supports.
      b. Details of inlet and molded outlet fitting (IMFO®), manways, flexible connections, and vents.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance, and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. The chemical storage tank shall be manufactured by PolyProcessing or approved equal.

2.02 QUALITY ASSURANCE

A. Tanks shall be manufactured from virgin materials

B. Tanks shall be manufactured from materials certified to NSF/ANSI Standard 61 for chemical storage and submit form from NSF supporting chemical certification.

2.03 DESIGN

A. Tanks shall be rotationally-molded, integrally molded flanged outlet IMFO®, high density cross-linked polyethylene, one-piece seamless construction, cylindrical in cross-section and vertical with flat / sloping bottoms in axis. Tanks shall be adequately vented as prescribed in Poly Processing Company's Technical Bulletin, Venting-Design for ACFM (air cubic feet per minute). Where indicated, tanks shall be provided with ancillary mechanical fittings and accessories. Tanks shall be marked to identify the manufacturer, date of manufacture and serial numbers must be permanently embossed into the tank.

B. Chemical storage tanks shall be suited for the following operating conditions per this section.

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C. Wall thickness for a given hoop stress is to be calculated in accordance with ASTM D 1998. In no case shall the tank thickness be less than design requirements per ASTM D 1998.

1. The wall thickness of any cylindrical portion at any fluid level shall be determined by the following equation: T = P x OD/2SD or 0.433 x SG x H x OD/2SD
   Where:
   T = wall thickness, in
   P = pressure, psi
   SG = specific gravity, gm/cc
   H = fluid head, ft
   OD = outside diameter, ft
   SD = hydrostatic design stress
2. The minimum wall thickness shall be sufficient to support its own weight in an upright position without external support but shall not be less than 0.187" thick.
3. On closed top tanks the top head shall be integrally molded with the cylindrical wall. Its minimum thickness shall be equal to the thickness of the top of the straight sidewall. In most cases, flat areas shall be provided for attachment of large fittings on the dome of the tank.
4. The bottom head shall be integrally molded with the cylindrical wall. Knuckle radius shall be:

Tank Diameter, ft	Min Knuckle Radius, in
less than or equal to 6	1
greater than 6	1-1/2

D. Tanks with 3000 gal capacity or larger shall have at least 3 lifting lugs. Lugs shall be designed for lifting the tank when empty. Unless otherwise indicated by Contract drawings, for indoor pneumatic fill, manways shall be 24-in diameter or greater and equipped with an emergency pressure relief device of SAFE-Surge Manway with pressure relief at 6" water column to prevent over-pressurization. The SAFE-Surge manway shall be chemically compatible with the chemical being stored. Gaskets shall be closed cell, cross-linked polyethylene foam, Viton, or EPDM materials.

E. Tank colors shall be natural (un-pigmented), black (compounded), or as specified by the Engineer with written agreement by the tank manufacturer.

F. Quantity 2

G. Type .....Closed, Upright

H. Classification..... Atmospheric pressure tanks, atmosphere vented

I. Loading conditions ..... Two (2) indoor, free standing

J. Minimum Nominal capacity .....4000 gallons.

K. Maximum Nominal inside diameter..... 10.5 feet.

L. Height not to exceed..... 10 feet.

M. Chemical name .....Aluminum Sulfate 48-49%

N. Chemical specific gravity 1.330

2.04 DESIGN CRITERIA

A. Materials of Construction.

1. Tank: High Density Cross-linked Polyethylene resin used in the tank manufacture shall be Poly CL™ or equal
2. Manway: Polyethylene

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B. General Appearance. Tank should be uniform to color. The finished surface shall be as free as commercially practical from visual defects such as foreign inclusions, air bubbles, pinholes, and craters. All edges where openings are cut into the tanks shall be trimmed smooth.

2.05 APPURTENANCES AND ACCESSORIES

A. For FRP tanks, the surfaces of fittings and accessories and the cut edges of all laminates shall be sealed with the same corrosion barrier laminate as the inner surface and interior layer.

B. Where a tank sidewall or head is cut in an area bearing hydrostatic pressure, the cutout shall be reinforced.

C. The following ports and accessories shall be included. All ports shall be flanged. For FRP tanks, all ports shall have plate gussets.
1. Top Flange Vent: 8" port – Contractor to provide Vent and terminate with insect screen. Vents shall be sized by the tank manufacturer.
2. Top Flange Fill: 2" port with anti-foam elbow assembly
3. Tank Connection: 4" flanged port. Contractor to provide fittings to reduce the tank connection to 1" SCH80 PVC suction piping.
4. Top 24" SAFE-surge lid
5. Lifting lugs
6. 1 set of plastic flange protectors

D. Down Pipes and Fill Pipes: Down pipes and fill pipes shall be supported at 6-ft max intervals. Down pipes and fill pipes shall be PVC or material compatible with the chemical stored.

E. All fittings on the 1/3 lower sidewall of tanks with capacities ≥ 1000 gallons shall have 100% virgin PTFE Flexijoint expansion joint. Expansion joint to have 3 convolutions, stainless steel limit cables, FRP composite flanges and meet the following minimum performance specifications. Galvanized parts will not be accepted.

Expansion joints to meet the following minimum performance requirements:

Axial compression ≥ 0.67''

Axial Extension ≥ 0.67''

Lateral Deflection ≥ 0.51''

Angular Deflection ≥ 14°

Torsional Rotation ≥ 4°

F. Bolted flange fittings shall be constructed of one 150 lb. flange with ANSI bolt pattern, one flange gasket and stud bolts with gaskets. Stud bolts to have chemical resistant polyethylene injection molded heads and gaskets to provide a sealing surface between the bolt head and the interior tank wall. Stud bolt heads are to be color coded for visual ease of identifying the bolt material by onsite operators. Green- 316 Stainless Steel, Black- Titanium, Red- Alloy C-276, Blue- Monel. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

2.06 NAMEPLATE

A. Nameplate shall be located on the tank with the following information:
1. Order Number
2. Customer
3. Customer purchase order number

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4. Tank model
5. Tank capacity
6. Design pressure
7. Specific gravity
8. Service temperature
9. Product
10. Date of fabrication
11. Tank tag (if specified by customer)
12. A warning to avoid pipe strain of fittings, use flexible connections where possible

2.07 FACTORY TESTING

A. Material Testing

1. Perform gel and low temperature impact tests in accordance with ASTM D 1998 on condition samples cut from each polyethylene chemical storage tank.

2. Degree of Crosslinking. Use Method C of ASTM D 1998- Section11.4 to determine the ortho-xylene insoluble fraction of cross-linked polyethylene gel test. Samples shall test at no less than 60 percent.

B. Tank Testing

1. Dimensions: Take exterior dimensions with the tank empty, in the vertical position. Outside diameter tolerance, including out-of-roundness, shall be per ASTM D 1998. Fitting placement tolerance shall be +/- 1/2-in vertical and +/- 1 degree radial.

2. Visual: Inspect for foreign inclusions, air bubbles, pimples, crazing, cracking, and delamination.

3. Hydrostatic test: Following fabrication, the bottom tanks, including inlet and outlet fittings, shall be hydraulically tested with water by filling to the top sidewall for a minimum of 1 hour and inspected for leaks. Following successful testing, the tank shall be emptied and cleaned prior to shipment.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. The tanks shall be shipped upright or lying down on their sides with blocks and slings to keep them from moving. Avoid sharp objects on trailers.

B. All fittings shall be installed and, if necessary, removed for shipping and shipped separately unless otherwise noted by the Contractor.

C. Upon arrival at the destination, Contractor to inspect the tanks and accessories for damage in transit.

3.02 INSTALLATION

A. Install equipment as shown on the contract drawings and in accordance with manufacturer's instruction and reviewed Submittals.

B. Contractor shall be trained by the tank manufacturer, the state or other approved agency.

C. Tank to be secured per manufacturer's recommendation.

3.03 TESTING

A. Tanks shall be installed and tested according to current installation instructions provided with the tank.

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B. Following successful startup and testing of the tank and chemical phosphorus removal system, Contractor shall fill both tanks with phosphorus removal chemical. Contractor shall coordinate with Owner/Engineer for details on the appropriate chemical and chemical supplier.

3.04 WARRANTY

A. Warranty shall be manufacturer's current standard warranty.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 44 42 76.10
WASTEWATER PROCESS VALVES AND SPECIALTIES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American National Standards Institute (ANSI) Standards, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   3. American Water Works Association (AWWA) Standards, Current Edition.
   4. Commercial Standards (CS), U.S. Department of Commerce Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all material, small tools, equipment, labor and supervision to install all plant and process valving (gravity and pressure piping) as indicated on the contract drawings and specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements – Division 00 (All Sections)

B. Submittals - Division 01

C. Electrical - Division 26 (All Sections)

D. Wastewater Process Piping System - Division 40

E. Rotary Lobe Pump - Division 44

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

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A. Manufacturer of wastewater process valves shall have a minimum of 10 years experience in the construction of municipal and industrial valves and appurtenances and shall have the appropriate ratings and certifications as indicated.

2.02 VALVES (GENERAL)

A. All valves 4 inch and larger shall be designed so that they can be repacked without removing the bonnet. The packing shall be adjustable. Valves shall conform to the sizes shown on the contract drawings and shall be of the type and quality as follows, unless otherwise designated on the contract drawings.

B. All valves whose center lines are 6 or more feet above the operation floor shall be equipped with a chain operator extending to 4 feet from the operating floor.

C. All exposed valves shall be furnished with operating nut, unless specified otherwise. Furnish one valve operating lever for every five valves with the same size operating nut and the same required lever length, minimum two levers of each type required.

D. All valves to be tagged with 1-1/2 inch diameter brass valve tags with 1/4 high black enamel filled letters. Each valve number shall consist of an identifying letter prefix with a maximum of five characters followed by a number with a maximum of four characters. Valve numbers to be supplied by Engineer.

E. Valve ends shall conform to ANSI B16.1, Class 125 flanges or mechanical joints to match the piping system.

F. Only manufacturers with a local state certified factory representative shall be allowed to supply equipment.

2.03 BALL VALVES

A. General Purpose Ball Valves
1. Ball valves, 2 inch through 12 inch, shall conform to ANSI B16.34 Class 150.
2. Body shall be full port 316 stainless steel with vented stainless steel ball and stem.
3. Seats and seals shall be PTFE.
4. Valves shall be rated for 200 psi services.
5. Provide hand lever operator with stops at full open and full closed positions.

B. Small Diameter General Purpose Ball Valves
1. Ball valves, 2 inch and smaller, shall be end entry type with threaded end connections.
2. Body shall be full bore 316 stainless steel, two-piece body with vented stainless steel ball and stem.
3. Seats and seals shall be PTFE.
4. Provide hand lever operator with stops at the full open and full closed positions.
5. Valves shall be rated for 400 psi service.
6. Valves to be Ladish, Apollo, or equal.

C. Thermoplastic Ball Valves
1. Thermoplastic ball valves, 6 inch and smaller, shall have full port, PVC SCH 80 body, ball and stem.
2. Valves shall be end entry, double union design with solvent weld socket in accordance with ANSI B1.20.1 or flanged end connections.
3. Seats shall be PTFE and seals shall be Viton o-ring stem seals.
4. Provide hand lever operator with stops at the full open and full closed positions.
5. Valves shall be rated for the greater of 150 psi or 150 percent of working pressure.

2.04 BUTTERFLY VALVES

A. Butterfly valves for potable water use shall be ductile iron body, stainless steel stem and bushings, copper flange press ends, and EPDM molded-in seat liner in accordance with API 609.

B. The valves shall be shipped loose for field installation.

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C. Lever lock operators shall be provided.

D. Butterfly valves shall for potable water use shall be manufactured by Nibco, Inc. or Engineer approved equal.

2.05 EQUIPMENT, GATE, AND VALVE IDENTIFICATION

A. Equipment and Flow Meter Nameplates
   1. Nameplates shall be engraved three-layer laminated plastic, black letters on white background.
   2. Submit equipment and flow meter tag naming schedule for all new equipment. Naming shall follow the P&ID naming convention as closely as possible:
      a. Equipment Name (e.g. Chemical Feed Pump No. 1)
      b. Equipment Tag No. (e.g. P-6-4-1)
   3. Provide approximate 3-in. by 6-in. (minimum) size tag for equipment.
      a. 1-in. high letters for equipment name.
      b. ½-in. high letters for equipment tag number.
   4. Coordinate all equipment identification nameplate titles and locations with Owner and Engineer.

B. Manual Gate Nameplates
   1. Nameplates shall be engraved three-layer laminated plastic, black letters on white background.
   2. Submit equipment and flow meter tag naming schedule for all new equipment. Naming shall follow the P&ID naming convention as closely as possible:
      a. Gate Tag No. (e.g. LG-8-3)
   3. Provide approximate 3-in. by 6-in. (minimum) size tag for equipment.
      a. 1-in. high letters for equipment name.
      b. ½-in. high letters for equipment tag number.
   4. Coordinate all equipment identification nameplate titles and locations with Owner and Engineer.

C. Process Valve Tags
   1. All new exposed valves shall be tagged with 1-1/2 inch diameter brass valve tags with 1/4 inch high black enamel filled letters that match its P&ID identification number. Contractor to submit manual valve naming schedule.

PART 3 EXECUTION

3.01 MATERIALS HANDLING

A. All valves shall be carefully unloaded so as not to be chipped, cracked or have the surface coating damaged. They shall be carefully stored so they are in no way damaged or made unsuitable for its purpose. Valves shall not be skidded upon the ground. If any valve coating is damaged, it shall be touched up with a suitable asphaltic varnish to the satisfaction of the Engineer. Damaged valve shall be immediately removed from the work site.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions and approved shop drawings.

