

Project Manual For

Well No. 5 Production Well, Pumphouse, SCADA Updates & Well No. 2 Demolition

Prairie du Chien, WI

Prepared For:
City of Prairie du Chien
214 E. Blackhawk Ave
Prairie du Chien, WI 53821

Prepared By:
Vierbicher
201 E Main Street, Suite 100
Reedsburg, WI 53959

January 2026

© Vierbicher Associates, Inc.

THIS PAGE INTENTIONALLY LEFT BLANK

PROJECT MANUAL FOR
Well No. 5 Production Well, Pumphouse, SCADA Updates, & Well No. 2
Demolition
City of Prairie du Chien
Prairie du Chien, WI

June 2025
240564

Prepared By:

Vierbicher
201 E Main Street, Suite 100
Reedsburg, WI 53959

PRODUCTION WELL, CIVIL, PROCESS PIPING & EQUIPMENT, PLUMBING, ELECTRICAL VIERBICHER  <i>Darrin R. Pope</i> 6/24/2025	ARCHITECTURE ADCI  <i>Michael L. Maas</i> 6-24-25
STRUCTURAL ADCI  <i>Robert H. Grothman</i> 6-25-25 EXP 7/31/2026	MECHANICAL TC MECHANICAL & DESIGN  <i>Timothy J. Coughlin</i>

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00 01 10

TABLE OF CONTENTS

Section Title

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 00 01	Title Page
00 01 07	Seals Page
00 01 10	Table of Contents

PROCUREMENT REQUIREMENTS

00 11 13	Advertisement for Bids
00 21 15	Instructions to Bidders – EJCDC
00 31 00	Available Project Information
00 41 43	Bid Form *
00 43 13	Bid Bond (EJCDC C-430) *

CONTRACTING REQUIREMENTS

00 51 00	Notice of Award (EJCDC C-510)
00 52 13	Standard Form of Agreement - EJCDC
00 55 00	Notice to Proceed (EJCDC C-550)
00 61 13.13	Performance Bond (EJCDC C-610)
00 61 13.16	Payment Bond (EJCDC C-615-A)
00 62 16	Certificate of Insurance
00 62 76	Contractor's Application for Payment
00 65 16	Certificate of Substantial Completion (EJCDC C-625)
00 72 13	General Conditions - EJCDC
00 73 00	Supplementary Conditions - EJCDC
00 73 43	Wage Requirements
00 73 46	Wage Rate Determination (Federal Wage Rates Only)
00 91 13	Addenda
00 94 10	Change Order

WDNR REQUIRMENTS

- **8700-294A EIF DBE Contacts Worksheet***
- DBE Compliance Contract Packet
- Davis-Bacon and Related Acts (DBRA)
- Federal Labor Standards Provisions (Form 4010)
- Web Resources
- Employee Rights Poster (English/Spanish)

*** Note: Required Forms to be submitted with Bid**

DIVISION 01 - GENERAL REQUIREMENTS (Contract A & B)

01 10 00	Summary
01 20 00	Price and Payment Procedures
01 30 00	Administrative Requirements
01 32 16	Construction Progress Schedule
01 33 00	Submittal Procedures
01 40 00	Quality Requirements
01 60 00	Product Requirements
01 70 00	Execution and Closeout Requirements

DIVISION 02 – EXISTING CONDITIONS (Contract B)

02 41 16	Structure Demolition

DIVISION 03 – CONCRETE (Contract B)

03 30 00	Cast-In-Place Concrete
03 30 00	Cast-In-Place Concrete – Building
03 35 11	Concrete Floor Finishes

DIVISION 04 – MASONRY (Contract B)

04 20 00	Unit Masonry

DIVISION 05 – METALS (Contract B)

05 05 19	Concrete and Masonry Anchors

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES (Contract B)

06 10 00	Rough Carpentry
06 17 53	Shop-Fabricated Wood Trusses
06 20 00	Finish Carpentry
06 83 16	Fiberglass Reinforced Plastic Panels

DIVISION 07 – THERMAL AND MOISTURE PROTECTION (Contract B)

07 21 00	Thermal Insulation
07 26 00	Vapor Retarders
07 27 00	Air/Weather-Resistive Barriers
07 31 13	Asphalt Shingles
07 42 13	Metal Wall Panels
07 62 00	Sheet Metal Flashing and Trim
07 92 00	Joint Sealants

DIVISION 08 – OPENINGS **(Contract B)**

08 11 13	Hollow Metal Doors and Frames
08 51 13	Aluminum Windows
08 71 00	Door Hardware
08 80 00	Glazing

DIVISION 09 – FINISHES **(Contract B)**

09 91 13	Exterior Painting
09 91 23	Interior Painting

DIVISION 10 – SPECIALTIES **(Contract B)**

10 28 00	Toilet and Bath Accessories

DIVISION 22 – PLUMBING **(Contract B)**

22 05 00	Common Work Requirements for Plumbing
22 05 13	Common Motor Requirements for Plumbing Equipment
22 05 18	Escutcheons for Plumbing Piping
22 05 19	Meters and Gages for Plumbing Piping
22 05 23	Valves for Plumbing Piping
22 05 29	Hangers and Supports for Plumbing Piping and Equipment
22 05 93	Testing, Adjusting and Balancing for Plumbing
22 07 19	Plumbing Piping Insulation
22 11 16	Domestic Water Piping
22 11 19	Domestic Water Piping Specialties
22 11 23.21	Inline, Domestic-Water Pumps
22 13 16	Sanitary Waste and Venting Piping
22 13 19	Sanitary Waste Piping Specialties
22 34 00	Fuel-Fired, Domestic-Water Heaters
22 42 00	Plumbing Fixtures
22 45 00	Emergency Plumbing Fixtures

DIVISION 26 – ELECTRICAL **(Contract B)**

26 05 00	Common Work Requirements for Electrical
26 05 19	Low-Voltage Electrical Power Conductors and Cables
26 05 23	Control-Voltage Electrical Power Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 29	Hanger and Supports for Electrical Systems
26 05 33	Raceway and Boxes for Electrical Systems
26 05 53	Identification for Electrical Systems

26 24 16	Panelboards
26 24 19	Motor Control Center Reuse
26 27 02	Equipment Wiring Systems
26 27 26	Wiring Devices
26 28 13	Fuses
26 28 16	Enclosed Switches and Circuit Breakers
26 29 23	Variable- Frequency Drives
26 32 13	Gas-Engine-Driven Generator Sets
26 36 00	Transfer Switches
26 51 19	LED Interior Lighting
26 52 13	Emergency and Exit Lighting
26 56 19	LED Exterior Lighting

DIVISION 31 – EARTHWORK **(Contract A & B)**

31 05 13	Soils for Earthwork
31 10 00	Site Clearing
31 23 16	Earthwork
31 23 17	Trenching and Backfilling
31 25 13	Erosion Controls

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 11 23	Aggregate Base Courses (Contract A & B)
32 12 16	Asphalt Paving (Contract B)
32 92 19	Seeding (Contract A & B)

DIVISION 33 - UTILITIES

33 09 10	SCADA System Update (Contract B)
33 11 13	Public Water Utility Distribution Piping (Contract B)
33 12 13	Water Service Connections (Contract B)
33 12 16	Water Utility Distribution Valves (Contract B)
33 12 19	Water Utility Distribution Fire Hydrants (Contract B)
33 13 00	Disinfecting of Water Utility Distribution (Contract B)
33 21 13	Public Water Supply Wells (Contract A)
33 29 00	Public Water Supply Well Abandonment – Well No. 2 (Contract B)
33 31 13	Public Sanitary Utility Sewerage Piping (Contract B)

DIVISION 40 - PROCESS INTEGRATION **(Contract B)**

40 23 25	Potable Water Well Pump Piping & Equipment

Plans
Drawing No.

Contract A

City of Prairie du Chien – Public Water Supply Well No. 5, Sheets 1-3,
prepared by Vierbicher, May 2025.

Contract B

City of Prairie du Chien – Public Water Supply Well No. 5 Pumphouse &
Well No. 2 Pumphouse Demolition, Sheets 1-28, prepared by Vierbicher,
June 2025.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00 11 13

ADVERTISEMENT FOR BIDS

Well No. 5 Production Well, Pumphouse, SCADA Updates & Well No. 2 Demolition
Prairie du Chien, WI

Sealed Bids for the construction of the following:

Project No. 240564

The Project consists of construction of Public Water Supply Well No. 5, and the Well No. 5 Pumphouse, completion of SCADA system updates, abandonment of Well No. 2, and demolition of the Well No. 2 Pumphouse.

Contract A – Public Water Supply Well No. 5: Construction of a 1,200 gallon per minute (gpm) municipal well to a depth of 106 feet, well development, performance pump testing of constructed well, WDNR NR 809 water quality analysis, erosion control restoration of the work area, and other miscellaneous items in conformance with the Contract Documents.

Contract B - Well No. 5 Pumphouse, SCADA Updates & Demolition of Well No. 2 Pumphouse: Construction of the Well No. 5 Pumphouse building, including furnishing and installing all well pump equipment, piping, valves, accessories and controls. The building includes a pump room, chemical room, and restroom. The Well No. 5 Pumphouse contract also includes installation of a natural gas-powered emergency electrical generator, erosion control measures, site work, site piping, driveway, pavement, restoration of the work area, pump testing, water quality testing, and other miscellaneous items in conformance with the Contract Documents.