3.03 EQUIPMENT START-UP

A. The equipment shall be started by a factory-trained representative who shall certify to the Engineer that the equipment is properly operating and the operating personnel have been properly instructed concerning proper operation and maintenance.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 44 42 76.30
MECHANICAL LIFT SLIDE GATE

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Iron and Steel Institute (AISI), Specifications and Standards, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM A36 - Specification for Structural Steel, Current Edition.
      b. ASTM A48 - Specification for Gray Iron Castings, Current Edition.
      c. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings, Current Edition.
      d. ASTM A240/A240M – Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications, Current Edition.
      e. ASTM A276 - Specification for Stainless and Heat-Resisting Steel Bars and Shapes, Current Edition.
      f.
      g. ASTM A582 - Specification for Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished.
      h. ASTM B21 - Specification for Naval Brass Rod, Bar and Shapes, Current Edition.
      i. ASTM B98 - Specification for Copper Silicon Alloy Rod, Bar and Shapes, Current Edition.
      j. ASTM B138 - Specification for Manganese Bronze Rod, Bar and Shapes, Current Edition.
      k. ASTM 139 - Specification for Phosphorus Bronze Rod, Bar and Shapes, Current Edition.
      l. ASTM B148 - Specification for Aluminum Bronze Castings, Current Edition.
      m. ASTM B150 - Specification for Aluminum Bronze Rod, Bar and Shapes, Current Edition.
      n. ASTM B179 - Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes, Current Edition.
      o. ASTM B584 - Specification for Copper Alloy Sand Castings for General Applications, Current Edition.
      p. ASTM D471 - Test Method for Rubber Property - Effect of Liquids, Current Edition.
      q. ASTM D1149 - Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber, Current Edition.
      r. ASTM D2000 - Classification System for Rubber Products in Automobile Applications, Current Edition.
      s. ASTM D4020 - Standard Specification for Ultra-High-Molecular-Weight Polyethylene Molding and Extrusion Materials, Current Edition.
      t. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs, Current Edition.

1.03 DESCRIPTION OF WORK

A. This section covers stainless steel channel gates sealing on both sides and bottom, upwards opening and their associated accessories for operation. The contractor shall furnish all labor, materials, equipment and incidentals required to install and field test the gates shown on the Contract Drawings and specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

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B. Submittals - Division 01

C. Metal Fabrications - Division 05

1.05 SUBMITTALS

A. Preparation of Submittals shall be in conformance with requirements in Submittals - Division 01 of these specifications.

B. The Contractor shall submit such Submittals and/or catalog cuts required for the construction and installation of the equipment. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications.

C. Submittals shall indicate the major support requirements, plot area, and process flow.

D. The Manufacturer shall submit intended equipment arrangement drawings for equipment supplied under this section. Drawings must indicate all dimensions that will allow the contractor to ensure coordination with dimensions of the installation environment. Drawings will also show sufficient details to determine compliance with the requirements, including the stainless steel plate thickness used for all components. Drawings shall also include certification that the slide gates supplied meet all requirements of the latest edition of AWWA C561.

E. The Manufacturer shall submit design calculations demonstrating compliance with the design requirements of these specifications and those of the latest edition of AWWA C561. In particular, calculations shall be submitted for the following gate components:

1. Slide
2. Seat contact pressure
3. Frame
4. Yoke
5. Stem, stem connection
6. Lifting nut
7. Manual actuator operating force
8. Anchors

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submittal literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance, and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review, an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

C. The manuals shall contain detailed information on the terms of the 5-year warranty on the products.

PART 2 PRODUCTS AND MATERIALS

2.01 QUALITY ASSURANCE

A. The gates supplied under this section shall be standard products of a manufacturer regularly engaged in the design and manufacturing of water control gates.

B. The gates supplied under this section shall conform to all requirements of the latest edition of ANSI/AWWA C561. The slide gate manufacturer must maintain an ISO-9001 certification and a company certification for its welding operations from the CWB or AWS.

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2.02 MANUFACTURERS

A. Gates supplied shall be FONTAINE-AQUANOX Series 25 Channel Gates, as manufactured by ISE Metal Inc., or approved equal.

2.03 DESIGN CRITERIA

A. Gates shall be upwards opening of the 3 sides sealing type designed for wastewater applications. Gates shall have flow control capability by allowing only flow through the open area when partially open. As specified in the gate schedule, each gate shall be of self-contained-frame design and rising stem configuration.

B. The maximum allowable leakage for the gates shall be 0.1 gpm/ft. of wetted perimeter for a design seating and unseating head of 10 feet. Design and test data to verify the above shall be furnished with the equipment drawing submittal. Manufacturer shall have proof of design test records in accordance with AWWA C561-14 on file available for submittal.

2.04 FRAME

A. The gate frame shall be made of formed plates or structural members creating the clear opening of the specified dimensions in a rigid one-piece unit. In wall mounted instances (CW), the mounting and bolting flange of the frame to the wall shall be separate and independent from the seating and sealing plane of the slide.

B. The frame shall be designed in such a manner so that access is provided to the side seal retainer bolts.

C. The bottom of the frame will be of the flush invert type.

D. Stresses in the frame under design head shall not exceed 25% of the ultimate tensile, compressive, and shear strength and 50% of the yield strength, whichever is less.

E. Minimum material thickness of all members of the frame shall be ¼" (6mm).

2.05 GUIDING AND SEATING

A. The slide shall seat and travel on guides made of ultra-high molecular weight polyethylene (UHMWPE) designed to perform for the life of the slide gate without replacement.

B. The slide shall be kept in positive contact with the guides on both its upstream and downstream faces, all along its travel in the gate clear opening by an elastomeric cord. Above the gate clear opening, the guides shall extend high enough to ensure that the slide is supported on a minimum of 1/2 of its height when fully opened.

C. The low friction guides shall be secured to the frame by bolted retainers permitting field adjustment of the contact pressure with the slide.

D. Gates frames designed as channel shaped guides with added UHWPE pads simply bolted inside the channel, not providing adjustment of the slide contact pressure by bolts will not be allowed.

E. The surface of contact on the side seats shall be large enough to limit the stress under the design head to 600 psi (4137 KPa) without considering the bottom seat as load bearing.

2.06 SEALING

A. The guides combined with the elastomeric cord will provide sealing on both sides of the opening.

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B. The compression cord shall push and close the UHMWPE seal as the gate opens to prevent grit and dirt to penetrate the guiding slot. Wide channel shaped guiding slots allowing accumulation of dirt and grit will not be accepted

C. At the gate invert, the slide shall close on a flush invert rubber seat/seal secured in the bottom member of the gate frame. Bottom seals attached to the slide and rubbing against the side seals will not be allowed, nor will rubber seals that are not flush bottom.

D. Under the design seating or unseating head specified in the gate schedule, the slide gates shall restrict leakage to a maximum of 0.04 gpm/ft (0.5 l/min/m) of clear opening perimeter. Manufacturer shall be able to demonstrate that the sealing system will retain its performance even after 25,000 operating cycles.

2.07 SLIDE

A. The slide consisting of a flat plate with welded reinforcing ribs shall be designed to withstand the design head specified in the gate schedule with a maximum deflection of 1/720 of the gate opening width and with stresses in the slide limited to 25% of the ultimate tensile, compressive, and shear strength and 50% of the yield strength, whichever is less.

B. Minimum material thickness of all members of the slide shall be ¼" (6mm).

2.08 YOKE

A. Gates specified as self-contained design shall include a yoke consisting of a beam made of formed plates or structural members mounted on top of the frame to permit mounting of the actuator with proper stem alignment using slotted holes in both direction.

B. The yoke shall be sized to limit deflection under the design load to a maximum of 1/360 of the gate opening width or ¼ in (6mm) whichever is less. The yoke design load must be considered as the vertical thrust generated by an 80 lbs (356 N) force on the crank or handwheel (for a manual actuator) or by the actuator in locked rotor condition (for an electric actuator).

C. Per the latest edition of AWWA C561, the stresses in the yoke generated by the design load shall not exceed (for a manual actuator) 25% of the ultimate tensile, compressive, and shear strength and 50% of the yield strength, whichever is less, or (for an electric actuator) 2/3 of the yield strength.

2.09 COUPLNGS

A. The required stem extensions shall be joined together or to the threaded stem by means of a bolted connection, passing through both pipe and stem.

2.10 STEM GUIDES

A. Guides will be provided as required to meet the stem buckling design criteria and positioned per the manufacturer's recommendations to ensure that the length to radius of gyration ratio (l/r) does not exceed 200. The guides shall incorporate a UHMWPE bushing supported by a stainless steel wall bracket adjustable in both horizontal directions.

2.11 STEM

A. The stem configuration shall be rising according to the type specified in the schedule. The threads shall be machine rolled ACME left hand threads with double entry to minimize the number of turns required for operation and provide gate opening by counterclockwise rotation of the manual actuator. Surface finish of the machined threads will be 32 micro inch (0.813 µm) or better.

B. For manually operated gates with rising stem, the stem shall be equipped with an adjustable stop collar to prevent over-closing the gate and potentially damaging components.

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C. The stem shall be sized so that its critical buckling load (as determined by the Euler column formula) is higher than the design compression load, defined as the vertical force developed by a 80lbs (356N) effort applied on the handwheel.

2.12 STEM CONNECTION

A. The stem or its extension will be connected to the slide by means of a pinned connection.

B. Stem connection design shall limit the stress under the design load to a maximum of 25% of the ultimate tensile, compressive, and shear strength and 50% of the yield strength. The stem connection design load shall be the thrust and torque developed when an 80lbs (356N) effort is applied to the handwheel.

2.13 STEM GUIDES

A. The guide shall be the rising stem type and the rising stem unit shall be provided with a stem cover. Clear butyrate plastic shall have mylar markings graduated to the 1/2-inch for position indication.

B. The quantity, size and location of anchor bolts shall be determined by the Manufacturer and shown on the submittal drawings. The minimum required load capacity of the anchors used for design must also be indicated on the submittal drawings.

2.14 MANUAL OPERATORS

A. Operation
1. Manual actuator of the proper type and mounting location, as listed in the gate schedule or shown on the drawings, shall be provided by the gate manufacturer.
2. The effort required on the manual device to operate the gates shall not exceed 40 lbs (178 N), while to start the gate in motion from the fully closed position with the design pressure, the required effort shall not exceed 60 lbs (267 N).
3. Indication of the opening direction of rotation shall be clearly marked in a permanent manner on the handwheel or crank.

B. Handwheels
1. The handwheel shall be removable and have a minimum diameter of 16” (406mm). It shall drive the lift nut directly or via the extension pipe of self-contained gates.

C. Actuator Lift Nut and Thrust Bearings
1. All gates shall include a thrust bearing assembly comprising a threaded bronze lift nut to engage the operating stem. This assembly must be enclosed in a machined stainless steel housing or be an integral part of the gearbox when supplied.
2. Needle roller thrust bearings shall be provided above and below the lift nut to support the operating efforts in closing and opening the gate.
3. The length of thread engagement shall be sufficient to ensure that the maximum pressure on the projected area of thread contact does not exceed 2000 psi (13,8 MPa) at normal maximum operating load and that the PV (pressure velocity) factor does not exceed 30,000. The PV factor is calculated by multiplying the pressure on the projected area of thread contact in psi by the surface velocity in ft/min at the pitch diameter of the threads.

D. Mounting
1. The thrust bearing assembly shall be mounted on the yoke of the gate for all gates specified as self-contained.

E. Stem Cover
1. All rising stem gates shall be equipped with a clear stem cover with a closed top and ventilation hole. The cover shall bear graduation in both inches and centimeters to indicate the position of the gate.

2.15 MATERIALS

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A. Materials for gate construction shall be as follows:

COMPONENT	MATERIAL	STANDARD
Slide, Frame and Yoke	Stainless Steel	ASTM A240, grade 316L or 304L
Side Seal/Guides	Ultra High Molecular Weight Polyethylene (UHMWPE)	ASTM D4020
Flush Invert Bottom Seal	Ethylene Propylene (EPDM)	ASTM D2000
Compression Cord	Ethylene Propylene (EPDM)	ASTM D2000
Wall Gasket	Ethylene Propylene (EPDM)	ASTM D2000
Bolts and Hardware	Stainless Steel	ASTM F593, grade 316
Stem	Stainless Steel	ASTM A582, grade 316 or 304
Thrust Nut and Lift Nut	Aluminum Bronze or Manganese Bronze	ASTM B505, C95800 ASTM B584, C86300
Stem Couplings	Stainless Steel or Bronze	ASTM A582, grade 316 ASTM B505, C95800 ASTM B584, C86300
Stem Guide Bracket	Stainless Steel	ASTM A582, grade 316
Stem Guide Bushing	Ultra High Molecular Weight Polyethylene (UHMWPE)	ASTM D4020
Handwheel	Cast Aluminum	ASTM B179
Crank	Stainless Steel	ASTM F593, grade 316
Pedestal	Stainless Steel	ASTM F593, grade 316
Gearbox Housing	Cast Iron	ASTM A48 35B/40B
Square Nut	Cast Aluminum	ASTM B179
Stem Cover	Clear PVC	
Stem Cover Cap	PVC	

2.16 CLEANING

A. Before assembly, slide, frame, yoke, pedestal and all others welded parts shall be completely cleaned by abrasive blast using single-use glass bead or crushed glass, never recycled. All the surfaces of all parts shall be cleaned, in order to remove all contaminants and allow the stainless steel surface to passivate by spontaneously forming a chemically resistant surface when exposed to air. Cleaning only the welds by paste or other chemical means is not an acceptable method to remove all contaminants from the fabrication process and achieve the required level of passivation per ASTM A-380.

2.17 SCHEDULE

1. Two (2) mechanical slide gates shall be provided in accordance with the following schedule:

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GATE NAME AND TAG	GATE LOCATION	OPENING ACTION	DESIGN SEATING AND UNSEATING HEAD (FEET)	SLIDGE GATE DIMENSIONS (WxH)	INSTALLATION DEPTH BELOW TOP OF CHANNEL	MOUNT	STEM TYPE	OPERATOR
UV Bypass (LG-8-2)	Bypass channel	Upwards opening without top seal	10’	36” x 66”	6.0’	Self-contained frame on face of channel	SINGLE RISING	Yoke mounted handwheel
UV Maintenance (LG-8-1)	Upstream of UV system in effluent channel	Upwards opening without top seal	10’	44” x 48”	7.6’	Self-contained frame on face of channel	SINGLE RISING	Yoke mounted handwheel

PART 3 EXECUTION

3.01 DELIVERY

A. The manufacturer shall use due and customary care in preparing the gates and accessories for shipment. Self-contained frame gates shall be shipped assembled with stem and manual operator, whenever size permits. When shipping several gates together, every item shipped separately must be clearly marked to the gate it belongs to.

3.02 INSTALLATION

A. Contractor to handle, store, and install the gates in strict accordance with the manufacturer’s instructions and recommendations. The Contractor shall review the installation drawings and instructions before proceeding to the installation of the gates.

B. The gate assemblies must be installed on a true vertical plane, square and plumb. The operating stem shall be accurately aligned with the gate guides and properly greased.

3.03 FIELD TESTING

A. After installation, gates must be field tested by the Contractor, in the presence of the Engineer and Owner, to ensure compliance with the requirements of these specifications. Each gate shall be operated on its complete open-close cycle to confirm operation without binding, scraping or distorting. Operating effort on the handwheel shall be observed or measured.

B. Each gate shall be water tested by the Contractor and sealing performance shall be observed.

C. The Contractor shall supply a detailed report of the field tests to the Engineer for review.

3.04 WARRANTY

A. The slide gates and manual operating accessories shall be covered by a five (5) year warranty from the Manufacturer against defects in materials, design and workmanship. The warranty period will start from the date of delivery of the equipment to the installation site.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 44 44 13.10
WASTEWATER CHEMICAL FEED PUMPS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 1 shall govern work of this section.

1.02 APPLICABLE PUBLICATION

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. National Electric Code (NEC), Specifications and Standards, Current Edition.
   2. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing Wastewater Chemical Feed Pumps and appurtenant valves, fittings, and instrumentation. The chemical feed pump systems shall be furnished complete, including all accessory items necessary for a complete installation.
   1. Provide three (3) new Wastewater Chemical Feed Pumps (Pumps #1, #2, and #3) with Automatic Control SCRs and motors for the chemical phosphorus removal system.

1.04 RELATED WORK ELSEWHERE

A. Submittals - Division 1

B. Plumbing - Division 22

C. General Requirements - Division 26

D. Basic Materials and Methods - Division 26

E. Instrumentation and Control - Division 26

F. Chemical Storage Tank - Division 44

1.05 SUBMITTALS

A. Preparation of Shop Drawings shall be in conformance with requirements in Submittals - Division 1 of these specifications.

B. The Contractor shall submit such Shop Drawings and/or catalog cuts required for the construction and installation of the equipment. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to these specifications.

C. The Contractor shall provide a list, catalog cuts, and descriptive information of all instrumentation and control equipment components to be provided.

D. Shop drawings shall indicate the intended equipment arrangement, major support requirements, and process flow.

E. Shop drawings shall be submitted which indicate the internal control schematics and remote equipment, such as motor starters, flowmeters, etc. Shop drawings shall be submitted which indicate equipment and terminal block layout for interconnections to remote equipment.

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1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be of sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 1 of these specifications. The Contractor shall submit to the Engineer for review, an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURER

A. The chemical metering pumps shall be Grundfos Model DDA 200-4 FCM-PVC/V/C-F-31A7A7 or approved equal.

2.02 DESIGN REQUIREMENTS

A. Alum Feed Pump #1 Operating Criteria and Equipment requirements shall be as follows:
1. Quantity 1
2. Feedpoint Filtrate
3. Feedrate Adjustment Manual/SCADA
4. Service Liquid Alum
5. Design Feedrate 50.0 gph max, 0.1 gph min
6. Design Pressure 50 psi
7. Pump Turndown (minimum) 800:1
8. Suction Connection 1 inch
9. Discharge Connection 1 inch
10. Automatic SCR Controller Yes
11. Electric Power 120 VAC

B. Alum Feed Pump #2 Operating Criteria and Equipment requirements shall be as follows:
1. Quantity 1
2. Feedpoint Chemical Vault/Filtrate
3. Feedrate Adjustment Manual/SCADA
4. Service Liquid Alum
5. Design Feedrate 50.0 gph max, 0.1 gph min
6. Design Pressure 0-50 psi
7. Pump Turndown (minimum) 800:1
8. Suction Connection 1 inch
9. Discharge Connection 1 inch
10. Automatic SCR Controller Yes
11. Electric Power 120 VAC

C. Alum Feed Pump #3 Operating Criteria and Equipment requirements shall be as follows:
1. Quantity 1
2. Feedpoint: Chemical Vault
3. Feedrate Adjustment Manual/SCADA
4. Service Liquid Alum
5. Design Feedrate 50.0 gph max, 0.1 gph min
6. Design Pressure 0-50 psi
7. Pump Turndown (minimum) 800:1
8. Suction Connection 1 inch
9. Discharge Connection 1 inch
10. Automatic SCR Controller Yes
11. Electric Power 120 VAC

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2.03 MECHANICAL DIAPHRAGM METERING PUMP

A. Description
1. Chemical metering pumps shall be Mechanically Actuated Diaphragm, positive displacement, motor driven, metering pump.
2. Chemical metering pump shall be driven by a microprocessor controlled stepper motor providing a minimum of 800:1 turndown ratio. The stepper motor is to be coupled to a flat, PTFE diaphragm via a gear assembly. The drive assembly shall be a maintenance free design.
3. The pump shall operate at 100% stroke length throughout the pumps entire capacity range.
4. Solenoid-driven pumps, hydraulically actuated diaphragm pumps and those with a lost motion spring return will not be accepted.
5. The liquid end & valve design shall provide for ease of maintenance. Ball checks shall be cartridge type design.
6. The pump shall be able to measure actual flow through the head to monitor the dosing process without need for additional measuring equipment.
7. The pump shall be able to compensate automatically for pressure fluctuations on the injecting point, maintaining the flow rate constant.
8. Each pump shall have a maximum capacity of 200 l/hr at 4.0 bar.
9. Each unit shall be Grundfos DDA FCM Series digital dosing pumps.

B. Enclosure
1. Drive mechanism and microprocessor shall be housed in a corrosion resistant, plastic UV stabilized enclosure.
2. The pump design shall include provisions for optional positioning of the control interface/display, for right/left side and front mounting.
3. Pump enclosure rating shall be to IP65 and NEMA 4X standards.
4. The pump design shall include an integral removable click stop mounting plate, to allow for flat base or wall mounting.

C. Drive
1. The pump's stroke length will always be 100%. No adjustment to the stroke length, to regulate flow, or for other reasons, is acceptable.
2. An integral variable speed stepper motor shall be used to ensure the pump discharge phase extends through out the full period between suction intervals.
3. Variable frequency drives shall not be accepted.
4. The motor shall be integral, supplied with power cord and plug.
5. The drive mechanism shall not require regular field service or external lubrication.

D. Interface
1. User interface/display shall be backlit LCD with selectable on-site positioning for either side or front mounting.
2. The interface shall provide a selection of metered output to be displayed in liters per hour (l/h) or gallons per hour (gph). Pumps displaying percent (%) of output only will not be accepted.
3. The interface should include a turn and push knob (click wheel) for easy navigation.
4. The interface menu shall include 25 language selections and provide easy navigation of all configuration and operational functions.
5. The interface shall include a lock function to protect against unauthorized changes.
6. A built-in counter shall be included to provide a running total of, accumulated strokes, cumulative hours of operation and dosing flow.
7. A priming button shall be provided on the interface. The priming button shall initiate a time selectable prime cycle operating at full capacity without need of attenuating the pumps output setpoint.
8. A system of white, red, yellow and green LCD shall indicate pump status and alarm conditions.

E. Pump Liquid End
1. The process diaphragm shall be PTFE. PTFE coated diaphragms are not acceptable.
2. Head and valves body material shall be PVC, with Ceramic ball material.

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3. Wetted gasket material shall be FKM.
4. Suction and discharge valve design shall incorporate double ball arrangement. Spring-loaded valves shall be available as an option. Direction of flow shall be clearly marked on each check valve to ensure correct installation.
5. Head design shall incorporate integral priming valve.
6. A back-plate with separation chamber shall have a safety lip seal and drain hole.
7. The pump shall be certified for NSF/ANSI 61, Drinking Water System Components

F. Control
1. The pump shall come equipped with 5 menu selectable control modes; Manual, analog, pulse, timer or batch. Optionally, the pump shall also be Profibus DP, Profinet IO, Modbus TCP, Modbus RTU and EtherNet/IP compatible.
   a. Manual Control
      1) Output of pump is displayed in gal or liters per hour. Pump output adjustment is performed with the turn and push knob (click wheel) on the interface.
      2) Pumping rate changes are to be achieved through precise speed control with fixed full stroke length.
      3) Pump should include a start/stop key.\
   b. Automatic Control
      1) Analog: Pump shall include direct interface provisions for analog control. Both direct and reverse acting 0/4-20mA input configurations are to be acceptable inputs. The menu configuration shall permit pump maximum output multipoint scaling. The pump shall include a local alarm for loss of input signal.
      2) Pulse: The pump shall include direct interface provisions for pulse output devices. In pulse control mode, the pump shall be configured to deliver a volume of product per incoming pulse. The pump speed shall attenuate the delivery rate based on the frequency of pulses generated by the external device.
      3) Batch: In batch mode the pump shall respond to deliver a menu configurable quantity of liquid after receiving a remotely provided contact input.
      4) Cycle timer: The configuration menu of the cycle timer shall permit the user to prescribe batch volume, timed sequence start point and the time between each successive timed delivery cycle.
      5) Week timer: The pump shall be equipped with a real-time clock and a seven-day internal week timer. The configuration menu shall permit the user to prescribe up to 16 procedures with batch volume, dosing time, start time and weekdays.
2. Signal Inputs / Outputs
   a. Input for 4...20mA external pace signal
   b. Output for 4...20mA speed reference signal
   c. Input for external start/stop
   d. Output for running signal
   e. Output for fault signal
3. Communication Cabling
   a. Five M12-style cable sockets shall be positively secured to the side of the pump housing. M12-style cable sockets shall be covered with a waterproof and dust tight cap when not in use.
   b. A quantity of five M12-style shall be supplied with each pump with proper slot configuration to match each unique cable socket configuration.

G. Liquid Connections
1. Manufacturer to provide necessary fittings to tie into 1" SCH 80 PVC suction side and discharge side piping.

H. Attach data plate to each pump and frame.
1. Information on plate:
   a. Manufacturer's name
   b. Model number
   c. Pump type and size

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d. Pressure

2.04 SPARE PARTS

A. One (1) set of diaphragms with check valves shall be furnished for each pump.

2.05 CHEMICAL SPLASH CURTAIN

A. A chemical splash curtain shall be provided by the Contractor for protection against chemical spills and discharges. The splash curtain shall be compatible with the chemical utilized at the facility.

B. The chemical splash curtain shall be constructed as per plans.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with Shop Drawings and manufacturer's recommendations.

B. The electrical contractor shall provide the required control wiring between the flow transmitter and flow proportional control together with all other wiring.

3.02 EQUIPMENT START-UP

A. The equipment shall be started by a manufacturer's authorized representative who shall certify to the Engineer that all equipment is properly installed and the plant operator has been instructed concerning proper operation and maintenance.

B. A written report covering the representative's activities and installation approval shall be submitted to the Engineer. This report shall cover all inspections and outline in detail any deficiencies in the installation.

3.03 WARRANTY

A. The equipment shall be covered under warranty, at minimum, for 24 months from the date of installation.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 44 44 73.11
ULTRAVIOLET DISINFECTION EQUIPMENT

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards.
      a. ASTM A240 - Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels, Current Edition.
      b. ASTM A264 - Specification for Stainless Chromium-Nickel Steel Clad Plate, Sheet and Strip, Current Edition.
      c. ASTM A276 - Specification for Stainless and Heat-Resisting Steel Bars and Shapes, Current Edition.
   2. Commercial Standards Association (CSA), Specifications and Standards, Current Edition.
   3. Underwriters Laboratories (UL), Specifications and Standards, Current Edition.
   4. United States Environmental Protection Agency (US EPA), Design Manual EPA/625/1-86-201.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing an open channel, gravity flow, and low-pressure, high-intensity ultraviolet (UV) disinfection system complete with an automatic chemical/mechanical cleaning system and variable output lamp drivers. The UV system shall be complete and operational with all control equipment and accessories as shown on the contract drawings and specified herein. The system shall be complete with UV banks, system control center, detection systems, power distribution center(s), hydraulic system center(s), and structural support as shown on the contract drawings and specified herein. The system shall be designed for complete shutdown or bypass. The system shall be able to continue providing disinfection while replacing UV lamps, quartz sleeves, ballasts, and while cleaning the UV lamp sleeves. This system will be capable of disinfecting effluent to meet the water quality standards listed in this section.

B. The equipment shall be provided by a single manufacturer qualified and experienced in the production of similar equipment.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Cast-in-Place Concrete - Division 03

C. Metal Fabrications - Division 5

1.05 SUBMITTALS

A. The Contractor shall submit such Submittals and/or catalog cuts required for the construction and installation of the equipment. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications.

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B. The Contractor shall provide a list, catalog cuts and descriptive information of all instrumentation and control equipment components to be provided with the Ultraviolet Disinfection Equipment. This does not include the additional components required in the facility motor control center and the process control center.

C. Submittals shall indicate the intended equipment arrangement, major support requirements, plot area, and process flow.

D. Submittals shall be submitted which indicate the internal control schematics and remote equipment, such as motor starters, level sensors, etc. Submittals shall be submitted which indicated equipment and terminal block layout for interconnections to remote equipment.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be of sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review, an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. The ultraviolet disinfection system shall be Model TrojanUVSigna as manufactured by Trojan Technologies, Inc. or equal.

2.02 DESIGN CRITERIA

A.	Design Peak Flow:	11.6 mgd
B.	Average Flow:	2.35 mgd
C.	Total Suspended Solids (30 day average):	30 mg/L
D.	5-Day BOD:	30 mg/L
E.	Effluent Temperature:	33 to 85 °F (1 to 30 °C)
F.	Ultraviolet Transmittance @ 253.7nm:	65%, minimum

G. Effluent standard to be achieved: 126 E.COLI/100 ml
Based on a 30-day geometric mean of daily samples.

H. The system shall be installed in an existing concrete channel as shown on the contract drawings.

I. Water surface elevation shall be maintained through use of a fixed weir supplied by the manufacturer.

2.03 SYSTEM CONFIGURATION

A. The system supplied shall be arranged in the following manner:

1.	Number of UV Channels:	1
2.	Number of Banks per Channel:	2
3.	Number of Lamps per Bank:	14-Lamp Bank
4.	Total Number of Lamps in the UV System:	28
5.	Number of System Control Centers:	1

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6.	Number of UV Sensors:	1 per bank
7.	Number of Power Distribution Centers:	1
8.	Number of Hydraulic System Centers:	1
9.	Number of Level Controllers:	1

2.04 PERFORMANCE REQUIREMENTS

A. Provide a UV disinfection system complete with UV Banks and lifting mechanism, System Control Center, Power Distribution Center(s), Hydraulic System Center(s), and Water Level Controller(s) as shown on the contract drawings and as herein specified.