Also, to include demolition of the Well No. 2 Pumphouse including building demolition, excavation, water main and other utilities disconnections/abandonments, backfilling, grading, and site restoration. The existing Well No. 2 motor control center and well pump equipment are to be salvaged and reused in the proposed Well No. 5 Pumphouse. Well No. 2 is to be abandoned including removal and off-site disposal, or salvaging for the Owner, of existing well pump, column pipe, electrical cables, and motor, removing the casing to 3 feet below final finish grade, filling with concrete, neat cement grout or approved bentonite chips, and submitting a Well/Drillhole Abandonment Report.

In addition, the project includes SCADA system updates which include removal and disposal of existing SCADA system equipment and installation of new equipment at the existing Well Nos. 1, 3, & 4, pumphouses, reservoirs site, and the proposed Well No. 5 Pumphouse.

Bids will be received **online only** through **QuestCDN.com** for the City of Prairie du Chien, until 1:00 PM local time, February 10, 2026, and then virtually opened and read aloud.

All **Bids shall be uploaded and submitted through Quest only** with **EJCDC C-430 Bid Bond** equal to five percent (5%) of the Bid payable to the OWNER. All Bids uploaded and submitted through Quest shall also be accompanied with **Bid Form 00 41 43**.

The Bidding Documents may be examined at the office of Vierbicher, 201 E. Main St., Suite 100, Reedsburg, WI 53959.

Complete digital Bidding Documents are available at www.vierbicher.com or www.questcdn.com. You may download the digital Bidding Documents for \$42.00 by inputting the **Quest project #9996672** on the website's Project Search page. Please contact QuestCDN.com at 952-233-1632 or info@questcdn.com for assistance in free membership registration, downloading, and working with this digital project information. An optional paper set of project documents is also available for a non-refundable price of \$100.00 per set. Please make your check payable to Vierbicher and send or bring it to 201 E. Main St., Suite 100, Reedsburg, WI 53959. Please contact us at 608-524-6468 if you have any questions.

The CONTRACTOR shall be required to pay not less than the Federal Davis-Bacon Prevailing Wage Rates as established by the United States Department of Labor.

Any contract or contracts awarded under this Advertisement for Bids may be funded in part by the Safe Drinking Water Loan Program (SDWLP) through the WDNR. Information on applicable SDWF requirements is contained in the Project Manual.

DBE's (Disadvantaged Business Enterprise), including MBEs and WBEs are encouraged to submit bid proposals under 40 CFR 33.301.

Attention of bidders is particularly called to the requirements that Build America, Buy America (BABA) Act domestic procurement, and American Iron and Steel (AIS) are required for this project. All covered materials must be produced in the United States. A waiver for certain products is available if domestic availability is limited. Documentation must be provided demonstrating compliance with the BABA/AIS requirements to the awarded contractor. Certification from the manufacturer will also be required stating that the materials are BABA-compliant.

No bidder may withdraw his/her bid within 30 days after the actual day of the opening thereof.

This solicitation will remain open for 30 days as provided in 40 CFR 33.301(b).

The City of Prairie du Chien reserves the right to waive any informalities and to reject any or all Bids. The letting of the work described herein is subject to the provisions of Sections 62.15, 66.0901 and 66.0903, Wisconsin Statutes.

Dated this 7th & 14th day of January 2026.

Vierbicher
201 E. Main St., Suite 100
Reedsburg, Wisconsin 53959

City of Prairie du Chien
214 E. Blackhawk Ave
Prairie du Chien, WI 53821

SECTION 00 21 15

INSTRUCTIONS TO BIDDERS

1.1 Summary

- A. Section Includes:
 - 1.2 Defined Terms
 - 1.3 Copies of Bidding Documents
 - 1.4 Qualifications of Bidders
 - 1.5 Examination of Contract Documents and Site
 - 1.6 Availability of Lands for Work, etc.
 - 1.7 Interpretations and Addenda
 - 1.8 Bid Security
 - 1.9 Contract Times
 - 1.10 Liquidated Damages
 - 1.11 Substitute and "Or-Equal" Items
 - 1.12 Subcontractors, Suppliers, and Others
 - 1.13 Bid Form
 - 1.14 Submission of Bids
 - 1.15 Modification and Withdrawal of Bids
 - 1.16 Opening of Bids
 - 1.17 Bids to Remain Subject to Acceptance
 - 1.18 Award of Contract
 - 1.19 Contract Security
 - 1.20 Signing of Agreement
- B. Related Sections:
 - 1. Section 00 11 13 – Advertisement for Bid.
 - 2. Section 00 31 00 - Available Project Information.
 - 3. Section 00 41 43 - Bid Form - Unit Price (Single-Prime Contract).
 - a. Definitions.
 - b. Contract Time identification.
 - c. Tax [and duty] rebate procedures.
 - d. Tax exempt procedures.
 - e. Contractors fees for changes.
 - f. Contractor's liability insurance.
 - g. Bond types and values.

1.2 Defined Terms.

- A. Terms used in these Instructions to Bidders which are defined in the Standard General Conditions of the Construction Contract (No. C-700) (2007 Edition) have the meanings assigned to them in the General Conditions. Certain additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof.
 - 1. Bidder - one who submits a Bid directly to OWNER as distinct from a sub-bidder, who submits a bid to a Bidder.

2. Issuing Office - the office, identified in the Advertisement for Bid, from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
3. Successful Bidder - the lowest, responsible, and responsive Bidder to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

1.3 Copies of Bidding Documents.

- A. Complete sets of the Bidding Documents may be obtained as stated in the Advertisement for Bid.
- B. Complete sets of Bidding Documents must be used in preparing bids; neither OWNER nor ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- C. Bidders must obtain complete sets of Bidding Documents through QUEST in order to bid on project.
- D. OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

1.4 Qualifications of Bidders.

- A. To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five days after Bid opening upon OWNER's request detailed written evidence such as financial data, previous experience, present commitments and other such data as deemed necessary to determine the ability of the Bidder to perform the work required. Each Bidder shall submit to OWNER a list of references with information for projects of similar nature and cost. The List of References is included with the Bid Form and shall be completely filled and submitted with the Bid. The OWNER reserves the right to reject any Bid if the evidence submitted by, or investigation of such Bidder fails to satisfy the OWNER that such Bidder is properly qualified to carry out the obligations of the Agreement and/or complete the work as specified.

1.5 Examination of Contract Documents and Site.

- A. It is the responsibility of each Bidder before submitting a Bid:
 1. To examine thoroughly the Contract Documents and other related data identified in the Bidding Documents (including "technical data" referred to below);
 2. To visit the site to become familiar with and satisfy Bidder as to the general, local and site conditions that may affect cost, progress, performance, or furnishing of the Work;

3. To consider federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of the Work;
 4. To study and carefully correlate Bidder's knowledge and observations with the Contract Documents and other related data; and
 5. To promptly notify ENGINEER of all conflicts, errors, ambiguities, or discrepancies which Bidder has discovered in or between the Contract Documents and such other related documents.
- B. Reference is made to the Supplementary Conditions for the identification of:
1. Those reports of explorations and tests of subsurface conditions at or contiguous to the site which have been utilized by ENGINEER in preparation of the Contract Documents. Bidder may rely upon the general accuracy of the "technical data" contained in such reports, but not upon other data, interpretations, opinions, or information contained in such reports or otherwise relating to the subsurface conditions at the site, nor upon the completeness thereof for the purpose of bidding or construction.
 2. Those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are at or contiguous to the site that have been utilized by ENGINEER in preparation of the Contract Documents. Bidder may rely upon the general accuracy of the "technical data" contained in such drawings but not upon other data, interpretations, opinions, or information shown or indicated in such drawings or otherwise relating to such structures, nor upon the completeness thereof for the purposes of bidding or construction.
- Copies of such reports and drawings will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified and established in Paragraph SC-4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.
- C. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities or others, and OWNER and ENGINEER do not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions or unless the OWNER of the Project also owns the Underground Facility.
- D. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due

to differing or unanticipated conditions appear in Paragraphs 4.02 and 4.03 of the General Conditions.

- E. Before submitting a Bid, each Bidder will be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the work in accordance with the time, price, and other terms and conditions of the Contract Documents.
- F. On request, OWNER will provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests, and studies, as each Bidder deems necessary for submission of a Bid. Bidder must fill all holes, clean up, and restore the site to its former conditions upon completion of such explorations, investigations, tests, and studies.
- G. Reference is made to the Supplementary Conditions for the identification of the general nature of work that is to be performed at the site by OWNER or others (such as utilities and other prime contractors) that relate to the work for which a Bid is to be submitted. On request, OWNER will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such work.
- H. The submission of Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the work required by the Contract Documents and applying the specific means, methods, techniques, sequences, or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Contract Documents and the written resolutions thereof by ENGINEER is acceptable to Bidder, and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.
- I. The provisions of 4.1 through 4.8, inclusive, do not apply to Asbestos, Polychlorinated Biphenyls (PCBs), Petroleum, Hazardous Waste or Radioactive Material covered by Paragraph 4.06 of the General Conditions.

1.6 Availability of Lands for Work, etc.

The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by CONTRACTOR in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by CONTRACTOR. Easements for permanent structures or permanent changes in existing

facilities are to be obtained and paid for by OWNER unless otherwise provided in the Contract Documents.

1.7 Interpretations and Addenda.

- A. All questions about the meaning or intent of the Bidding Documents are to be directed to ENGINEER. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than three days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- B. Addenda may also be issued to modify the Bidding Documents as deemed advisable by OWNER or ENGINEER.