B. The ultraviolent disinfection system will produce an effluent conforming to the following discharge permit: 126 E.Coli/100 mL, based on a 30 day Geometric mean. Grab samples will be taken in accordance with the Microbiology Sampling Techniques found in *Standard Methods for the Examination of Water and Wastewater, 21st Ed.*

C. The UV system will be designed to deliver a minimum of RED of 30 mJ/cm^2 MS2 at peak flow, in effluent with a UV Transmission of 65% at the4 end of lamp life (EOLL) after reductions for quartz sleeve fouling. The basis for evaluating the RED will be the independent third party bioassay, without exception. Bioassay validation methodology to follow applicable protocols described in NWRI *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003, 2012) and 2006 USEPA UVDGM.

D. The RED will be adjusted using an end of lamp life factor of 0.5 to compensate for lamp output reduction over the time period corresponding to the manufacturer's lamp warranty. The use of a higher lamp aging factor will be considered only upon review and approval of independent third party data that has been collected and analyzed in accordance with protocols described in the NWRI *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003, 2012).

E. The Red will be adjusted using a quartz sleeve fouling factor of 0.8 to compensate for quart sleeve transmission reduction due to wastewater effluent fouling. The use of a higher quartz sleeve fouling factor will be considered only upon review and approval of independently verified data that has been collected and analyzed in accordance with protocols described in the NWRI *Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse* (May 2003, 2012). The data recorded for the determination of the validated fouling factor must be obtained by testing in secondary wastewater effluent utilizing the same lamp, quart sleeve and cleaning system proposed by the UV manufacturer.

F. Independent validation for use of higher factors (lamp aging and sleeve fouling) must be submitted to the Engineer for consideration a minimum of fifteen (15) days prior to bid. The independent validation shall have oversight by a qualified registered professional engineer with knowledge and experience in testing and evaluating of UV systems as defined in the EPA UVDGM (Appendix C, Section C.3.3).

G. The system will be designed for complete outdoor installation.

H. The flow characteristics through the system shall closely simulate ideal plug flow conditions under the full operating flow range. The Morrill Dispersion Index shall be less than 2.0. The coefficient t_{50}/T shall have a value between 0.9 and 1.1. The coefficient t_f/T shall have a value greater than 0.5.

I. The dispersion coefficient E shall be less than 100 cm^2/second. The dispersion number d shall be less 0.1.

J. The flow through the system shall be turbulent with a Reynolds Number greater than 4,000 at average flow.

K. Full use shall be made of the reactor volume throughout the flow range. The coefficient theta divided by T shall be greater than 0.9.

L. The headlosses through the entire system shall not exceed 2.2 inches as calculated using a headloss formula agreed to by the Engineer.

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2.05 MATERIALS

A. All UV Bank metal components in contact with effluent will be Type 316 stainless steel.

B. All wiring exposed to UV light shall be Teflon coated.

C. All material exposed to UV light shall be Type 316 stainless steel, Type 214 quartz, or Teflon.

D. All wires connecting the lamps to the ballasts will be enclosed inside the frame of the UV Bank and not exposed to the effluent.

2.06 LAMP ARRAY CONFIGURATION

A. The lamp array configuration shall be a uniform, staggered inclined array with all lamps parallel to each other and perpendicular to the flow. The lamps shall be evenly spaced in horizontal and vertical rows with centerline spacings equal in both directions.

B. The lamp array pattern shall be continuous and symmetrical throughout the bank.

C. Systems with a concentric array or uniform staggered array and having an equivalent UV density shall have 30% additional lamps to compensate for the inefficiencies of these arrays as shown on Page 206, Figure 7-33 of the US EPA Design Manual.

D. The system shall be designed for complete immersion of the UV lamps under all flow conditions, including both electrodes and the full length of the lamp arc. Both lamp electrodes shall operate at the same temperature and be cooled by the effluent.

E. Systems designed whereby the lamps are inserted through a metallic bulkhead or which otherwise prevent continuous cooling of the lamp electrodes by the effluent shall not be permitted.

F. To maximize performance and ensure safety, bank light locks will be used in each bank to prevent potential short circuiting over the top of the lamps.

G. For any UV inclined system that does not contain UV bank light locks to prevent short circuiting, the system shall be supplied with 1 additional UV bank to compensate for short-circuiting over the top of the lamps.

2.07 UV BANK

A. Each UV bank shall consist of 14 UV lamps, quartz sleeves, and an automatic chemical/mechanical cleaning system with an electronic ballast enclosure mounted on a Type 316 stainless steel frame.

B. Each lamp will be enclosed in its individual quartz sleeve, one end of which will be closed and the other end sealed by a lamp end seal. To be considered as an alternate, lamp quartz sleeves that are open at both ends will be supplied with twice the amount of specified spare seals and lamps.

C. The closed end of the quartz sleeve shall be held in place by a retaining O-ring. The quartz sleeve shall not come in contact with any steel in the frame.

D. Lamp wires shall terminate in the electronic ballast enclosure located at the top of the UV Bank.

E. Each UV Bank will contain a pre-formed Type 316 stainless steel wall on each side to prevent possible short-circuting at the side walls of the reactor.

F. Each UV Bank will contain light locks at the top of the bank to prevent short circuiting over the top of the lamps and maximize disinfection efficiency.

G. The enclosure shall be anodized aluminum.

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H. The UV Bank shall be connected to a receptacle on the Power Distribution Center by means of a multi-conductor cable with a molded connector.

I. At the point of exit from the UV Module frame the multi-conductor cable shall pass through a waterproof strain relief.

J. Each UV Bank will be rated Type 6P. UV Banks that are not Type 6P are not acceptable.

K. The UV Modules shall be designed such that operating personnel at the plant can change the lamps and quartz sleeves.

L. To minimize maintenance, equipment must be provided by the UV manufacturer to enable lifting a complete bank of lamps from the channel at once for inspection and/or servicing.

2.08 UV LAMPS

A. Lamps will be high intensity low pressure amalgam design. Lamps that are not amalgam will not be allowed.

B. The filament shall be significantly rugged to withstand shock and vibration.

C. Electrical connections for the lamp will consist of four (4) pins at one end of the lamp only. Lamp wiring shall be Teflon insulated stranded wire.

D. Lamps without maintenance coating or that do not have four (4) pins are considered instant-start and are not acceptable due to reduced reliability and increased maintenance and operating costs.

E. Lamps will be rated to produce zero levels of ozone.

F. The lamp shall withstand an average of four (4) on/off cycles per day without reducing lamp life, warranty or causing any damage to the lamp.

G. Lamps will be operated by electronic lamp drivers with variable output capabilities ranging from 30% to 100% of nominal power. The lamp assembly shall incorporate active filament heating to maintain a minimum lamp efficiency of 35% across varying water temperatures and between the minimum and maximum stated lamp power levels.

H. UV Manufacturer to supply all cabling between lamps and drivers.

2.09 LAMP PLUGS

A. Each lamp plug will be accessible from the top of the UV bank to facilitate lamp removal without moving the UV banks or any other components.

B. Each lamp plug shall have provisions for a light emitting diode (LED) visual indicator that indicates on/off status for each lamp.

C. An integral safety interlock in the lamp plug will prevent removal of energized lamps.

D. The lamp plug shall be rated Type 6P.

2.10 LAMP DRIVERS

A. Each lamp driver will independently power two (2) UV lamps. Failure of one lamp will not affect operation of the other lamp.

B. The lamp driver will have a power factor correction circuit to ensure minimum 99% power factor and less than 5% total harmonic distortion (THD) current at the maximum power level and nominal input voltage.

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C. The lamp driver electrical efficiency will be minimum 95% at the maximum power level.

D. The lamp driver will be programmed-start type utilizing filament preheat followed by a high voltage pulse to ignite the lamp.

E. During lamp operation, variable filament heating current shall be provided according to a predetermined curve to maintain optimum filament temperature and amalgam temperature to ensure maximum lamp life and maintain a minimum lamp efficiency of 35% across varying water temperatures and between the minimum and maximum stated lamp power levels.

F. A ground fault in the output circuit shall be detected and communicated as a warning to the external controls system while the corresponding lamp operates undisturbed.

G. The communication protocol shall be Modbus implemented on an RS485 electrical interface. Wiring provided by Division 26.

H. Local visual diagnostic will be provided with LEDs for lamp driver status, lamp status (on, idle, preheat, fault), power and communication status.

I. For reliability and to facilitate trouble shooting, at a minimum, the following external indicators (protections, status, warnings and alarms) shall be provided: lamp status, driver status, ground fault, and communication time-out. The lamp driver shall be UL, CE, and RoHS compliant.

2.11 QUARTZ SLEEVES

A. Quartz sleeves will be clear fused quartz circular tubing containing 99.9% silicon dioxide.

B. Sleeves will have minimum UV transmittance at 254nm of 87% (2.5mm wall thickness).

C. Sleeves will be open at one end only and domed at the other end.

2.12 CLEANING SYSTEM

A. An automatic in-situ cleaning system will be provided to clean the quartz sleeves using both chemical and mechanical methods. Wiping sequence will be automatically initiated with capability for manual override.

B. The cleaning system shall also incorporate an integrated debris removal device to clear the quartz sleeves of any large solids or debris to maximize the life of the chemical/mechanical cleaning system.

C. The wiper on the cleaning system shall be parked out of the effluent when not in use.

D. Cleaning systems that utilize a screw drive, or park the wiper in the effluent while not in use shall not be acceptable due to collection of debris in and around the wetted parts of the wiper.

E. The cleaning system will be fully operational while UV lamps and modules are submerged in the effluent channel and energized.

F. To minimize maintenance, UV System will be designed such that cleaning solution replacement can be performed while the UV Bank and lamps are in place and operational in the channel.

G. Cleaning sequence frequency will be field adjustable to enable optimization with effluent characteristics.

H. Cleaning system operation will be remote auto (default) or remote manual.

I. The cleaning system will be provided with the required solutions necessary for initial equipment testing and for equipment start-up.

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J. The wipers shall travel the full length of the UV lamp arc. Designs in which the wipers only travel part way along the sleeves will not be acceptable.

K. The UV intensity sensor shall be cleaned utilizing the same chemical/mechanical cleaning method as that of the lamp quartz sleeves. UV intensity sensors that only utilize a mechanical means shall not be acceptable.

2.13 EFFLUENT LEVEL CONTROLLER

A. Level Control Weir
1. Level control weir to be located at the discharge end of the UV channel.
2. Weir will be designed to maintain the minimum channel effluent level required to keep lamps submerged at all times.
3. Weir to be constructed of Type 304 stainless steel.

2.14 LIGHT LOCKS

1. Light locks, two (2) per bank, will be provided to force effluent through the UV treatment zone maximizing disinfection performance.
2. The entire length of the lamp arc will remain submerged to maximize UV dose delivered to the effluent and to prevent any UV exposure above the water free surface.

2.15 POWER DISTRIBUTION CENTER (PDC)

1. The configuration of Power Distribution Center shall be 28 lamps per PDC.
2. PDC enclosure material will be 304 Stainless Steel – Type 4X (IP66).
3. All internal components will be sealed from the environment.
4. All Power Distribution Centers to be UL approved or equivalent.
5. An air conditioner externally mounted to the PDC will be provided to prevent overheating of electrical components during high ambient air temperature conditions.
6. An internal heater will be provided in the PDC to prevent condensation when the external temperature drops below the dew point.
7. Each PDC shall be able to electrically isolate each bank of lamp drivers and safely replace a lamp driver without de-energizing any other operating banks.

2.16 HYDRAULIC SYSTEM CENTER (HSC)

1. The Hydraulic System Center houses the components required to operate the automatic cleaning system and bank Automatic Raising Mechanism (ARM).
2. HSC enclosure material will be 304 Stainless Steel (Type 4X, IP 66) (Type 4X).
3. The HSC will contain hydraulic power unit complete with pump, fluid reservoir, manifolds, valves and filter.

2.17 ELECTRICAL

A. General
1. All applicable electrical components will be UL-listed to ensure safety standards are met.
2. Each UV lamp within a bank will be powered from a Power Distribution Center.
3. Each electronic lamp driver will power two lamps.
4. Power factor will not be less than 99% leading or lagging.
5. Electrical supply to each Power Distribution Center will be 480/277V 60Hz, 3 Phase, 4 Wire + Ground, 31.7 kVA.
6. Electrical supply to the Hydraulic System Center will be 480V 60Hz, 3 Phase, 3 Wire + Ground, 2.5 kVA.
7. Electrical supply to the low water level sensor box will be from 120V, 1 Phase, 2 Wire + GND.
8. Electrical supply to the System Control Center will be 120V 60Hz, 1 Phase, 2 Wire + Ground, 1.8 kVA

2.18 CONTROL AND INSTRUMENTATION

A. System Control Center (SCC)

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1. The monitoring, operation, and control of the TrojanUVSigna is managed at the System Control Center (SCC) by a CompactLogix, model 5069-L3XXER, with a SCC HMI Beijer – 12'' (316 SST Outdoor 4X Rated) HMI screen.
2. Panel shall be rated NEMA 4X and wall mounted.
3. Provide (1) N-Tron 108TX ethernet switch. SCC shall communicate Ethernet IP to SCADA.
4. Provide Modbus-Ethernet protocol converter for interfacing the SCADA system and SCC communication protocol with the communication protocol of the Power Distribution Center and Hydraulic System Center.
5. Provide all required panel components for a complete and operable control system.
6. Alarms will be provided to plant operators that maintenance attention is required or to indicate an extreme alarm condition in which the disinfection performance may be jeopardized. The alarms will include, but not limited to:
    a. Low warning UV intensity alarm shall be preset at the factory for 25% of the intensity after 100 hours. Alarm set point shall be field adjustable.
    b. Individual Lamp Failure shall indicate single lamp failures that occur.
    c. Multiple Lamp Failure shall indicate multiple lap failures that occur.
    d. Bank Communication Alarm.
7. The 100 most recent alarms will be recorded in an alarm history register and will be displayed when prompted.
8. Mode of operations for UV Banks can be manual, automatic, or remote.
9. Elapsed time of each bank shall be recorded and displayed on the display screen when prompted.

B. Low Water Level Sensor
1. The UV Manufacturer will provide (1) low water level sensor for each UV channel.
2. During all modes of system operation (manual, automatic, and remote), the water level sensor will ensure that lamps extinguish automatically if the water level in the channel drops below an acceptable.