1.8 Bid Security.

- A. Each Bid must be accompanied by Bid security made payable to OWNER in an amount of five percent of Bidder's maximum bid price and in the form of a certified or bank check or a Bid Bond issued by a surety meeting the requirements of Paragraph 5.02 of the General Conditions.
- B. The Bid security of Successful Bidder will be retained until such Bidder has executed the Agreement, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within ten days after the Notice of Award, OWNER may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the Agreement is signed or 45 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned. Bid security with Bids that are not competitive will be returned within seven days after the Bid opening.

1.9 Contract Times.

The number of days within which, or the dates by which, the Work is to be substantially completed and also completed and ready for final payment (the term "Contract Times" is defined in Paragraph 1.01.A.14 of the General Conditions) are set forth in the Agreement and in Division 01.

1.10 Liquidated Damages.

Provisions for liquidated damages, if any, are set forth in the Agreement and in Division 01.

1.11 Substitute and "Or-Equal" Items.

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or-equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, applications for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in Paragraph 6.05 of the General Conditions.

1.12 Subcontractors, Suppliers, and Others

Each Bidder shall submit to OWNER a list of all Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) proposed for those portions of the Work for which such identification is required. 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, person, or organization if requested by OWNER. An OWNER or ENGINEER who after due investigation has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, may before the Notice of Award is given request apparent Successful Bidder to submit an acceptable substitute, without an increase in Bid price.

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 and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any Bidder. Any Subcontractor, Supplier, other person or organization listed and to whom OWNER or ENGINEER does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

1.13 Bid Form

- A. The Bid Form is included with the Bidding Documents download through QUEST.
- B. All blanks on the Bid Form must be completed by printing in ink or by typewriter.
- C. Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.
- D. Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.
- E. All names must be typed below the signature.

- F. The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).
- G. The address and telephone number for communications regarding the Bid must be shown.
- H. Evidence of authority to conduct business as an out-of-state corporation in the state where the Work is to be performed shall be provided in accordance with Paragraph 3 above. Federal I.D. number must also be shown.

1.14 Submission of Bids.

Bids shall be submitted at the time and place indicated in the Advertisement for Bid.

1.15 Modification and Withdrawal of Bids.

- A. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.
- B. If, within twenty-four hours after Bids are opened, any Bidder files a duly signed, written notice with the 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, that Bidder will be disqualified from further bidding on the Work to be provided under the Contract Documents.

1.16 Opening of Bids.

Bids will be opened virtually through Quest. 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.

1.17 Bids to Remain Subject to Acceptance.

All Bids will remain subject to acceptance for the period of time stated in the Bid Form and in Division 1, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to that date.

1.18 Award of Contract.

- A. OWNER reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, nonresponsive, unbalanced or conditional Bids and to reject the Bid of any Bidder if OWNER believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by OWNER. OWNER also reserves the right to waive all informalities not involving price, time, or changes in the Work. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct use thereof will be resolved in favor of the

correct sum. Discrepancies between words and figures will be resolved in favor of the words.

- B. In evaluating Bids, OWNER will consider the qualifications of Bidders, 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.
- C. OWNER may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations has been requested. OWNER also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed when such data is required to be submitted as provided in the Supplementary Conditions.
- D. OWNER may conduct such investigations as OWNER deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to OWNER's satisfaction within the prescribed time.
- E. If the contract is to be awarded it will be awarded to the lowest Bidder whose evaluation by OWNER indicates to OWNER that the award will be in the best interests of the Project.

1.19 Contract Security

Article 5 of the General Conditions and the Supplementary Conditions set forth OWNER's requirements as to performance and payment Bonds. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by the required performance and payment Bonds.

1.20 Signing of Agreement.

When OWNER gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement. Within ten days thereafter, CONTRACTOR shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER with the required Bonds. Within ten days thereafter OWNER will deliver one fully signed counterpart to CONTRACTOR.

END OF SECTION

SECTION 00 31 00

AVAILABLE PROJECT INFORMATION

- A. Section Includes:
 - 1. Asbestos and Lead Investigation Report
- B. Related Sections:
 - 1. Section [00 21 15 - Instructions to Bidders - EJCDC:] Site examination

1.2 ASBESTOS INVESTIGATION REPORT

- A. A copy of the Asbestos and Lead Investigation Report with respect to the project site is available for viewing at the office of the Vierbicher, 201 E Main St, Suit 100, Reedsburg, WI 53959 titled as follows:
 - 1. Title: Pre-Demolition DNR Inspection for Asbestos & Pb
 - 2. Dated: 12/19/2025.
 - 3. Prepared by: Advanced Testing & Inspection LLC (ATI)

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK



Advanced Testing & Inspections LLC (ATI)

4575 CTH C Spring Green, WI 53588

1-877-268-2402

atinspections2@gmail.com

PRE-DEMOLITION DNR INSPECTION FOR ASBESTOS & Pb

December 19, 2025

City of Prairie du Chien
PO Box 324
214 E. Blackhawk Ave.
Prairie du Chien, WI 53821

Attn: Larry Gates Utility Director

RE:

Well House #2
724 E Blackhawk
Prairie du Chien, WI

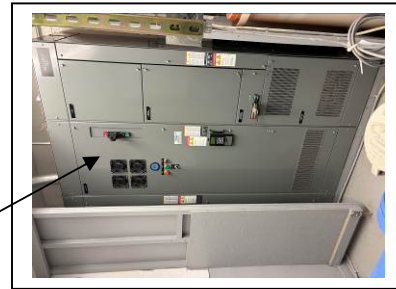
Quick Summary:

This is a small in use well structure scheduled for demotion.

Assumed items:

Electrical control and switch backings verified negative, re-utilized or properly disposed of.

Interior wall – past vermiculite indications



The following is a result of the asbestos inspection / samples:

Project: Well 2 724 E Blackhawk

Lab Code: 714055-1

Method: EPA 600 / R93 / 116 and EPA 40 CFR Appendix E to Subpart E of Part 763

Client ID	Lab ID	Layer	Sample Description	Asbestos %
251219-B1	3979118		Black flashing	Chrysotile 10%
251219-B2	3979119		Black tar	None Detected
251219-B3	3979120		Gray/white wall covering	Chrysotile 15%
251219-B4	3979121		Gray glazing	None Detected

Negative for Pb – limit 0.5% by weight

Project: Well 2 724 E Blackhawk

Method: USEPA SW846 7000B (LEAD IN PAINT)

Client ID	Lab ID	PPM (µg/g)	Concentration % By Weight
251219-C1	3979122	<78.6	<0.007858

Comment: L03

Summary

Have a licensed asbestos abatement company file a DNR permit, abate and properly dispose the following prior to demolition:

1. Exterior gray roof flashing (22Sq Ft)
2. All interior (transite) wall and ceiling along with any vermiculite behind wall (860 Sq Ft)
3. Verify electrical equipment backing and properly address

Please call with any questions,

Marty Limmex

Marty Limmex WI-AI & LRA 16789
SR Safety Consultant
Advanced Testing & Inspection LLC
608-588-4831 (cell)



MV Service companies are a complete portfolio of Industrial & Residential Health & Safety Inspection Services specializing in Industrial Hygiene, Indoor & Worker Air Quality, Mold, Thermal imaging, Radon, LB Paint, Asbestos, Asbestos & Mold abatements and general Process Audits. For further information on how we may be able to help you, call toll free @ 1-877-268-2402.

SECTION 00 41 43

BID FORM

Proposal of _____ hereinafter called "BIDDER".

PROJECT IDENTIFICATION: Well No. 5 Production Well, Pumphouse, SCADA Updates & Well No. 2 Demolition

PROJECT NUMBER: 240564

THIS BID IS SUBMITTED TO: City of Prairie du Chien
214 E. Blackhawk Ave
Prairie du Chien, WI 53821

hereinafter called "OWNER".

1. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid Price and within the Bid Times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
2. BIDDER accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 45 days after the day of Bid opening. BIDDER will sign and deliver the required number of counterparts of the Agreement with the Bonds and other sections required by the Bidding Requirements within ten days after the date of OWNER's Notice of Award.
3. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
 - (a) BIDDER has examined and carefully studied the Bidding Documents and the following Addenda, receipt of all which is hereby acknowledged:

Addendum No. ____ Dated ____
Addendum No. ____ Dated ____
Addendum No. ____ Dated ____
 - (b) BIDDER has visited the site and become familiar with and is satisfied as to the general, local, and site conditions that may affect cost, progress, performance, and furnishing of the Work;
 - (c) BIDDER is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance, and furnishing of the Work.
 - (d) BIDDER has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in the Supplementary

Conditions as provided in paragraph 4.02 of the General Conditions. BIDDER accepts the determination set forth in paragraph SC-4.02 of the Supplementary Conditions of the extent of the "technical data" contained in such reports and drawings upon which BIDDER is entitled to rely as provided in paragraph 4.02 of the General Conditions. BIDDER acknowledges that such reports and drawings are not Contract Documents and may not be complete for BIDDER's purposes. BIDDER acknowledges that OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the site. BIDDER has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by BIDDER and safety precautions and programs incident thereto. BIDDER does not consider that any additional examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the times, price and other terms and conditions of the Contract Documents.