C. UV Intensity Sensors
1. A UV sensor will continuously monitor the UV intensity produced within each UV Bank.
2. The sensors will measure only the germicidal portion of light emitted by the lamps.
3. The UV sensor shall be factory-calibrated to US National Institute for Standards and Technology (NIST). Sensors requiring field-calibration are not acceptable.
4. The sensor shall be digitally calibrated to ensure calibration accuracy.
5. To ensure continuous disinfection, the sensor shall be accessible without shutting down the system, lifting a bank/module or removing lamps.
6. Sensors will be designed to provide UV intensity data for dose monitoring and control functions. Dose pacing program will enable use of measured UV intensity along with flow rate and UVT to determine the delivered dose during operation.
7. Sensors will be designed such that reference sensor readings can be taken without interrupting disinfection and without removing UV lamps, banks/modules or sleeves.

D. Bank In Place Proximity Sensors
1. UV Manufacturer to supply bank in place proximity sensor for UV bank(s).
2. UV Manufacturer to supply 3-conductor cabling for UV bank proximity sensor(s).

E. Dose-Pacing
1. The dose-pacing system to modulate the lamp UV output will be in relation to a 4-20 mA DC signal from an existing effluent flow meter and new UV intensity sensor(s).
2. The system to be dose-pacing such that as the flow and effluent quality change, the design UV dose is delivered while conserving power.
3. The dose-pacing system will allow the operator to vary the design dose setting. Logic and time delays will be provided to regulate UV Bank ON/OFF cycling.

F. On-Line UV Transmission Monitor

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1. An on-line UVT monitor will be provided to automatically and continuously tack the UV transmission of the effluent at the 254 nm wavelength. UVT monitor will be UVAS as manufactured by Hach Company.
2. UV Manufacturer to supply UVAS sc sensor cable and plug for connecting the UVAS sensor to the system controller.
3. UV Manufacturer to supply stainless steel pole mounting kit for UVAS sensor as recommended for design application by Hach Company.
4. The UVT monitor will measure transmittances from 25 to 100%.
5. Power feed of 100 – 230 VAC ± 10%, 50/60 Hz, 1 phase, 2 wire (plus ground), 50 VA required to the sensor located at the UV channel as shown on the Drawings.
6. New UVT monitor will interface with existing Hach SC4500 controller and remaining Hach system control panel. A Cat-6 cable for communicating UV transmission over Ethernet communications to be provided by the Contractor for connecting the existing Hach system control panel to the new System Control Center. The SCC will modulate the lamp intensity in response to the effluent UV Transmission.

2.19 UV BANK LIFTING DEVICE

A. The lifting device for UV Banks will be supplied by the UV Manufacturer.

B. An Automatic Raising Mechanism (ARM) will be designed and supplied to facilitate lifting a UV bank from the channel without use of ancillary equipment.

C. The ARM will be integrated into the UV Bank for simple and seamless operation.

D. The UV Bank will be raised from the channel for easier access and maintenance.

E. The ARM design will provide access to components without having to break electrical connections thus reducing wear on connectors.

F. Contractor to provide four (4) hydraulic hoses per UV Bank with associated connections as per Manufacturer recommendations. Hydraulic hoses and connections to be compatible with UV Bank Lifting Device.

2.20 CABLE MANAGEMENT SYSTEM

A. Manufacturer to provide all necessary implements as required for an effective cable management system.

2.21 SPARE PARTS

A. The following spare parts shall be furnished:
3 - UV Lamps
3 - Quartz Sleeves
3 - Lamp Wiper Seals
1 - Ballast
2 - Operators Kit that includes UV-resistant face shield, gloves, and cleaning solution.

2.22 WARRANTY

A. Equipment:
1. The equipment furnished under this section will be free of defects in material and workmanship, including damages that may be incurred during shipping for a period of 24 months from date of start-up or 30 months after shipment, whichever comes first.

B. UV Lamps:
1. The UV lamps to be warranted for a minimum of 12,000 hours when operated in automatic mode, prorated after 9,000 hours.

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C. Ballasts to be warranted for 5 years, prorated after 1 year.

PART 3 EXECUTION

3.01 INSTALLATION

A. Contractor to install equipment as shown on the Plans and in accordance with manufacturer's instructions and reviewed Submittals. A Contractor Installation Checklist to be completed and returned at least two (2) weeks prior to date requested for commissioning. Photographs illustrating site readiness are required. The Contractor assumes all responsibility for the installation readiness of the UV system.

3.02 EQUIPMENT START-UP

A. The equipment shall be started by a manufacturer's authorized representative who shall certify to the Engineer that all equipment is properly installed and the plant operator has been instructed concerning proper operation and maintenance.

B. Equipment manufacturer or manufacturer's authorized representative shall provide a minimum of one-day operator training on the new UV system.

3.03 POST START-UP

A. Three to five months following start-up, a manufacturer's authorized representative shall perform a site visit to inspect the condition and function of the equipment and answer Owner questions. The date and time for the visit shall be determined with the Owner.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 44 53 00
SOLID WASTE PROCESSING EQUIPMENT

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 1 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
1. American National Standards Institute (ANSI), Specifications and Standards, Current Edition.
2. American Society of Mechanical Engineers (ASME), ASME Code.
3. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
4. American Water Works Association (AWWA), Specifications and Standards, Current Edition.
5. National Electric Code (NEC), Specifications and Standards, Current Edition.
6. National Electrical Manufacturers Associations (NEMA), Specifications and Standards, Current Edition.
7. Steel Structures Painting Council (SSPC), Specifications and Standards, Current Edition.
8. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.
9. American Iron and Steel Institute (AISI), Specifications and Standards, Current Edition.
10. American National Standards Institute (ANSI), Specifications and Standards, Current Edition.
11. American Welding Society (AWS), Specifications and Standards, Current Edition.
12. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor, Part 1926 Regulations, Current Edition.

1.03 DESCRIPTION OF WORK

A. The Pelletizer System Supplier shall furnish the necessary process equipment and select process piping and piping supports as specified herein. The Pelletizer System Supplier shall furnish and install the necessary instrumentation for a complete Pelletizer Controls System as shown on the Contract Documents and as specified herein. Pelletizer System instrumentation shall be wired by Division 26. The Work includes one (1) tote discharger with inclined screw conveyor, two (2) Chainvey conveyance systems, one (1) screener system, one (1) bucket elevator, one (1) pelletizer feeder, one (1) pelletizer conditioner, one (1) pellet mill, one (1) counterflow cooler, one (1) cooler cyclone, and one (1) cooler main fan.

B. The Contractor shall install all equipment being furnished by the Pelletizer System Supplier and shall provide all remaining equipment, controls, and necessary appurtenances for a complete Pelletizer System. The Contractor shall provide general hardware, piping, pipe supports, and electrical equipment as shown and specified within the Contract Documents. The Contractor or Contractor's representative shall install the full scope of the Work in accordance with the Contract Documents.

C. The Pelletizer System Supplier shall provide a complete and operable control system for the pelletizer and the auxiliary process equipment. The pelletizer system control panel shall be constructed to land all field wires for the control points as shown on the Contract Documents and as specified herein.

D. The Pelletizer System Supplier shall provide a pelletizer system local control station equipped with an operator interface terminal and emergency stop pushbutton located remotely from the pelletizer system control panel as shown and specified herein.

E. The Pelletizer System Supplier shall verify the rating for all provided instrumentation and equipment based upon field conditions as shown on the Contract Documents.

F. Division 26 shall provide a motor control center system equipped with the required motor controllers and additional control components for the pelletizer system and auxiliary process equipment. The pelletizer

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system control panel provided by the Pelletizer System Supplier shall be responsible for communicating with the motor control center to control and monitor all pelletizer and auxiliary system motors.

G. The Pelletizer System Supplier shall provide all control, monitoring, alarming, and setpoint data registers to the System Integrator no less than 6 weeks prior to the start-up of the equipment for incorporation of all graphics and interfacing with the existing SCADA system at the facility and pelletizer system motor control center. At a minimum, provide 16 hours of coordination time with the System Integrator. The Pelletizer System Supplier shall be responsible for full control of all pelletizer systems, but SCADA shall be configured to monitor, alarm, and change setpoints of the pelletizer systems from SCADA. The pelletizer system control panel provided by the Pelletizer System Supplier shall be responsible for communicating with the existing Sludge Dryer Building Control Panel for incorporation into the SCADA system.

H. The design is based on the Pelletizer system from Pesco, Inc. Any additional Work needed for other Pelletizer System Supplier's equipment shall be provided at no additional cost to the Owner.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements – Division 00 (All Sections)

B. Submittals – Division 01

C. Anchor Bolts – Division 05

D. Plumbing – Division 22

E. Heating, Ventilating, and Air Conditioning (HVAC) – Division 23

F. Electrical – Division 26

G. Wastewater Process Piping System – Division 40

H. Wastewater Process Valves and Specialties – Division 44

1.05 SUBMITTALS

A. Preparation of Submittals shall be in conjunction with requirements in Submittals - Division 01 of these specifications.

B. Contractor shall submit the Equipment Data Form – see Section 01 33 00 Submittals.

C. The Contractor shall submit such submittals and/or catalog cuts required for installation of the equipment. These submittals shall be accurate in every detail and shall contain all information necessary to relate the equipment to these specifications.

D. The Contractor shall provide a list, catalog cuts, and descriptive information of all instrumentation and control equipment components to be provided with the system.

E. Submittals shall indicate the intended equipment arrangement, major support requirements, plot area, and process flow.

F. Submittals shall indicate the internal control schematics and remote equipment, such as motor starters, etc. Submittals shall indicate equipment and terminal block layout for interconnections to remote equipment.

G. such as motor starters, etc. Submittals shall indicate equipment and terminal block layout for interconnections to remote equipment.

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1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review an outline of any variations of information for the operation and maintenance manuals and other documentation they propose to prepare.

B. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

C. The Pelletizer System Supplier shall provide one (1) copy of electronic format and one (1) hard copy of information for the Owner to utilize in Operation and Maintenance of the system.

D. The Operation and Maintenance manual shall include the following information for the system:
1. Warranty
2. Process Guarantee
3. Operation recommendations regarding the process
4. Installation recommendations
5. Maintenance requirements and schedule
6. Equipment drawings
7. Equipment technical data

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All equipment and parts shipped to the job site shall be properly protected from the elements so that no damage or deterioration occurs from the time of delivery to the time when the installation is complete and the units are placed into operation.

B. Manufacturers shall define the requirements to properly protect the equipment and parts shipped to the job site.

1.08 DESIGN CRITERIA

A. The Pelletizer System shall be designed based on the following solids source characteristics:

Parameter	Value
Design Solids Throughput	2,000 lb/hour
Solids Density	40 lb/ft^3
Target Moisture Content	14%

B. The Pelletizer System shall be designed to operate during working hours when staff are present at the facility, with the upstream solids dryer system operating continuously during periods when solids drying is completed.

C. The Pelletizer System shall be designed based on an upstream solids dryer design throughput of 665 lbs/hour.

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PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. The Pelletizer System equipment shall be supplied by Pesco, Inc. of Edina, Minnesota, or Engineer-approved equal.

Contact Information: Jacob Harper – Pesco, Inc.
jharper@pescoinc.com
(612)965-2642 (Cell)

B. The individual pieces of equipment for the Pelletizer System shall be supplied by the manufacturers as specified herein, or Engineer-approved equal.

2.02 SCOPE OF SUPPLY

Below is a list of equipment supplied by the Pelletizer System Supplier. All other components required to ensure a complete installation shall be supplied by the Contractor.

PROCESS	EQUIPMENT	QTY	Equipment Tag / Comments
Conveyance Equipment and Accessories	Tote Discharger with Inclined Screw Conveyor Flexicon Models BFH-C-X and UTRS-S045-015 5 HP	1	M-35-1-1
	Chainvey Conveyor Chainvey Model 3” Chainvey 5 HP	2	M-35-4-1 (Counterflow Cooler Input) M-35-5-1 (Counterflow Cooler Output)
	Chainvey Conveyor Supports (U-bolts and brackets) and Compression Couplings	2	One (1) set of supports and compression couplings per Chainvey Conveyor
	Chainvey Conveyors Pneumatic Tensioner Pressure Regulator Valve	2	AV-35-4-1, AV-35-5-1 One per Chainvey Conveyor
	Chainvey Conveyors Pneumatic Tensioner Check Valve	2	AV-35-4-2, AV-35-5-2 One per Chainvey Conveyor
	Bucket Elevator Universal Industries Model U-94ED 1 HP	1	M-35-3-1

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PROCESS	EQUIPMENT	QTY	Equipment Tag / Comments
	Metal Fabrication Transition Pieces	5	Transition from Pneumatic Roller Slide Gate to Flexible Tubing Covered Hopper between Bulk Bag Unloader and Tubing from Transfer Conveyor into Screener Transition from Screener to Bucket Elevator Covered Hopper from Bucket Elevator Process Piping to Pelletizer Feeder Inlet Transition from Counterflow Cooler Discharge to Chainvey Conveyor Inlet
	Pneumatic Roller Slide Gate Valve Solina Vortex Model SA13V1-WS1-SB	1	GV-27-2-3 (Roller Gate), FV-27-2-3 (Solenoid Valve)
Screening Equipment and Accessories	Gentle Roll Screener EBM Model 24S-1-HB 3 HP	1	M-35-2-1
Pelletizer System Equipment and Accessories	Feeder CPM Model FD9INF 2 HP	1	M-36-1-1
	Conditioner CPM Model C18INF6.5 10 HP	1	M-36-2-1

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PROCESS	EQUIPMENT	QTY	Equipment Tag / Comments
	Water Add System Panel 0-500 lbs/hour	1	Manual Ball Valve (WV-36-2-1) Y-Strainer Water Supply Pressure Gauges (PI 36-2-1 and PI 36-2-2) Pressure Regulator Valve (WV-36-2-2) Flow Transmitter (FE/FT 36-2-1) Filter Regulator Lubricator Electrically Actuated Ball Valve (WCV-36-3-1) Pneumatically Actuated Ball Valve and Solenoid (WCV-36-3-2) WV-36-2-3 (Check Valve) Mounting Plate
	Pellet Mill CPM PM1116-4 75 HP	1	M-36-3-1
Cooling Equipment and Accessories	Counterflow Cooler CPM Model 5-34-4A Inlet Feeder – 1 HP	1	M-37-1-1
	Cooler Cyclone w/ Stand Coperion Model CT36	1	T-37-3-1
	Airlock/Fines Rotary Valve Coperion Model MD20 0.75 HP	1	M-37-2-1
	Cooler Main Fan Twin City Fan RBO/R 15 HP	1	M-37-3-1
Conveyance Equipment Instruments	Inclined Screw Conveyor Motor Temperature Switch	1	TSH-35-1-1