- (e) BIDDER is aware of the general nature of Work to be performed by OWNER and others at the site that relates to Work for which this BID is submitted as indicated in the Contract Documents.
 - (f) BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
 - (g) BIDDER has given ENGINEER written notice of all conflicts, errors, ambiguities or discrepancies that BIDDER has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to BIDDER, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which the Bid is submitted.
 - (h) This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement of rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.
4. BIDDER will complete the Work in accordance with the Contract Documents for the following prices:

BID FORM - Contract A Section 00 41 43 Well No. 5 Production Well, Pumphouse, SCADA System Update & Well No. 2 Demolition, Prairie du Chien, W					
Bid Item Ref. No.	Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
CONTRACT A - WELL NO. 5 PRODUCTION WELL					
General, Erosion Control & Site Work					
1	Performance & Payment Bonds	LS	1	\$ -	\$ -
2	Mobilization / Demobilization	LS	1	\$ -	\$ -
3	Inlet Protection - Type D	EA	4	\$ -	\$ -
4	Silt Fence or Silt Sock	LF	140	\$ -	\$ -
5	Strip, Stockpile, & Re-Spread Topsoil (Estimated 125 CY +/-)	SY	865	\$ -	\$ -
6	Drill Cutting Containment, Stone Weepers, & Erosion Control	LS	1	\$ -	\$ -
7	Drill Rig Pad or Aggregate Base	LS	1	\$ -	\$ -
8	Clear Stone Tracking Pad	TON	60	\$ -	\$ -
9	Lot Re-grading	LS	1	\$ -	\$ -
10	Restoration - Seed, Fertilizer, & Mulch	SY	865	\$ -	\$ -
Subtotal - General, Erosion Control & Site Work					\$ -
Production Well					
11	Upper Enlarged Bore Hole & Temporary Outer Casing - 30"	VF	20	\$ -	\$ -
12	Bore Hole & Temporary Outer Casing - 24"	VF	106	\$ -	\$ -
13	Permanent Casing - 18" (casing to extend 36" above grade)	VF	73	\$ -	\$ -
14	Well Screen - 18"	VF	33	\$ -	\$ -
15	Gravel Pack	LS	1	\$ -	\$ -
16	Well Development	LS	1	\$ -	\$ -
17	Conduct Performance Test and Provide Report	HR	24	\$ -	\$ -
18	Furnish, Install, Remove Test Pump & Well Disinfection	LS	1	\$ -	\$ -
19	Water Quality Analysis Sampling, Testing & Reports	LS	1	\$ -	\$ -
20	Sand Seal	LS	1	\$ -	\$ -
21	Clay Seal	LS	1	\$ -	\$ -
22	Plumbness Test of Permanent Casing Before Grouting	LS	1	\$ -	\$ -
23	Annular Grout between 24" Bore Hole & 18" Casing (65 VF)	Bags	92	\$ -	\$ -
24	Plumbness & Alignment Test of Permanent Casing After Grouting	LS	1	\$ -	\$ -
25	Collect & Deliver Drilling Samples, Well Construction Report, Casing Pipe Report & Daily Reports	LS	1	\$ -	\$ -
26	Sealing Casing, Site Clean-up & Demobilization	LS	1	\$ -	\$ -
Subtotal - Production Well					\$ -
TOTAL CONTRACT A - WELL NO. 5 PRODUCTION WELL					\$ -
The Contract A TOTAL BID PRICE is:					
Dollars _____					
Unit Prices have been computed in accordance with paragraph 11.03.B of the General Conditions.					

BID FORM - Contract B Section 00 41 43 Well No. 5 Production Well, Pumphouse, SCADA System Update & Well No. 2 Demolition, Prairie du Chien, W						
CONTRACT B - WELL NO. 5 PUMPHOUSE, SCADA UPDATES & WELL NO. 2 DEMOLITION						
Well No. 5 Pumphouse & Emergency Electrical Generator						
1	Pumphouse	LS	1		\$	-
2	Emergency Electrical Generator & Automatic Transfer Switch	LS	1		\$	-
Subtotal - Well No. 5 Pumphouse & Generator						\$ -
General Erosion Control & Site Work - Well No. 5 Pumphouse						
3	Performance & Payment Bonds	LS	1		\$	-
4	Mobilization	LS	1		\$	-
5	Strip, Salvage, & Re-Spread Topsoil (Estimated 160 CY +/-)	LS	1		\$	-
6	Common Excavation Move On Site (Estimated 180 CY +/-)	LS	1		\$	-
7	Structural Fill - Under Asphalt & Generator Pad	CY	120		\$	-
8	Base Aggregate Dense - 1 1/4" (6" Depth)	TON	180		\$	-
9	Base Aggregate Dense - 3" (6" Depth)	TON	160		\$	-
10	Base Aggregate Dense - 1 1/4" (Shouldering)	TON	15		\$	-
11	Temporary Traffic Control	LS	1		\$	-
12	Sawcut Concrete Curb Head	LF	20		\$	-
13	Sawcut Asphalt	LF	65		\$	-
14	Remove Existing Asphalt (2 1/2")	SY	15		\$	-
15	Remove Existing Asphalt (4")	SY	20		\$	-
16	Remove Existing Tree	EA	2		\$	-
17	HMA Pavement - Upper Layer (2"), 4 LT 58-28S	TON	110		\$	-
18	HMA Pavement - Lower Layer (2"), 4 LT 58-28S	TON	110		\$	-
19	HMA Pavement - Trail (2 1/2") 4 LT 58-28S	TON	2		\$	-
20	Asphaltic Tack Coat	SY	435		\$	-
21	Restoration W/ Seed, Mulch, & Fertilizer (+/- 1430 SY)	LS	1		\$	-
22	Inlet Protection - Type D	EA	4		\$	-
23	Clear Stone Tracking Pad	TON	90		\$	-
24	Silt Fence / Silt Sock	LF	180		\$	-
25	Concrete Pad - Emergency Electrical Generator	LS	1		\$	-
26	Concrete Pad - Transformer	LS	1		\$	-
27	Concrete Driveway Apron (7")	SF	110		\$	-
28	Remove & Replace Concrete Curb & Gutter - 30"	LF	20		\$	-
29	Pipe Bollard	EA	2		\$	-
Subtotal - Erosion Control & Sitework - Well No. 5 Pumphouse						\$ -
Sanitary Sewer - Well No. 5 Pumphouse						
30	Sanitary Sewer Lateral - 4-inch, C-900, W/10 AWG Tracer Wire	LF	124		\$	-
Subtotal - Sanitary Sewer - Well No. 5 Pumphouse						\$ -
Water Distribution - Well No. 5 Pumphouse						
31	Water Main - 6" C-900	LF	8		\$	-
32	Water Main - 10" C-900	LF	167		\$	-
33	Remove Existing Water Service - 6"	LS	1		\$	-
34	Gate Valves - 6"	EA	1		\$	-
35	Gate Valves - 10"	EA	1		\$	-
36	Water Service Lateral - 1.5" Copper	LF	12		\$	-
37	Water Service - 1.5" Corporation, Curb Stop, Union, and Box	EA	1		\$	-
38	Hydrant - New w/ Marker Flag	EA	1		\$	-
Subtotal - Water Distribution - Well No. 5 Pumphouse						\$ -
SCADA System Update						
39	Well No. 3 Pumphouse Remote Terminal Unit	LS	1		\$	-
40	Well No. 4 Pumphouse Remote Terminal Unit	LS	1		\$	-
41	Well No. 5 Pumphouse Remote Terminal Unit	LS	1		\$	-
42	Reservoirs Remote Terminal Unit	LS	1		\$	-
43	Well No. 1 Pumphouse Master Telemetry Unit	LS	1		\$	-
44	MTU Firewall & Cellular Application for Remote SCADA Access	LS	1		\$	-
Subtotal - SCADA System Update						\$ -
Well No. 2 Demolition						
45	Salvage Designated Equipment & Materials and Deliver to Owner	LS	1		\$	-
46	Abandon Well No. 2	LS	1		\$	-
47	Hazardous Materials Abatement, Building Demolition, & Materials Disposal	LS	1		\$	-
48	Abandon Connecting Water Main, Building Sewer, & Utilities	LS	1		\$	-
49	Borrow Excavation (Trucked-in)	CY	170		\$	-
50	Restoration W/ 4" Topsoil, Seed, Mulch, & Fertilizer (130 SY)	LS	1		\$	-
TOTAL - Well No. 2 Demolition						\$ -
TOTAL CONTRACT B - WELL NO. 5 PUMPHOUSE, SCADA SYSTEM UPDATE, & WELL NO. 2 DEMOLITION						\$ -
The Contract B TOTAL BID PRICE is:						
Dollars _____						
Unit Prices have been computed in accordance with paragraph 11.03.B of the General Conditions.						
Alternate Bid Item - Well No. 5 Pumphouse - Contract B						
1A	Rebuild Well No. 2 Well Pump Bowl Assembly (Instead of New Well Pump Bowl Assembly. Add or deduct to Item #1)	LS	1		\$	-
Alternate Bid Item - SCADA System Update - Contract B						
39A	Furnish Wood Utility Pole & Install Antenna - Well No. 5 Pumphouse RTU (Add to Item #39)	LS	1		\$	-

BIDDER acknowledges that quantities are not guaranteed and final payment will be based on actual quantities determined as provided in the Contract Documents.

1. BIDDER agrees that Work will be substantially completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement and in Division 1.

BIDDER accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified in the Agreement.

2. The following sections are attached to and made a condition of this Bid:

- (a) Required Bid security.
- (b) A tabulation of Subcontractors, suppliers and other persons and organizations required to be identified in this Bid.
- (c) Required BIDDER'S List of References.

Respectfully submitted:

BIDDER:

(SEAL)

ATTEST:

Signature

Signature

Please Type Name and Title

Please Type Name and Title

Address

Date

Phone

Federal I.D. Number

Email Address

LIST OF REFERENCES

The following is a list of projects similar in nature and cost that have been completed by the Bidder within the past five (5) years.