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PROCESS	EQUIPMENT	QTY	Equipment Tag / Comments
	Inclined Screw Conveyor Level Switch	1	LSL-35-1-1
	Pelletizer System E-Stop Button	1	XS-35-1-1 (Bulk Bag Unloading Location)
	Chainvey Conveyors Pneumatic Tensioner Pressure Switches	4	PSL-35-4-1 (Cooler Input Conveyor Low) PSH-35-4-1 (Cooler Input Conveyor High) PSL-35-5-1 (Cooler Output Conveyor Low) PSH-35-5-1 (Cooler Output Conveyor High)
	Chainvey Conveyors Pneumatic Tensioner Limit Switches	4	ZSL-35-4-1 (Cooler Input Conveyor Low) ZSH-35-4-1 (Cooler Input Conveyor High) ZSL-35-5-1 (Cooler Output Conveyor Low) ZSH-35-5-1 (Cooler Output Conveyor High)
	Chainvey Conveyors Pneumatic Tensioner Pressure Gauges	2	PI-35-4-1 (Cooler Input Conveyor Pressure) PI-35-5-1 (Cooler Output Conveyor Pressure)
	Chainvey Conveyors Door Switches	2	ZSO-35-4-1 (Cooler Input Conveyor Lid Open) ZSO-35-5-1 (Cooler Output Conveyor Lid Open)
	Chainvey Conveyors Motor Temperature Switches	2	TSH 35-4-1 (Cooler Input Conveyor Motor Temp) TSH 35-5-1 (Cooler Output Conveyor Motor Temp)

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PROCESS	EQUIPMENT	QTY	Equipment Tag / Comments
	Bucket Elevator Speed Switch	1	SS-35-3-1
	Bucket Elevator Motor Temperature Switch	1	TSH-35-3-1
	Pneumatic Roller Slide Gate Valve Proximity Switches	2	Open and Closed positions
Screening Equipment Instruments	Screener Level Switch	1	LSH-35-2-1
	Screener Motor Temperature Switch	1	TSH-35-2-1
	Screener Speed Switch	1	SS-35-2-1
Pelletizer System Equipment Instruments	Feeder Inlet Hopper Pellet Source Surge Level Switches	2	LSL-36-1-1 (Low) LSH-36-1-1 (High)
	Feeder Motor Temperature Switch	1	TSH-36-1-1 (Motor Temp)
	Conditioner Motor Temperature Switch	1	TSH-36-2-1 (Motor Temp)
	Conditioner Temperature Transmitter	1	TT-36-2-1
	Pellet Mill Motor Temperature Switch	1	TSH-36-3-1
	Pellet Mill Shear Pin	1	NSH-36-3-1
	Pellet Mill Door Switch	1	ZE-36-3-1
	Pelletizer System E-Stop Button	1	XS-36-3-1 (Pellet Mill Location)
	Pellet Mill BEMF Key	1	HS-36-3-1-3 (To be furnished for installation in Division 26 MCC)
	Pelletizer System Active Alarm Light	1	YL-36-3-1
Cooling Equipment Instruments	Counterflow Cooler Inlet Feeder Motor Temperature Switch	1	TSH-37-1-1 (Motor Temp)

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PROCESS	EQUIPMENT	QTY	Equipment Tag / Comments
	Counterflow Cooler Temperature Transmitter	3	TT-37-3-1 (Air Exhaust) TT-37-1-1 (Pellet Discharge) TT-37-1-2 (Ambient Air)
	Counterflow Cooler Level Switch	3	LSH-37-1-1 (Overflow) LSC-37-1-1 (Operating) LSL-37-1-1 (Low)
	Counterflow Cooler Door Switch	1	ZS-37-1-1
	Counterflow Cooler Discharge Grid Solenoid Valve	1	SCV-37-1-1 (Open/Close)
	Counterflow Cooler Discharge Grid Proximity Switch	1	ZS- 37-1-2 (Closed/Home)
	Counterflow Cooler Inlet Hopper Level Switch	1	LSH-37-1-2 (High Level)
	Counterflow Cooler Discharge Level Switch	1	LSH -37-1-3 (Surge Hopper)
	Cooler Cyclone Paddle-Style Plug Switch	1	LSH -37-2-1 (High Level)
	Cyclone Airlock/Fines Rotary Valve Motor Temperature Switch	1	TSH -37-2-1 (Motor Temp)
	Cooler Main Fan Motor Temperature Switch	1	TSH -37-3-1 (Motor Temp)
Pelletizer System Control Panels	Pelletizer System Main Control Panel CPM Automations	1	LCP-36-3-1 (Refer to detailed specifications for component requirements)
	Pelletizer System Local Control Station CPM Automations	1	XS-36-3-1 (Refer to detailed specifications for component requirements)

2.03 CONVEYANCE EQUIPMENT

A. Tote Discharger with Inclined Screw Conveyor
1. The tote discharger with inclined screw conveyor shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) tote discharger with inclined screw conveyor
3. Tote Discharger with Inclined Screw Conveyor Design Conditions
a. Name Tote Discharger with Inclined Screw Conveyor
1) Quantity 1

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2)	Rigid Tote Exterior Dimensions	57” (L) x 45” (W) x 74” (H)
3)	Motor Horsepower	5 HP
4)	Motor Control	VFD
5)	Manufacturer and Model No.	Flexicon BFH-C-X (tote discharger) and Flexicon UTRS-045-015 (inclined screw conveyor)

4. Tote Discharger with Inclined Screw Conveyor Construction
   a. The tote discharger shall be designed for loading rigid totes via Owner-supplied lifting mechanism and mounting onto the frame.
   b. The tote discharger shall include a frame extended above mounting location for side support of the rigid tote. Frame dimensions shall accommodate the rigid tote.
   c. The tote discharger shall include a hopper cover with bulk bag interface chute. Interface chute shall consist of a dust-tight snap action door, air displacement vent, and filter sock.
   d. A hopper screen shall be provided prior to the floor hopper with 1-3/8” square openings and shall be capable of supporting up to 100 lbs of solids material. The hopper screen shall be accessible via the special hopper cover.
   e. The tote discharge shall include a floor hopper with 7 cubic foot capacity and vertical side wall extension.
   f. The inclined screw conveyor shall be of UHMW polyethylene construction for the outer tubing with a round wire spiral configuration.
   g. The tote discharger with inclined screw conveyor contact surfaces shall be of 304 stainless steel construction.
   h. Pelletizer System Supplier shall coordinate height and length of inclined screw and coordinate connection into gentle roll screener inlet hopper. Discharge from inclined screw shall be of 8-inch diameter.

5. Motor
   a. Motor horsepower as specified on equipment design conditions herein.
   b. Motor Speed: 1725 RPM
   c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   d. Motor shall be rated for operation in a Class II, Division 2 environment.
   e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
   f. Motor for use with variable frequency drives shall be constructed to NEMA MG1 Part 31 standards.
   g. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

B. Chainvey Conveyors
1. Chainvey conveyors shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of two (2) Chainvey conveyors: one for conveyance of pelletized solids from the Pellet Mill outlet to the Counterflow Cooler inlet, and one for conveyance of cooled pelletized solids from the Counterflow Cooler outlet to the existing Transfer Conveyor.
3. Chainvey Conveyor Design Conditions

a. Name		Counterflow Cooler Input Conveyor
1)	Quantity	1
2)	Pipe Size	3”
3)	Motor Horsepower	5 HP
4)	Motor Control	VFD
5)	Required Air Flow to Pneumatic Tensioner	1 SCFM
6)	Required Pressure to Pneumatic Tensioner	20-40 psi
7)	Number of Air Piping Connection(s)	One (1)
8)	Size of Air Piping Connection(s)	1/4"

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9)	Manufacturer and Model No.		Chainvey 3-inch

b. Name — Counterflow Cooler Output Conveyor

1)	Quantity	1
2)	Pipe Size	3”
3)	Motor Horsepower	5 HP
4)	Motor Control	VFD
5)	Required Air Flow to Pneumatic Tensioner	1 SCFM
6)	Required Pressure to Pneumatic Tensioner	20-40 psi
7)	Number of Air Piping Connection(s)	One (1)
8)	Size of Air Piping Connection(s)	1/4"
9)	Manufacturer and Model No.	Chainvey 3-inch

4. Chainvey Conveyor Construction
   a. Each conveyor shall include a 180-degree turnaround unit with pneumatic tensioner, U-track, tray-bottom, and tool-less entry.
   b. Each conveyor shall include a 180-degree drive unit with a square-flanged discharge transition.
   c. Conveyor inlet shall be low-breakage.
   d. Chains shall be of 301 stainless steel construction with split wide UHMW discs.
   e. Connecting links shall be of 304 stainless steel construction with metal detectable wiper discs.
   f. Piping and elbows shall be 3-inch 304 stainless steel.
   g. Two (2) sight glasses shall be included per conveyor.
   h. Floor and ceiling support brackets and compression couplings shall be provided. Pelletizer System Supplier shall provide recommendations on support bracket locations, spacing, and quantity.
   i. Pelletizer System Supplier shall coordinate dimensions and layout of Chainvey system and shall coordinate connections of Chainvey system to upstream and downstream equipment.

5. Motor
   a. Motor horsepower as specified on equipment design conditions herein.
   b. Motor Speed: 1800 RPM
   c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   d. Motor shall be rated for operation in a Class II, Division 2 environment.
   e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
   f. Motor for use with variable frequency drives shall be constructed to NEMA MG1 Part 31 standards.
   g. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

C. Bucket Elevator
1. The bucket elevator shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) bucket elevator for conveyance of dried solids from the screener to the pellet feeder.
3. Bucket Elevator Design Conditions
   a. Name — Bucket Elevator

1)	Quantity	1
2)	Motor Horsepower	1 HP
3)	Motor Control	VFD
4)	Manufacturer and Model No.	Universal Industries Model U-94ED

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4. Bucket Elevator Construction
   a. Bucket elevator shall include head casing and head pulley with black vulcanized rubber lagging.
   b. Bucket elevator shall include boot casing and cast-iron slatted boot pulley.
   c. Bucket elevator shall be of carbon steel construction.
   d. A standard boot cleanout shall be provided.
   e. Backstop shall be internal in the reducer.
   f. Inlet shall be spout hopper.
   g. Discharge spout shall be straight down to 6" round.
   h. Belt shall be of black PVC 120 construction.
   i. Buckets shall be of high density polyethylene construction.
   j. Pelletizer System Supplier shall coordinate height of bucket elevator and coordinate connection with process piping into pellet feeder.

5. Motor
   a. Motor horsepower as specified on equipment design conditions herein.
   b. Motor Speed: 1800 RPM
   c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   d. Motor shall be rated for operation in a Class II, Division 2 environment.
   e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
   f. Motor for use with variable frequency drives shall be constructed to NEMA MG1 Part 31 standards.
   g. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

D. Metal Fabrication Hoppers and Transition Pieces
1. Fabricated transition pieces shall be provided by the Pelletizer System Supplier or Mechanical Contractor.
2. The Pelletizer System shall consist of five (5) fabricated transition pieces to serve as the following connections between equipment:
   a. Transition from Pneumatic Roller Slide Gate to Flexible Tubing
   b. Hopper connecting Tote Discharger with Inclined Screw Conveyor Discharge and Tubing from Transfer Conveyor Discharge into Screener Inlet
   c. Transition from Screener to Bucket Elevator
   d. Hopper from Bucket Elevator Process Piping to Pelletizer Feeder Inlet
   e. Transition from Counterflow Cooler Discharge to Chainvey Conveyor Inlet

3. Metal Fabrication Hoppers and Transition Pieces Design Conditions
   a. Name — Transition from Slide Gate to Flexible Tubing
      1) Quantity — 1
      2) Volume Requirement — N/A
      3) Manufacturer(s) — Anderson Crane or fabricated by Mechanical Contractor

   b. Name — Hopper connecting Inclined Screw Conveyor Tubing and Transfer Conveyor Tubing into Screener Inlet
      1) Quantity — 1
      2) Volume Requirement — N/A
      3) Manufacturer(s) — Anderson Crane or fabricated by Mechanical Contractor

   c. Name — Transition from Screener to Bucket Elevator

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1) Quantity 1
2) Volume Requirement N/A
3) Manufacturer(s) Anderson Crane or fabricated by Mechanical Contractor

d. Name Hopper from Bucket Elevator to Pelletizer Feeder
1) Quantity 1
2) Volume Requirement 25 ft^3 (1000 lbs of solids)
3) Manufacturer(s) Anderson Crane or fabricated by Mechanical Contractor

e. Name Transition from Cooler Discharge to Chainvey
1) Quantity 1
2) Volume Requirement N/A
3) Manufacturer(s) Anderson Crane or fabricated by Mechanical Contractor

4. Metal Fabrication Transition Pieces Construction
a. Metal fabricated transition pieces shall be of 304 stainless steel construction.
b. Pelletizer System Supplier or Mechanical Contractor to coordinate dimensions of hoppers and transitions pieces for proper connections between equipment.
c. All transition pieces and hoppers shall be fully enclosed to contain dust.

E. Pneumatic Roller Slide Gate Valve
1. The slide gate shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consists of one (1) pneumatic roller slide gate valve to be installed on the existing port on the Transfer Conveyor for isolation of dried solids to be pelletized.
3. Pneumatic Roller Slide Gate Valve Design Conditions
a. Name Pneumatic Roller Slide Gate Valve
1) Quantity 1
2) Required Air Flow 0.772 SCF per stroke of air cylinder
3) Minimum Required Pressure 80 psi
4) Number of Air Piping Connection(s) Two (2) – two position solenoid valve
5) Size of Air Piping Connection(s) 1/4"
6) Manufacturer and Model No. Solina Vortex SA13V1-WS1-SB

4. Pneumatic Roller Slide Gate Valve Construction
a. Roller slide gate valve contact surfaces shall be of 304 stainless steel and polymer construction.
b. Valve body shall be of 6061-T6 aluminum construction with a 304 stainless steel blade and seal retainers.
c. Roller slide gate valve shall include a special service inlet to eliminate material packing and reduce wear on seals for granular materials and a 1/4" thick flange gasket.
d. A 1/4” NPT vented ball valve shall be provided on the air supply line and shall be installed per manufacturer’s instructions.
e. The air control assembly shall include a ASCO 8551, or equal, double coil solenoid that includes poly tubing for connection from the regulator to the slide gate, fittings, and mounting brackets.
f. Roller slide gate shall be equipped with NEMA 4X open and closed position proximity switches.
g. The air purge assembly shall include a filter and regulator with gauge and 1/4” NPT to pressurize valve body for preventing internal material build-up and leakage.
h. Pelletizer System Supplier to coordinate dimensions of roller slide gate with existing transfer conveyor port.