Project Name:_____	_____
	(Owner Name)
Project Cost:_____	_____
Description:_____	_____
_____	_____
_____	_____
	(Contact Person) (Phone No.)

Project Name:_____	_____
	(Owner Name)
Project Cost:_____	_____
Description:_____	_____
_____	_____
_____	_____
	(Contact Person) (Phone No.)

Project Name:_____	_____
	(Owner Name)
Project Cost:_____	_____
Description:_____	_____
_____	_____
_____	_____
	(Contact Person) (Phone No.)

Project Name:_____	_____
	(Owner Name)
Project Cost:_____	_____
Description:_____	_____
_____	_____
_____	_____
	(Contact Person) (Phone No.)

LIST OF SUBCONTRACTORS

If awarded this Contract, the Bidder declares the intent to employ the following Subcontractors for the Class of Work as noted below:

NAME OF SUBCONTRACTOR	FEDERAL EMPLOYEE INDENTIFICATION NUMBER (FEIN)	CLASS OF WORK

The above is a full and complete list of all the proposed Subcontractors and the Class of Work to be performed by each. This list shall not be altered without the written consent of the OWNER.

LIST OF SUPPLIERS

If awarded this Contract, the Bidder declares the intent to have materials provided by the following Suppliers as noted below

NAME OF SUPPLIER OR MANUFACTURER	MATERIAL

This list shall not be altered without the written consent of the OWNER.

DISCLOSURE OF OWNERSHIP

Personally identifiable information may be used for secondary purposes.
See s. 15.04(1)(m) Stats. for details.

(1) INSTRUCTIONS: On the date a CONTRACTOR submits a bid to or completes negotiations with a state agency or local governmental unit on a project subject to ss. 66.0903 or 103.49, Stats., the CONTRACTOR shall disclose to such state agency or local governmental unit the name of any "other construction business" which the CONTRACTOR, or a shareholder, officer or partner of the CONTRACTOR, owns or has owned within the preceding three (3) years.

(2) DEFINITION: The term "other construction business" means any business engaged in erection, construction, remodeling, repairing, demolition, altering, or painting and decorating buildings, structures or facilities and any business engaged in supplying mineral aggregate or hauling excavated material or spoil, as provided by ss. 66.0903(3), 103.49(2) and 103.50(2), Stats.

(3) WHEN TO COMPLETE FORM: This form ONLY needs to be completed if (a) the CONTRACTOR, or a shareholder, officer or partner of the CONTRACTOR, owns at least a 25% interest in the "other construction business" indicated below on the date the CONTRACTOR submits a bid or completes negotiations, or has owned at least a 25% interest in the "other construction business" at any time within the preceding three (3) years; and (b) the Wisconsin Department of Workforce Development (DWD) has determined that the "other construction business" failed to pay the prevailing wage rate or time and one-half the required hourly basic rate of pay for hours worked in excess of the prevailing hours of labor to any employee at any time within the preceding three (3) years. This form DOES NOT have to be completed if the requirements of both (a) and (b) above are not met. If the requirements of both (a) and (b) above are met, this form must ONLY be filed with the state agency or local government unit that will be awarding the contract.

(4) NAME AND ADDRESS OF OTHER CONSTRUCTION BUSINESS: Indicate below the name(s) and address(es) of any "other construction business" which meets all of the criteria specified in (2) and (3) above.

Name of Other Construction Business

Street or P.O. Box, City, State and Zip

Name of Other Construction Business

Street or P.O. Box, City, State and Zip

Name of Other Construction Business

Street or P.O. Box, City, State and Zip

I HEREBY STATE UNDER PENALTY OF PERJURY THAT THE INFORMATION CONTAINED IN THIS IS TRUE AND ACCURATE ACCORDING TO MY KNOWLEDGE AND BELIEF.

Print Name of Authorized Officer

Signature of Authorized Officer

Title of Authorized Officer

This ____ day of _____, 20__

Name of Corporation, Partnership, or Sole Proprietorship
Zip)

Address (Incl. Street or P.O. Box, City, State &

The statutory authority for the use of the form is prescribed in ss. 66.0903(12)(d) and 103.49(7)(d). Stats. The use of this form is mandatory. The penalty for failing to complete this form is prescribed in s. 103.005(12). Stats.

AFFIDAVIT OF ORGANIZATION AND AUTHORITY

I, _____, being first duly sworn on oath certify that _____ (Name of corporation, partnership, or person submitting bid) Bidder on the attached Proposal is organized as indicated below; that I have examined and carefully prepared this Proposal from the Plans and Specifications and have checked the same in detail before submitting this Proposal; that all statements made herein are made on behalf of such Bidder and that I have full authority to make such statements and submit this Proposal in (its) (their) behalf; and that the said statements are true and correct.

Bidder is (fill out applicable paragraph)

A corporation organized and existing under the laws of the State of _____, its President is _____, its Secretary is _____, and it does have a corporate seal. The _____ (Officer or authorized agent) authorized to sign construction Contracts and Bids for the company by action of its Board of Directors taken _____, a certified copy of which is attached hereto.
(Strike out this last sentence if not applicable.)

A partnership consisting of _____ and _____, partners doing business under the name of _____.

An individual operating under the trade name of _____.

Signature

Title, if any

Bidders Address

Telephone

Email Address

Subscribed and sworn to before me this __ day
of _____, 20__.

Notary Public, _____ County, _____
My Commission expires _____

(This Affidavit must be attached to and filed with the Bid Proposal).

THIS PAGE INTENTIONALLY LEFT BLANK

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER (*Name and Address*):

SURETY (*Name and Address of Principal Place of Business*):

OWNER (*Name and Address*):

BID

Bid Due Date:

Description (*Project Name and Include Location*):

BOND

Bond Number:

Date (*Not earlier than Bid due date*):

Penal sum _____ \$ _____
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER

SURETY

Bidder's Name and Corporate Seal (Seal) Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Above addresses are to be used for giving any required notice. Provide execution by any additional parties, such as joint venturers, if necessary.

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 shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur 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 shall 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 shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.
6. No suit or action shall 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 Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall 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 Registered or Certified Mail, return receipt requested, postage pre-paid, and shall 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 shall 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 shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

SECTION 00 51 00

NOTICE OF AWARD

Date: _____

Project: Well No. 5 Production Well, Pumphouse, SCADA Updates & Well No. 2 Demolition

Owner: City of Prairie du Chien

Engineer's Project No.: 240564

Bidder:

Bidder's Address:

You are notified that your Bid dated February 10, 2026, for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for

Contract A – Public Water Supply Well No. 5: Construction of a 1,200 gallon per minute (gpm) municipal well to a depth of 106 feet, well development, performance pump testing of constructed well, WDNR NR 809 water quality analysis, erosion control restoration of the work area, and other miscellaneous items in conformance with the Contract Documents.

Contract B - Well No. 5 Pumphouse, SCADA Updates & Demolition of Well No. 2 Pumphouse: Construction of the Well No. 5 Pumphouse building, including furnishing and installing all well pump equipment, piping, valves, accessories and controls. The building includes a pump room, chemical room, and restroom. The Well No. 5 Pumphouse contract also includes installation of a natural gas-powered emergency electrical generator, erosion control measures, site work, site piping, driveway, pavement, restoration of the work area, pump testing, water quality testing, and other miscellaneous items in conformance with the Contract Documents.

Also, to include demoltion of the Well No. 2 Pumphouse including building demolition, excavation, water main and other utilities disconnections/abandonments, backfilling, grading, and site restoration. The existing Well No. 2 motor control center and well pump equipment are to be salvaged and reused in the proposed Well No. 5 Pumphouse. Well No. 2 is to be abandoned including removal and off-site disposal, or salvaging for the Owner, of existing well pump, column pipe, electrical cables, and motor, removing the casing to 3 feet below final finish grade, filling with concrete, neat cement grout or approved bentonite chips, and submitting a Well/Drillhole Abandonment Report.

In addition, the project includes SCADA system updates which include removal and disposal of existing SCADA system equipment and installation of new equipment at the existing Well Nos. 1, 3, & 4, pumphouses, reservoirs site, and the proposed Well No. 5 Pumphouse.

The Contract Price of your Contract is _____ Dollars (\$_____).

1 copy of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

3 sets of the Drawings will be delivered separately or otherwise made available to you

immediately.

You must comply with the following conditions precedent within 15 days of the date you receive this Notice of Award.

1. Deliver to the Owner 1 fully executed counterparts of the Contract Documents.
2. Deliver with the executed Contract Documents the Contract security [Bonds] as specified in the Instructions to Bidders (Article 20), General Conditions (Paragraph 5.01), and Supplementary Conditions (Paragraph SC-5.01).
3. Other conditions precedent:
Insurance Certificates as indicated by the General Conditions (Paragraph 5.03)

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 ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

City of Prairie du Chien

Owner

By: _____

Authorized Signature

Title

Date

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT

Owner and Contractor hereby agree as follows:

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Contract B - Well No. 5 Pumphouse, SCADA Updates & Demolition of Well No. 2 Pumphouse: Construction of the Well No. 5 Pumphouse building, including furnishing and installing all well pump equipment, piping, valves, accessories and controls. The building includes a pump room, chemical room, and restroom. The Well No. 5 Pumphouse contract also includes installation of a natural gas-powered emergency electrical generator, erosion control measures, site work, site piping, driveway, pavement, restoration of the work area, pump testing, water quality testing, and other miscellaneous items in conformance with the Contract Documents.

Also, to include demolition of the Well No. 2 Pumphouse including building demolition, excavation, water main and other utilities disconnections/abandonments, backfilling, grading, and site restoration. The existing Well No. 2 motor control center and well pump equipment are to be salvaged and reused in the proposed Well No. 5 Pumphouse. Well No. 2 is to be abandoned including removal and off-site disposal, or salvaging for the Owner, of existing well pump, column pipe, electrical cables, and motor, removing the casing to 3 feet below final finish grade, filling with concrete, neat cement grout or approved bentonite chips, and submitting a Well/Drillhole Abandonment Report.

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Project No. 240564
Standard Form of Agreement

ARTICLE 3 – ENGINEER

- 3.01 *The Project has been designed by Vierbicher (Engineer), which is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.*

ARTICLE 4 – CONTRACT TIMES

- 4.01 *Time of the Essence*

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 *Days to Achieve Substantial Completion and Final Payment*

- A. Comply with and complete the Work in accordance with the following construction schedule:

Contract A - Well No. 5 Production Well:

1. Award Contract (March 2026)
2. Notice to Proceed (April 2026)
3. Start Construction: Work may begin following the execution of the Contract documents, issue of Notice to Proceed, and the preconstruction meeting.
4. Substantial Completion: The work shall be substantially completed by June 2026 (Well construction complete).
5. Final Completion: The work shall be complete and ready for final payment by July 2026 (Water quality test results obtained). Final completion shall include all work as shown on the Contract Drawings and detailed in these specifications, including all the items addressed in final project closeout punchlist.
6. 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.

Contract B - Well No. 5 Pumphouse, SCADA Updates, & Well No. 2 Demolition:

1. Award Contract (March 2026)
2. Notice to Proceed (July 2026)
3. Start Construction: Work may begin following the execution of the Contract documents, issue of Notice to Proceed, and the preconstruction meeting.
4. Substantial Completion: The work shall be substantially completed by January 2027
5. Final Completion: The work shall be complete and ready for final payment by February 2027. Final completion shall include all work as shown on the Contract Drawings and detailed in these specifications, including all the items addressed in final project closeout punchlist.

6. 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.

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 Article 12 of the General Conditions. 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. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$1,500 for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$1,500 for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

- 5.02 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraph 5.01.A below:

- A. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the actual quantity of that item:

The Bid prices for Unit Price Work set forth as of the Effective Date of the Agreement are based on estimated quantities. As provided in Paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer as provided in Paragraph 9.07 of the General Conditions.

For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 15th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of 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 in the General Requirements.

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 Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.
 - a. 95 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and
 - b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 98 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less 110 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST

- 7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of 12 percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:
 - A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. As referenced in Supplementary Conditions 00 73 00, contractor also 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" and "Build America, Buy America;" that require all of the iron and steel, manufactured products, and construction materials used in the project to be produced in the United States, including iron and steel products provided by the Contractor pursuant to this agreement.
 - C. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

- D. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
- E. Contractor has considered the information known to Contractor; 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 Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 8.01.D above, Contractor does not consider that 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 Documents.
- G. 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.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

- A. The Contract Documents consist of the following:
 - 1. This Agreement (pages 1 to 7, inclusive).
 - 2. Performance bond (pages 1 to 3, inclusive).
 - 3. Payment bond (pages 1 to 3, inclusive).
 - 4. General Conditions (pages 1 to 61, inclusive).
 - 5. Supplementary Conditions (pages 1 to 6, inclusive).
 - 6. Specifications as listed in the table of contents of the Project Manual.
 - 7. Drawings:
 - a. Contract A: Consisting of 3 sheets with each sheet bearing the following general title: Public Water Supply Well No. 5
 - b. Contract B: Consisting of 28 sheets with each sheet bearing the following general

title: Public Water Supply Well No. 5 Pumphouse & Well No. 2 Pumphouse Demolition.

8. Addenda (numbers ___ to ___, inclusive).
 9. Exhibits to this Agreement (enumerated as follows):
 - a. Contractor's Bid (pages ___ to ___, inclusive).
 - b. 8700-294A DBE Contacts Worksheet
 10. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Notice to Proceed (pages 1 to 1, inclusive).
 - b. Work Change Directives.
 - c. Change Orders.
- B. The sections listed in Paragraph 9.01.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 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 Terms

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 Assignment of Contract

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are 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 Documents.

10.03 Successors and Assigns

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 Severability

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall 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.

10.05 *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 10.05:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing 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.

10.06 *Other Provisions*

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on ____ (which is the Effective Date of the Agreement).

OWNER:

CONTRACTOR

City of Prairie du Chien

By: _____

By: _____

Title: _____

Title: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

Attest: _____

Title: _____

Title: _____

Address for giving notices:

Address for giving notices:

214 E. Blackhawk Ave

Prairie du Chien, WI 53821

License No.: _____

(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.)

(Where applicable)

Agent for service of process:

SECTION 00 55 00
NOTICE TO PROCEED

Date: _____

Project: Well No. 5 Pumphouse

Owner: City of Prairie du Chien

Engineer's Project No.: 240564

Contractor:

Contractor's Address:

You are notified that the Contract Times under the above Contract will commence to run on _____. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement, the date of Substantial Completion is _____, and the date of readiness for final payment is _____.

Owner

City of Prairie du Chien
Given by:

Authorized Signature

Title

Date

THIS PAGE INTENTIONALLY LEFT BLANK

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*): SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*):

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

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

Contractor's Name and Corporate Seal

(Seal)

Surety's Name and Corporate Seal

(Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

1. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 2.1.
2. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
 - 2.1 Owner has notified Contractor and Surety, at the addresses described in Paragraph 9 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor, and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
 - 2.2 Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 2.1; and
 - 2.3 Owner has agreed to pay the Balance of the Contract Price to:
 1. Surety in accordance with the terms of the Contract; or
 2. Another contractor selected pursuant to Paragraph 3.3 to perform the Contract.
3. When Owner has satisfied the conditions of Paragraph 2, Surety shall promptly, and at Surety's expense, take one of the following actions:
 - 3.1 Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
 - 3.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
 - 3.3 Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 5 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
 - 3.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
 1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
 2. Deny liability in whole or in part and notify Owner citing reasons therefor.
4. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 3.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.
5. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 3.1, 3.2, or 3.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

- 5.1 The responsibilities of Contractor for correction of defective Work and completion of the Contract;
- 5.2 Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 3; and
- 5.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

6. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

7. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

8. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located, and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after 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 period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

9. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

10. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

11. Definitions.

- 11.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
- 11.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
- 11.3 Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
- 11.4 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address and Telephone)*

Surety Agency or Broker:

Owner's Representative *(Engineer or other party)*:

THIS PAGE INTENTIONALLY LEFT BLANK

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*):

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

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

Contractor's Name and Corporate Seal

Surety's Name and Corporate Seal

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2 Claimants who do not have a direct contract with Contractor:
 1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. Reserved.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.
9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders, and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, 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 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 shall be applicable.

12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. Definitions

15.1 Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and 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.

15.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract, or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address, and Telephone)*

Surety Agency or Broker:

Owner's Representative *(Engineer or other)*:

THIS PAGE INTENTIONALLY LEFT BLANK



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:		
	PHONE (A/C, No. Ext):	FAX (A/C, No):	
	E-MAIL ADDRESS:		
	INSURER(S) AFFORDING COVERAGE		NAIC #
	INSURER A :		
	INSURER B :		
INSURED	INSURER C :		
	INSURER D :		
	INSURER E :		
	INSURER F :		

COVERAGES**CERTIFICATE NUMBER:****REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
	COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE \$
	☐ CLAIMS-MADE ☐ OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence) \$
							MED EXP (Any one person) \$
							PERSONAL & ADV INJURY \$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE \$
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG \$
	OTHER:						\$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident) \$
	☐ ANY AUTO						BODILY INJURY (Per person) \$
	☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident) \$
	☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident) \$
							\$
	UMBRELLA LIAB						EACH OCCURRENCE \$
	☐ EXCESS LIAB ☐ CLAIMS-MADE						AGGREGATE \$
	DED ☐ RETENTION \$						\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY						☐ PER STATUTE ☐ OTH-ER
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)	Y / N ☐	N / A				E.L. EACH ACCIDENT \$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE \$
							E.L. DISEASE - POLICY LIMIT \$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER**CANCELLATION**

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

THIS PAGE INTENTIONALLY LEFT BLANK

REQUEST AND CERTIFICATE FOR PAYMENT

PROJECT: Well No. 5 Production Well, Pumphouse, SCADA System Update & Well No, 2 Demolition

ENGINEER'S PROJECT # : 240564

OWNER: City of Prairie du Chien
214 E. Blackhawk Ave
Prairie du Chien, WI 53821CONTRACTOR: CONTRACTOR NAME
CONTRACTOR ADDRESS
CONTRACTOR CITY, STATE, ZIPENGINEER: Vierbicher
201 E. Main St, Suite 100
Reedsburg, WI 53959

REQUEST NO. 1

REQUEST DATE __/__/2026

CHANGE ORDER SUMMARY		
Previously Approved Change Orders:		Additions/Deductions
		\$0.00
		\$0.00
		\$0.00
Net Additions/Deductions:		\$0.00
Current Change Orders:		Additions/Deductions
1		\$0.00
2		\$0.00
Net Additions/Deductions:		\$0.00
Net Change by Change Orders:		\$0.00

The undersigned CONTRACTOR certifies that (1) all previous progress payments received from OWNER on account of work completed under the contract referred to above have been applied to discharge in full, all obligations of CONTRACTOR incurred in connection with the work covered by prior applications for payment numbered ____ through ____ inclusive (none); and (2) title to all 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, claims, security interests, and encumbrances (except such as covered by Bond acceptable to OWNER).