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2.04 SCREENING EQUIPMENT

A. Gentle Roll Screener

1. The screener shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) screener to separate large overs from the dried solids prior to pelletization.
3. Gentle Roll Screener Design Conditions

a.	Name	Gentle Roll Screener
1)	Quantity	1
2)	Screen Size	1/2"
3)	Motor Horsepower	3 HP
4)	Motor Control	VFD
5)	Manufacturer and Model No.	EBM 24S-1-HB

4. Gentle Roll Screener Construction
   a. Screener shall be a single drum, single screen gentle roll.
   b. Screener shall include standard unlined inlet.
   c. Screener shall include offset unlined discharge hopper and alternate position unlined overs hopper discharge.
   d. Screener contact parts shall be of 304 stainless steel construction.
   e. Screener doors and roof shall be of aluminum construction.
   f. Pelletizer System Supplier shall coordinate height of screener and orientation of screen discharge and overs hopper to coordinate connection to the bucket elevator.

5. Motor
   a. Motor horsepower as specified on equipment design conditions herein.
   b. Motor Speed: 1800 RPM
   c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   d. Motor shall be rated for operation in a Class II, Division 2 environment.
   e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
   f. Motor for use with variable frequency drives shall be constructed to NEMA MG1 Part 31 standards.
   g. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

2.05 PELLETIZER SYSTEM EQUIPMENT

A. Pelletizer Feeder

1. The feeder shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) feeder to meter solids into the conditioner and pellet mill.
3. Pelletizer Feeder Design Conditions

a.	Name	Pelletizer Feeder
1)	Quantity	1
2)	Motor Horsepower	2 HP
3)	Motor Control	VFD
4)	Manufacturer and Model No.	CPM FD9INF

4. Pelletizer Feeder Construction
   a. Feeder shall be variable pitch screw design for consistent product discharge.
   b. Feeder shall include 5-ft long shaft and 9-inch diameter flighting.
   c. Feeder shall be of 304 stainless steel construction.

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5. Motor
   a. Motor horsepower as specified on equipment design conditions herein.
   b. Motor Speed: 1800 RPM
   c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   d. Motor shall be rated for operation in a Class II, Division 2 environment.
   e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
   f. Motor for use with variable frequency drives shall be constructed to NEMA MG1 Part 31 standards.
   g. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

B. Pelletizer Conditioner
1. The conditioner and water add system panel shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) conditioner to provide moisture back into solids for proper pelleting.
3. Pelletizer Conditioner Design Conditions

a. Name		Pelletizer Conditioner
1)	Quantity	1
2)	Motor Horsepower	10 HP
3)	Motor Control	VFD
4)	Manufacturer and Model No.	CPM C18INF6.5
b. Name		Water Add System Panel
1)	Water Add Panel Required Flow	1.5 GPM
2)	Water Add Panel Required Pressure	40-60 psi
3)	Number of Water Piping Connection(s)	Two (2) – Upstream and Downstream
4)	Size of Water Piping Connection(s)	1/2"
5)	Required Pressure	60-90 psi
6)	Number of Air Piping Connection(s)	One (1)
7)	Size of Air Piping Connection(s)	1/4”

4. Pelletizer Conditioner Construction
   a. Conditioner shall include hinged inspection covers that can be installed on either side.
   b. Conditioner shall be designed for the addition of water with a stainless steel port provided.
   c. Conditioner shall include infinitely adjustable pics to optimize mixing of water.
   d. Conditioner contact parts shall be of 304 stainless steel construction.
   e. A Water Add System Panel shall be provided with capacity of 0-500 lbs/hour.
      1) Panel shall include a mounting plate, Y-strainer, two (2) water supply pressure gauges, pressure regulator valve, filter regulator lubricator, and check valve.
      2) Panel shall be equipped with flow meter, FE-36-2-1, and flow transmitter, FT-36-2-1, which shall provide 24VDC 4...20mA flow rate signal to the Pelletizer System Supplier’s control panel. Manufacturer cabling shall be provided to interface the flow meter with the flow transmitter.
      3) Panel shall be equipped with modulating ball valve, WCV-36-3-1, which shall provide 24VDC 4...20mA position reference signal to the Pelletizer System Supplier’s control panel. The control panel shall provide a 24VDC 4...20mA position command signal to the modulating ball valve.
      4) Panel shall be equipped with solenoid control valve, WCV-36-3-2, which shall position a pneumatic actuator. The Pelletizer System Supplier’s control panel shall provide a 120VAC discrete open command signal to the solenoid control valve. The pneumatic actuator shall be spring-return.

5. Motor

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a. Motor horsepower as specified on equipment design conditions herein.
b. Motor Speed: 1800 RPM
c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
d. Motor shall be rated for operation in a Class II, Division 2 environment.
e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
f. Motor for use with variable frequency drives shall be constructed to NEMA MG1 Part 31 standards.
g. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

C. Pellet Mill
1. The pellet mill shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) pellet mill to create pelletized solids.
3. Pellet Mill Design Conditions

a. Name		Pellet Mill
1)	Quantity	1
2)	Motor Horsepower	75 HP
3)	Motor Control	Soft starter
4)	Manufacturer and Model No.	CPM PM1116-4

4. Pellet Mill Construction
a. Pellet mill gearbox shall be durable cast with single reduction and shall be bolted to reinforced pellet mill base.
b. Pellet mill shall have direct drive transmission for efficient and energy savings operation.
c. Pellet mill die shall have 16-inch inner diameter and be 4.3 inches wide for 229 square inches of pelleting area.
d. Three-piece die clamps shall be provided to secure the die to the quill flange.
e. Standard motor couplings, motor guard, and vibration pads shall be provided.
f. Pellet mill chamber shall be of 304 stainless steel construction with selectable left- or right-handed hinge.

5. Motor
a. Motor horsepower as specified on equipment design conditions herein.
b. Motor Speed: 1800 RPM
c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
d. Motor shall be rated for operation in a Class II, Division 2 environment.
e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
f. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

2.06 COOLING EQUIPMENT

A. Counterflow Cooler
1. The counterflow cooler shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) counterflow cooler to aid in the cooling process after pelletization.
3. Counterflow Cooler Design Conditions

a. Name		Counterflow Cooler Inlet Feeder
1)	Quantity	1

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2)	Motor Horsepower	1 HP
3)	Motor Control	Across-the-line starter
4)	Manufacturer and Model No.	CPM 5-34-4A

b. Name — Counterflow Cooler Discharge Grid Solenoid

1)	Manufacturer: ASCO 8551, or equal.	
2)	Required Air Flow	4.1 SCFM
3)	Minimum Required Pressure	90 psi
4)	Number of Air Piping Connection(s)	Two (2) – two position solenoid valve
5)	Size of Air Piping Connection(s)	1/4"

4. Counterflow Cooler Construction
   a. The counterflow cooler shall consist of a hinged service door and two (2) inspection windows.
   b. A custom discharge hopper with bolted service panel shall be provided.
   c. Rotary feeder and cooler top and walls shall be of 304 stainless steel construction.
   d. Fixed grid and louver discharge shall be of mild steel construction.
   e. Pelletizer System Supplier shall coordinate height of cooler support structure for level duct connection to cooler cyclone inlet.

5. Motor
   a. Motor horsepower as specified on equipment design conditions herein.
   b. Motor Speed: 1800 RPM
   c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   d. Motor shall be rated for operation in a Class II, Division 2 environment.
   e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
   f. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

B. Cooler Cyclone
1. The cooler cyclone shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) cooler cyclone to remove fines created by the cooler process.
3. Cooler Cyclone Design Conditions
   a. Name — Cooler Cyclone

1)	Quantity	1
2)	Volumetric Flow Range	850 – 2,250 CFM
3)	Manufacturer and Model No.	Coperion CT36

4. Cooler Cyclone Construction
   a. Cyclone shall consist of conical top design with tangential inlet and clockwise inlet rotation.
   b. Cyclone shall consist of 36” diameter flanged collector housing with riser tube.
   c. Cyclone shall be of 304 stainless steel construction.
   d. Cyclone support structure shall be of carbon steel construction.
   e. Pelletizer System Supplier shall coordinate height of cyclone support structure for level duct connection from counterflow cooler exhaust.

C. Airlock/Fines Rotary Valve
1. The airlock/fines rotary valve shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) airlock/fines rotary valve to control the discharge of fines from the cooler cyclone.
3. Airlock/Fines Rotary Valve Design Conditions

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a. Name — Airlock/Fines Rotary Valve
   1) Quantity — 1
   2) Motor Horsepower — 0.75 HP
   3) Motor Control — Across-the-line starter
   4) Manufacturer and Model No. — Coperion MD20

4. Airlock/Fines Rotary Valve Construction
   a. Valve shall include flanged housing and endplates tapped with plug for endplate cavity air purge port.
   b. Valve housing shall be of cast grey iron construction.
   c. Valve rotor shall be of 304 stainless steel construction.
   d. Pelletizer System Supplier shall coordinate connection required to counterflow cooler discharge.

5. Motor
   a. Motor horsepower as specified on equipment design conditions herein.
   b. Motor Speed: 1800 RPM
   c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   d. Motor shall be rated for operation in a Class II, Division 2 environment.
   e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.
   f. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

D. Cooler Main Fan
1. The cooler main fan shall be provided by the Pelletizer System Supplier.
2. The Pelletizer System shall consist of one (1) cooler main fan to supply air to the counterflow cooler and cooler cyclone.
3. Cooler Main Fan Design Conditions
   a. Name — Cooler Main Fan
      1) Quantity — 1
      2) Volumetric Flow — 2,000 CFM
      3) Static Pressure — 20 inches
      4) Motor Horsepower — 15 HP
      5) Motor Control — VFD
      6) Manufacturer and Model No. — Twin City Fan RBO/R

4. Cooler Main Fan Construction
   a. Fan shall consist of flanged inlet and outlets.
   b. Fan shall include a bolted access door and ¾” drain with plug.
   c. Fan shall include belt, shaft, and bearing guards.
   d. Fall shall include a weatherhood for outdoor installation.
   e. Fan shall be of carbon steel construction.

5. Motor
   a. Motor horsepower as specified on equipment design conditions herein.
   b. Motor Speed: 3600 RPM
   c. Motor shall be 460 volts, 3-phase, 60 Hz, 1.15 service factor, NEMA Design B, premium efficiency, TEFC, Class F insulation minimum.
   d. Motor shall be rated for operation in a Class II, Division 2 environment.
   e. Motor shall be equipped with temperature switches imbedded in each of the windings and shall be monitored by a Division 26 single pole / single throw relay located in the motor control center for monitoring in SCADA.

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f. Motor for use with variable frequency drives shall be constructed to NEMA MG1 Part 31 standards.
g. Motor control center, motor controllers, and adjustable frequency motor controllers provided under another division of the specifications. Refer to Electrical – Division 26 for information regarding specified equipment.

2.07 INSTRUMENTATION AND CONTROLS

A. Instrumentation
1. Level Monitoring (Capacitance Style)
a. Manufacturer: 4B Binswitch Elite, or equal.
b. Applicable Instrumentation: LSL-35-1-1, LSH-35-2-1
c. Capacitance style level switch(es) shall continuously monitor the level of the hoppers for the Tote Discharger with Inclined Screw Conveyor and Gentle Roll Screener.
d. The level switch shall provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.
2. Level Monitoring (Type 1, Paddle Style)
a. Manufacturer: Bindicator RX Roto-Bin-Dicator, or equal.
b. Applicable Instrumentation: LSL-36-1-1, LSH-36-1-1, LSH-37-1-2, LSH-37-2-1
c. Paddle style level switch(es) shall continuously monitor the level of the Pelletizer Feeder inlet hopper, Counterflow Cooler inlet hopper, and Cooler Cyclone.
d. The level switch shall provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.
3. Level Monitoring (Type 2, Paddle Style)
a. Manufacturer: Solido 500, or equal.
b. Applicable Instrumentation: LSL-37-1-1, LSC-37-1-1, LSH-37-1-1, LSH-37-1-3
c. Paddle style level switch(es) shall continuously monitor the level of Counterflow Cooler bin and the Counterflow Cooler discharge surge hopper.
d. The level switch shall provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.
4. Pressure Monitoring
a. Manufacturer: Festo SPAN-P10R-G18M, or equal.
b. Applicable Instrumentation: PSL-35-4-1, PSH-35-4-1, PSL-35-5-1, PSH-35-5-1
c. Low- and high-pressure switch(es) shall continuously monitor the air pressure to the Counterflow Cooer Input and Output Conveyors pneumatic tensioners.
d. The low- or high-pressure switch shall provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.
5. Speed Monitoring
a. Manufacturer: 4B M800 Elite Speed Switch, or equal.
b. Applicable Instrumentation: SS-35-2-1, SS-35-3-1
c. Speed switch(es) shall continuously monitor the slip, belt underspeed, stop motion, low speed, or zero speed on the Gentle Roll Screener and Pelletizer Bucket Elevator.
d. The speed switch shall provide dual output 120VAC discrete signals to the Pelletizer System Supplier's control panel.
e. The unit shall receive 120VAC power from the Pelletizer System Supplier's control panel.
6. Temperature Monitoring
a. Manufacturer: Pyromation RTDs, or equal.
b. Applicable Instrumentation: TT-36-2-1, TT-37-1-1, TT-37-1-2, TT-37-3-1
c. Resistance temperature detector(s) shall continuously monitor the temperature of the Pelletizer Conditioner along with the Counterflow Cooler ambient air, pellet discharge, and air exhaust.

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d. The resistance temperature detector shall provide a 4...20mA signal to the Pelletizer System Supplier's control panel.
e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.