Submitted by Contractor: _____ Date: _____

I hereby certify that I have reviewed the work and that to the best of my knowledge and belief, the quantities shown in this estimate are correct. This application is in conformance with the Contract Documents, therefore, I recommend payment of **One Hundred Fifty-Five Thousand, Nine Hundred Nine and 06/100 (\$155,909.06).**

Recommended by Engineer: _____ Date: _____

Approved by Owner: _____ Date: _____

Request is made for payment, as shown below, in connection with the contract. Continuation Sheet is attached.

The present status of the contract is as follows:

ORIGINAL CONTRACT SUM:..... \$0.00

NET CHANGE BY CHANGE ORDERS:..... \$0.00

CONTRACT SUM TO DATE:..... \$0.00

TOTAL COMPLETED TO DATE:..... \$0.00

RETAINAGE: (5% of work completed until 50% complete)..... \$0.00

TOTAL EARNED LESS RETAINAGE:..... \$0.00

LESS PREVIOUS CERTIFICATES FOR PAYMENT:..... \$0.00

CURRENT PAYMENT DUE:..... \$0.00

CONTINUATION SHEET

REQUEST AND CERTIFICATE FOR PAYMENT -CONTRACTOR'S SIGNED CERTIFICATE IS ATTACHED

PROJECT: Well No. 5 Production Well, Pumphouse, SCADA System Update & Well No, 2 Demolition

ENGINEER'S PROJECT # : 240564

OWNER: City of Prairie du Chien
214 E. Blackhawk Ave
Prairie du Chien, WI 53821

CONTRACTOR: CONTRACTOR NAME
CONTRACTOR ADDRESS
CONTRACTOR CITY, STATE, ZIP

ENGINEER: Vierbicher
201 E. Main St, Suite 100
Reedsburg, WI 53959

REQUEST NO.

1

REQUEST DATE ___/___/2026

Bid Item Ref. No. (A)	Description of Work (B)	Unit of Measure	Scheduled Quantity (C)	Unit Price (D)	Item Total (C*D)	Work Completed				Total Completed To Date (E+F)		% Complete
						Previous Requests (E)		This Request (F)				
						Quantity	Amount	Quantity	Amount	Quantity	Amount	
1			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
2			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
3			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
4			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
5			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
6			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
7			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
8			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
9			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
10			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
11			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
12			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
13			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
14			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
15			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
16			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
17			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
18			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
19			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
20			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
21			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
22			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
23			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
24			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
25			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
26			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
27			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
28			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
29			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
30			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
Subtotal - :					\$0.00		\$0.00		\$0.00		\$0.00	
31			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
32			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
33			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
34			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
Subtotal - :					\$0.00		\$0.00		\$0.00		\$0.00	

Bid Item Ref. No. (A)	Description of Work (B)	Unit of Measure	Scheduled Quantity (C)	Unit Price (D)	Item Total (C*D)	Work Completed				Total Completed To Date (E+F)		% Complete
						Previous Requests (E)		This Request (F)				
						Quantity	Amount	Quantity	Amount	Quantity	Amount	
35			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
36			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
37			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
38			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
39			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
40			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
41			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
42			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
43			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
44			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
45			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
46			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
Subtotal - :					\$0.00		\$0.00		\$0.00		\$0.00	
47			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
48			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
49			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
50			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
51			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
Subtotal - :					\$0.00		\$0.00		\$0.00		\$0.00	
52				\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
53				\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
Subtotal - :					\$0.00		\$0.00		\$0.00		\$0.00	
54			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
55			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
56			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
57			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
58			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
59			0	\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
Subtotal - :					\$0.00		\$0.00		\$0.00		\$0.00	
Original Contract TOTAL:					\$0.00		\$0.00		\$0.00		\$0.00	
Change Orders/Additions												
1				\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
2				\$0.00	\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
3					\$0.00	0	\$0.00	0	\$0.00	0	\$0.00	#DIV/0!
Subtotal - Change Orders/Additions:					\$0.00		\$0.00		\$0.00		\$0.00	
TOTAL:					\$0.00		\$0.00		\$0.00		\$0.00	

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00 65 16

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project: Well No. 5 Pumphouse

Project #: 240564

Owner: City of Prairie du Chien
214 E. Blackhawk Ave
Prairie du Chien, WI 53821

Contractor:

Contract Date:

The Work performed under this Contract has been reviewed and found to be substantially complete. The Date of Substantial Completion is hereby established as: _____.

DEFINITION OF DATE OF SUBSTANTIAL COMPLETION

The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Engineer when construction is sufficiently complete, in accordance with the Contract Documents, so the OWNER may occupy the Work or designated portion thereof for the use for which it is intended.

A list of items to be completed, prepared by the ENGINEER, is appended hereto. 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.

Vierbicher
ENGINEER

BY _____

DATE _____

The CONTRACTOR will complete or correct the Work on the list of items appended hereto prior to Final Contract Payment.

CONTRACTOR _____ BY _____ DATE _____

The OWNER accepts the Work or designated portion thereof as substantially complete as indicated above.

City of Prairie du Chien
OWNER

BY _____

DATE _____

THIS PAGE INTENTIONALLY LEFT BLANK

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.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by



AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

Copyright © 2007 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

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

The copyright for this EJCDC document is owned jointly by the four
EJCDC sponsoring organizations and held in trust for their benefit by NSPE.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
Article 1 – Definitions and Terminology	1
1.01 Defined Terms.....	1
1.02 Terminology	5
Article 2 – Preliminary Matters	6
2.01 Delivery of Bonds and Evidence of Insurance.....	6
2.02 Copies of Documents.....	6
2.03 Commencement of Contract Times; Notice to Proceed	6
2.04 Starting the Work	7
2.05 Before Starting Construction	7
2.06 Preconstruction Conference; Designation of Authorized Representatives	7
2.07 Initial Acceptance of Schedules	7
Article 3 – Contract Documents: Intent, Amending, Reuse	8
3.01 Intent.....	8
3.02 Reference Standards	8
3.03 Reporting and Resolving Discrepancies	8
3.04 Amending and Supplementing Contract Documents	9
3.05 Reuse of Documents	10
3.06 Electronic Data.....	10
Article 4 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points	10
4.01 Availability of Lands	10
4.02 Subsurface and Physical Conditions	11
4.03 Differing Subsurface or Physical Conditions.....	11
4.04 Underground Facilities	13
4.05 Reference Points	14
4.06 Hazardous Environmental Condition at Site.....	14
Article 5 – Bonds and Insurance	16
5.01 Performance, Payment, and Other Bonds	16
5.02 Licensed Sureties and Insurers	16
5.03 Certificates of Insurance	16
5.04 Contractor’s Insurance	17
5.05 Owner’s Liability Insurance	18
5.06 Property Insurance	18
5.07 Waiver of Rights	20
5.08 Receipt and Application of Insurance Proceeds	21
5.09 Acceptance of Bonds and Insurance; Option to Replace.....	21

5.10	Partial Utilization, Acknowledgment of Property Insurer	21
Article 6 – Contractor’s Responsibilities		22
6.01	Supervision and Superintendence	22
6.02	Labor; Working Hours.....	22
6.03	Services, Materials, and Equipment	22
6.04	Progress Schedule	23
6.05	Substitutes and “Or-Equals”	23
6.06	Concerning Subcontractors, Suppliers, and Others	25
6.07	Patent Fees and Royalties	26
6.08	Permits.....	27
6.09	Laws and Regulations	27
6.10	Taxes	28
6.11	Use of Site and Other Areas	28
6.12	Record Documents.....	29
6.13	Safety and Protection	29
6.14	Safety Representative	30
6.15	Hazard Communication Programs	30
6.16	Emergencies	30
6.17	Shop Drawings and Samples	30
6.18	Continuing the Work	32
6.19	Contractor’s General Warranty and Guarantee.....	32
6.20	Indemnification	33
6.21	Delegation of Professional Design Services	34
Article 7 – Other Work at the Site.....		34
7.01	Related Work at Site	34
7.02	Coordination.....	35
7.03	Legal Relationships.....	35
Article 8 – Owner’s Responsibilities		36
8.01	Communications to Contractor.....	36
8.02	Replacement of Engineer.....	36
8.03	Furnish Data	36
8.04	Pay When Due	36
8.05	Lands and Easements; Reports and Tests	36
8.06	Insurance	36
8.07	Change Orders.....	36
8.08	Inspections, Tests, and Approvals	36
8.09	Limitations on Owner’s Responsibilities	36
8.10	Undisclosed Hazardous Environmental Condition.....	37
8.11	Evidence of Financial Arrangements	37
8.12	Compliance with Safety Program.....	37
Article 9 – Engineer’s Status During Construction		37
9.01	Owner’s Representative.....	37
9.02	Visits to Site	37
9.03	Project Representative	38