7. Proximity Monitoring (Type 1, Pneumatic Tensioner)
   a. Manufacturer: BIMBA HCQ, or equal.
   b. Applicable Instrumentation: ZSL-35-4-1, ZSH-35-4-1, ZSL-35-5-1, ZSH-35-5-1
   c. The position switch(es) shall continuously monitor the position of the pneumatic tensioner cylinder for the Counterflow Cooler Input and Output Conveyors.
   d. The position switch shall provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
   e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.
8. Proximity Monitoring (Type 2, Conveyor Door)
   a. Manufacturer: Allen Bradley Trojan 440K, or equal.
   b. Applicable Instrumentation: ZSO-35-4-1, ZSO-35-5-1
   c. The position switch(es) shall continuously monitor the inlet door position of the turnaround unit for the Counterflow Cooler Input and Output Conveyor systems.
   d. The position switch shall provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
   e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.
9. Proximity Monitoring (Type 3, Counterflow Cooler Door)
   a. Manufacturer: Honeywell BZE6, or equal.
   b. Applicable Instrumentation: ZS-37-1-1
   c. The position switch(es) shall continuously monitor the door position of the Counterflow Cooler.
   d. The position switch shall provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
   e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.
10. Proximity Monitoring (Type 4, Pellet Mill)
   a. Manufacturer: Emerson TopWorx GO Switch 73M, or equal.
   b. Applicable Instrumentation: ZE-36-3-1, NSH-36-3-1
   c. The position switch shall continuously monitor the door position of the Pellet Mill and provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
   d. The Pellet Mill shear pin limit switch shall provide a 120VAC discrete signal to the Division 26 motor control center for monitoring in SCADA.
   e. The units shall be loop powered.
11. Proximity Monitoring (Type 5, Counterflow Cooler Discharge Grid)
   a. Manufacturer: Honeywell HDLS, or equal.
   b. Applicable Instrumentation: ZS-37-1-2
   c. The position switch(es) shall continuously monitor the position of the Counterflow Cooler discharge grid.
   d. The position switch shall provide a 120VAC discrete signal to the Pelletizer System Supplier's control panel.
   e. The unit shall be loop powered from the Pelletizer System Supplier's control panel.
12. Alarm Light
   a. Manufacturer: Federal Signal LP3, or equal.
   b. Applicable Instrumentation: YL-36-3-1
   c. The alarm light shall continuously strobe while the Pelletizing Systems are operating.
   d. The Pelletizer System Supplier's control panel shall provide a 120VAC discrete output to the alarm light.
   e. The unit power supply shall be 120VAC, 60 Hz, 0.18A typical operating current, and be powered from the lighting panelboard.
   f. Coordinate installation requirements with the Contractor. Refer to the Contract Documents.
13. Emergency Stop Pushbutton
   a. Applicable Instrumentation: XS-35-1-1, XS-36-3-2
   b. The Pelletizer System Local Control Station, XS-36-3-1, shall also feature an emergency stop pushbutton.

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c. The emergency stop pushbuttons shall provide 120VAC discrete signals to the Pelletizer System Supplier's control panel.
d. Activation of any emergency stop pushbutton shall shutdown and inhibit all pelletizing-related equipment motors, close the slide gate to the pelletizing systems, and open the slide gate to the bulk bagging system.
e. Coordinate installation requirements with the Contractor. Refer to the Contract Documents.

14. Trapped-Key-Interlock
    a. Pelletizer System Supplier shall furnish BEMF trapped-key-interlock, HS-36-3-1-3 as shown on the Contract Documents, for Pellet Mill. Trapped-key-interlock shall be installed in new motor control center provided by Division 26. Coordinate installation requirements with the System Integrator to accommodate space and wiring requirements for the device.

B. Pelletizer System Main Control Panel
1. Manufacturer:
    a. CPM Automation, or Engineer-approved equal.
2. The Pelletizer System Main Control Panel shall be used to control all pelletizing, cooling, and conveyance processes. The main control panel shall be located in the control room with the motor control center provided under Division 26. The operations described herein are intended to identify minimum acceptable hardware.
3. All Pelletizer System passwords, IP address, Final copies of software and PLC logic (with comments) shall be provided to the Owner as part of the O&M. No passwords embedded in portions of the PLC logic shall be omitted from the list.
4. The control panel enclosure shall be rated NEMA 12 painted steel. Control panel shall be wall mounted with dimensions 60"H x 36"W x 12"D. Depth of control panel shall be coordinated to allow the UPS to be located within the control panel enclosure.
5. The Pelletizer System Main Control Panel shall consist of an Allen Bradley CompactLogix 5380 L3, Model 5069-L320ER or better. The following components shall be provided as part of the PLC system. Refer to the Contract Documents for required number of I/O modules for each type.
    a. 16-Point, 120VAC Input Module: 5069-IA16
    b. 16-Point, Relay Output Module: 5069-OW16
    c. 4-Point, Universal Analog Input Module: 5069-IY4
    d. 8-Point, Analog Output Module, Isolated: 5069-OF8
    e. Other auxiliary components compatible with the specified CompactLogix PLC, including but not limited to field potential distributor, FPD screw terminal, module screw terminal, and power terminal block.
6. Power supply shall be ABB 120VAC input, 24 VDC output, 20A rated, or equal.
7. Uninterruptible power supply shall be Phoenix Contact – Quint Series, 24 VDC, 5 amp hour rated, or equal.
8. Ethernet networking switch shall be N-TRON, 108TX, unmanaged.
9. Pelletizer System Supplier shall provide Secomea Site Manager VPN Router for remote access into the Pelletizer System Main Control Panel for troubling shooting during startup.
10. The control panel shall contain an Allen Bradley Guardmaster safety relay, or equivalent relay which carries the safety relay label. Safety relay shall interface with remote pelletizer system emergency stop pushbuttons and motor control center provided under Division 26. Refer to the Contract Documents.
11. Intrinsically safe barriers shall be provided as required based upon field conditions as shown on the contract documents. Intrinsically safe barriers shall be PR Electronics, non-Zener diode, or equal.
12. Ethernet patch cabling shall support Category 6 applications and be RJ-45 compatible.
13. The control panel shall include a 120VAC DIN rail mounted duplex convenience receptacle. Coordinate receptacle breaker with control panel main breaker.
14. The Control Panel enclosure shall feature a LED light switched to operate upon opening the panel doors.
15. Pelletizer System Supplier shall provide control panel components, including but not limited to, circuit breakers, surge suppressor, pilot devices, relays, and terminal blocks, as shown on the Contract Documents or as required to provide a complete and operable control system.

C. Pelletizer System Local Control Station

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1. Manufacturer:
   a. CPM Automation, or Engineer-approved equal.
2. The Pelletizer System Local Control Station shall be used for operator control of the Pelletizer System. The local control station shall be located remotely from the main control panel. The local control station shall utilize Ethernet communications and hardwired signals to communicate with the main control panel.
3. The local control station enclosure shall be rated NEMA 4X stainless steel. The control station shall be pedestal mounted with dimensions 24"H x 24"W x 12"D.
4. Local control station shall feature the pelletizer system operator interface terminal mounted to control station panel door. Operator interface terminal shall be Allen Bradley PanelView 5510, 15" minimum. Operator interface terminal shall be touchscreen and utilize Ethernet communications to communicate with the main control panel.
5. Local control station shall feature an emergency stop push button mounted to the control station panel door. Emergency stop push button shall be hardwired to the safety relay in the main control panel.
6. Local control station shall be powered from the Pelletizer System Main Control Panel and utilize the uninterruptible power supply located in the main panel.

2.08 ADDITIONAL PARTS

A. Items listed under this section are to be provided by the Contractor. Contractor is responsible for providing a complete and operable Pelletizer System.

B. Process Piping
1. Contractor shall provide process piping for connection between Bucket Elevator and Pelletizer Feeder Inlet Hopper as shown on the Contract Drawings and as specified in Section 40 23 36.
2. Contractor shall provide process hose for connections between Transfer Conveyor Discharge and Inclined Screw Conveyor Discharge into Gentle Roll Screener Inlet Hopper as shown on the Contract Drawings and as specified in Section 40 23 36 – Wastewater Process Piping System.

C. Pneumatic Air Piping
1. Contractor shall provide pneumatic air piping connections from the existing high pressure air piping to the equipment listed above as shown on the Contract Drawings and as specified in Section 40 23 36 – Wastewater Process Piping System.

D. Dust Collection Piping
1. Contractor shall provide dust collection piping from existing dust collection connection to the newly utilized port in the transfer conveyor as shown on the Contract Drawings and as specified in Section 40 23 36 – Wastewater Process Piping System.

E. Plumbing
1. Contractor shall supply and install non-potable water piping and connections to feed the Pelletizer Conditioner water add system panel and connect into the Pelletizer Conditioner as shown on the Contract Drawings and as specified in Section 22 00 00 - Plumbing.

F. Ductwork
1. Contractor shall supply and install ductwork for connections between the Counterflow Cooler, Cooler Cyclone, and Cooler Main Fan as shown on the Contract Drawings and as specified in Section 23 00 00 - HVAC.

G. Anchor Bolts
1. Contractor shall supply and install all anchor bolts of sufficient size and quantity for mounting of all equipment and piping associated with the Pelletizer System.

H. Threaded Rods

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1. Contractor shall supply and install threaded rods in the required number, diameter, length, and spacing per manufacturer recommendations to properly support the Chainvey conveyors using the Pelletizer System Supplier-provided ceiling support brackets.

I. Plastic Drums

1. Contractor shall supply two (2) plastic drums for overs collection at Gentle Roll Screener outlet and fines collection at Cooler Cyclone outlet. Plastic drums are to be covered and a fully enclosed connection shall be made between equipment outlets and drums to contain dust. Contractor to field-verify sizing prior to ordering.

2.09 PAINTING AND SURFACE PREPARATION

A. Contractor shall provide finish coating in accordance with Division 09.

B. Equipment shall be factory primed and painted in accordance with Division 09.

2.10 SPARE PARTS

A. The following spare parts shall be provided by the Pelletizer System Supplier:

1. Chainvey Conveyors
   a. One (1) drive unit sprocket
   b. One (1) drive shaft
   c. One (1) drive shaft seal
   d. Two (2) vent socks
   e. One (1) solenoid valve
   f. One (1) turnaround sprocket
   g. One (1) pneumatic cylinder assembly
   h. Two (2) bearings
   i. One (1) tool-less lid safety interlock
   j. Twenty (20) wide puck replacements
   k. Twelve (12) metal detectable wiper discs
   l. Three (3) connector links
   m. One (1) sight glass assembly

2. Pelletizer Conditioner
   a. Two (2) mixing picks with hardware

3. Pellet Mill
   a. One (1) set of spare die and set of rolls
   b. One (1) spare parts kit that includes:
      1) Shear pins
      2) Shear pin bushings
      3) Knife post blades and fasteners
      4) Wiper, deflector, and fasteners
      5) Mainshaft end cap gasket
      6) Roller adjusting gears
      7) Bear claw die clamps and bolts
      8) Belleville springs
      9) Mainshaft bearing
      10) Oil seals
      11) Wear ring
   c. Premalube Xtreme food grade grease in the volume to maintain the pellet mill for a period of one year after startup.

4. Counterflow Cooler
   a. One (1) level sensor

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b. One (1) temperature sensor

5. Cooler Cyclone
   a. One (1) high level indicator
6. Cooler Fan
   a. Two (2) bearings
   b. One (1) V-belt drive that includes sheaves, bushings, and belts

7. Control Panel
   a. Provide one spare I/O card of each type utilized.

2.11 QUALITY ASSURANCE

A. It is the intent of this specification that the equipment described herein, when installed makes a complete and effective Pelletizer System.

B. The Contractor, Pelletizer System Supplier, and System Integrator shall consult and cooperate to achieve this end.

C. All furnished equipment and systems shall conform in every respect to the requirements of the Contract Drawings and Specifications.

2.12 WARRANTY

A. The equipment provided under this section shall be free against all defects in workmanship and materials, including damages that may be incurred during shipping, for a period of 12 months from the date on which the equipment is commissioned or 18 months from when the equipment is shipped, whichever occurs first.

PART 3 EXECUTION

3.01 PREPARATION AND INSTALLATION

A. The Contractor shall verify that the field conditions are acceptable, and the facilities are ready to receive the Work.

B. The Contractor shall verify items provided by other sections of Work are properly sized and located.

C. The Contractor shall verify that the beginning of installation means the installer accepts existing conditions.

D. Install equipment in accordance with Pelletizer System manufacturers' written instructions and approved submittals.

3.02 EQUIPMENT START-UP

A. Startup and post startup shall be in accordance with 01 75 16 Equipment Start Up.

B. A qualified representative of the Pelletizer System Supplier, Equipment Manufacturers, and Contractor shall perform preliminary field-testing, inspection, and checkout of the entire Pelletizer System following installation in order to certify to the Owner that all equipment is properly installed and that the operator has been instructed in operation and maintenance.

C. Sufficient tests shall be conducted to demonstrate that all system components are fully operational.

D. Control and instrumentation components shall be calibrated and properly adjusted.

E. All connections between equipment shall be leakproof and properly anchored.

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F. Entire system shall be ready for continuous and safe operation.

G. The Pelletizer System Supplier shall supply the services of system-trained personnel for a minimum of two (2) days, in not more than one trip to assist with the start-up of the system.

H. The Pelletizer System Supplier's representative shall train the Owner's operating personnel during the start-up period.

I. Start-up operations shall be continued until it is satisfactorily demonstrated that the equipment is suitable for continuous on-line service.

J. A written report covering the representative's activities and installation approval shall be submitted to the Engineer. This report shall cover all inspections and outline in detail any deficiencies in the installation.

3.03 FIELD PERFORMANCE TEST

A. Any defects in the equipment or failure to meet the requirements of the specifications shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the contract shall be final. If the Contractor fails or refuses to make these corrections or if the improved equipment, when tested shall again fail to meet the guarantees of the Contractor, the Owner, notwithstanding its ownership of work and materials which have entered into the manufacture of said equipment, shall have the option of rejecting said equipment or of accepting the same at such reduced price as may be agreed upon by the parties hereto.

3.04 OPERATOR TRAINING

A. Upon satisfactory completion of the start-up and calibration, a representative of the manufacturer shall be provided to instruct the Owner's personnel in the proper operation and maintenance of the equipment. The manufacturer's representative who will be providing the instruction shall have prior operation, maintenance, and instructing experience acceptable to the Engineer. The contractor shall submit the individual's name and qualifications to the Engineer for approval at least one week prior to the scheduled operating and maintenance instruction sessions. The Engineer reserves the right to require the replacement of the manufacturer's representative who is providing operating and maintenance instruction if the services are found inadequate.

B. Training services shall be a minimum of one (1) day.

3.05 POST START-UP VISIT

A. Six months following equipment installation, a factory-trained representative from the equipment manufacturer or equipment manufacturer's authorized representative shall return to the project site for a one-day post start-up visit. The purpose of the visit is to answer operator questions and check the system for proper operation.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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