9.04	Authorized Variations in Work	38
9.05	Rejecting Defective Work	38
9.06	Shop Drawings, Change Orders and Payments	38
9.07	Determinations for Unit Price Work	38
9.08	Decisions on Requirements of Contract Documents and Acceptability of Work	39
9.09	Limitations on Engineer's Authority and Responsibilities.....	39
9.10	Compliance with Safety Program.....	40
Article 10 –	Changes in the Work; Claims	40
10.01	Authorized Changes in the Work	40
10.02	Unauthorized Changes in the Work	40
10.03	Execution of Change Orders.....	40
10.04	Notification to Surety.....	41
10.05	Claims.....	41
Article 11 –	Cost of the Work; Allowances; Unit Price Work.....	42
11.01	Cost of the Work	42
11.02	Allowances	44
11.03	Unit Price Work	45
Article 12 –	Change of Contract Price; Change of Contract Times.....	45
12.01	Change of Contract Price.....	45
12.02	Change of Contract Times	47
12.03	Delays	47
Article 13 –	Tests and Inspections; Correction, Removal or Acceptance of Defective Work.....	48
13.01	Notice of Defects	48
13.02	Access to Work	48
13.03	Tests and Inspections	48
13.04	Uncovering Work.....	49
13.05	Owner May Stop the Work.....	49
13.06	Correction or Removal of Defective Work.....	49
13.07	Correction Period.....	50
13.08	Acceptance of Defective Work	51
13.09	Owner May Correct Defective Work.....	51
Article 14 –	Payments to Contractor and Completion.....	52
14.01	Schedule of Values	52
14.02	Progress Payments	52
14.03	Contractor's Warranty of Title	54
14.04	Substantial Completion.....	55
14.05	Partial Utilization	55
14.06	Final Inspection.....	56
14.07	Final Payment	56
14.08	Final Completion Delayed.....	57
14.09	Waiver of Claims	58

Article 15 – Suspension of Work and Termination	58
15.01 Owner May Suspend Work	58
15.02 Owner May Terminate for Cause	58
15.03 Owner May Terminate For Convenience.....	59
15.04 Contractor May Stop Work or Terminate	60
Article 16 – Dispute Resolution	60
16.01 Methods and Procedures	60
Article 17 – Miscellaneous	61
17.01 Giving Notice	61
17.02 Computation of Times	61
17.03 Cumulative Remedies	61
17.04 Survival of Obligations	61
17.05 Controlling Law	61
17.06 Headings	61

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. 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 which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer 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, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given 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 under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *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.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *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 for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *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 at the Site.
44. *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 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 thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, 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 Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *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, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. 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 Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. 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 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean 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, shall mean 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, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. 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 Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement 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 Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), 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 Documents;
 - 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.

2.06 *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 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, 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 instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial 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 for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall 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 component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one 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. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement 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, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, 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 Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, 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) any standard, specification, manual, or code, or (c) 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 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
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 Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); 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 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 1. A Field Order;
 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier 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 editions; or
 2. 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.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor 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. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- 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 the Work is to be performed 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.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

- 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
- 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "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; or
- 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.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

- 1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
- 2. is of such a nature as to require a change in the Contract Documents; or
- 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 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

- B. *Engineer's Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition 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 meet any one or more of the categories described in Paragraph 4.03.A; and
 - 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 Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final 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
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, 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 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *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.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "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; or
 - 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 any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) 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 obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. 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, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. 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. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. 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 or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. 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 a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds 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 shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed 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:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 - 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 - 6. claims 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.
- B. The policies of insurance required by this Paragraph 5.04 shall:
 - 1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners,

employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of

them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their 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 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 Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (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. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. 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:
1. loss 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 perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, 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. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *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. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *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 at all times maintain good discipline and order at the Site.
- B. 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 shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *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.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall 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 shall 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.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 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 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description 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 or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it 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; and
 - 3) it has a proven record of performance and availability of responsive service.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) 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
 - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
 - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. 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.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or

entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (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 any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *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 a particular 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 shall be disclosed by Owner 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.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. 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 opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *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. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear 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. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner

and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *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.

6.11 *Use of Site and Other Areas*

A. Limitation on Use of Site and Other Areas:

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. 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 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 by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall 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 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 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 property to stresses or pressures that will endanger it.

6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *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. 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;
 - 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, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. 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. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. 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.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.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 (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).

- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of 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.

6.16 *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 threatened 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 thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

- A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will 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 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.

- b. 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 6.17.D.
- B. 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. Submittal Procedures:

- 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
- 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
- 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review:

- 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. 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, conform to the information given in 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 (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the

Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.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's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

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.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *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 and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper 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.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 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 or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. 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 performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury 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 6.20.A shall 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.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe

access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. 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. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, 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.

7.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER’S RESPONSIBILITIES

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner’s duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner’s identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

- A. Owner’s responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

- A. Owner’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *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.

8.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *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 Documents.

8.12 *Compliance with Safety Program*

- 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 pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *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 Documents.

9.02 *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 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 9.09. 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.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which 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 Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. 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, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents 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 shall 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 Paragraph 14.07.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 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *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 by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *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 as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
 - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 - 2. changes in the 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; and
 - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of

executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *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.

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
 - 1. deny the Claim in whole or in part;
 - 2. approve the Claim; or
 - 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall 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. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall 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 shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall 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, who 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 shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including 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, and hand tools not owned by the workers, 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.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the 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 property insurance established in accordance with Paragraph 5.06.D), 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 shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall 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 telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, 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 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 4. 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.
 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 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:*
1. Contractor agrees that:
 - a. 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
 - b. 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 on account of any of the foregoing will be valid.

C. Contingency Allowance:

1. Contractor agrees that a 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 on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 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. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- 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. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

- B. The value of any Work covered by a Change Order or of any Claim for 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, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall 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 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five 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 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, 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 the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will 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 therewith as applicable.

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- 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.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

- E. 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.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, 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, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay 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 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 Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. 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, or both, 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, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *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, 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 shall 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.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay 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 correction or removal (including but not limited to all costs of repair or replacement of work of others).

- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *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 terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If 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. 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 correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. 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.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, 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.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay 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) 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 pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *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 rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, 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, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, 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 (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) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. 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 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *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 completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. 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 shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, 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 9.07, 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, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; 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, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, 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 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. Reduction in Payment:

- 1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. 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;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
- 2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action 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, when Contractor remedies the reasons for such action.
- 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 Contractor's Warranty of Title

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *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 (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- 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 tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. 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 tentative list.

14.05 *Partial Utilization*

- 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. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and 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 14.04.A through D for that part of the Work.
2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and 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 14.04 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 5.10 regarding property insurance.

14.06 *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 is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *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, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and

- d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) 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.

B. Engineer's Review of Application and Acceptance:

1. 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 Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. 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. Payment Becomes Due:

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *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 notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will 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 established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor's repeated disregard of the authority of Engineer; or
4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. 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
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.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 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) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed 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.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. 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. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven 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;
 3. 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) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven 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 15.03.

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, seven 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 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 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 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or
3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents 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.

17.03 *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 Documents. 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.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00 73 00

SUPPLEMENTARY CONDITIONS - EJCDC

1.1. SUMMARY

A. Section Includes:

1. Supplementary Conditions.

- 1.2. These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (C-700)(2007 Edition) and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

SC-1

Definitions

The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract C-700, (2007 Edition) have the meanings assigned to them in the General Conditions.

SC-2.01

Delivery of Bonds and Evidence of Insurance

Delete paragraph 2.01 of the General Conditions in its entirety and insert the following in its place:

2.01.A When Contractor delivers the executed Agreement to Owner, Contractor shall also deliver to Owner such **EJCDC Bonds**, insurance certificates and other sections as Contractor may be required to furnish in accordance with Article 5 of the General Conditions or other provisions of the Contract Documents.

2.01.B Before any work at the site is started, Contractor shall deliver to Owner the required number of counterparts of the fully executed Agreement, Bonds and other sections as may be required by the Contract Documents, as well as Owner approved copies of certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) with copies to each additional insured identified in the Supplementary Conditions, which Contractor is required to purchase and maintain in accordance with Article 5. Costs incurred to purchase, obtain, maintain and comply with Article 5 – Bonds and Insurance shall be borne by the Contractor, at no extra cost to the Owner, or additional insured.

SC-2.05

Before Starting Construction

Add the following to paragraph 2.05.A of the General Conditions:

2.05.A.4

A proposed listing of subcontractors and major material and equipment suppliers. The list shall include any proposed substitutions in accordance with paragraph 6.05 of the General Conditions.

SC-2.05.A.3

Preliminary Schedules

The Bid will be considered as the Schedule of Values of the work required by the General Conditions except that a Schedule of Values shall be submitted for each lump sum bid item as requested by the Engineer.

SC-3.03.A.2

Reporting Discrepancies

Add the following language at the end of paragraph 3.03.A.2 of the General Conditions.

If Contractor proceeds with work that Contractor had actual knowledge or should have known that a conflict, error, ambiguity or discrepancy existed as indicated above, correction of work constructed without such notification to Engineer shall be at Contractor's expense, (except in an emergency as authorized by paragraph 6.16.A).

SC-5.01

Add the following to paragraph 5.01 of the General Conditions:

Performance and Payment Bonds

The forms of the Performance and Payment Bonds attached hereto may be used for the Contract. Note instructions thereon as to the form applicable. Each form contemplates one corporate surety only. In case co-sureties or individual sureties will be furnished, proper forms therefore shall be obtained. Besides the stipulations of paragraphs 5.01 through 5.03 of the General Conditions, the surety on the Bonds shall provide a certificate indicating surety is licensed to underwrite contracts in the jurisdiction of the project location which shall be attached to the Bonds.

Every Bond must run to the Owner.

If the principal is an individual, his/her full name and residence shall be inserted in the body thereof, and he/she shall sign the Bonds with his/her usual signature on the line opposite the scroll seal. If the principals are partners, their individual names shall appear in the body of the Bonds, with the recital that they are partners comprising a firm, naming it, and all the members of the firm shall execute the Bonds as individuals.

The signature of a witness shall appear in the appropriate places, attesting the signatures of each individual party to the Bonds.

If the principal is a corporation, the name of the state in which incorporated shall be inserted in the appropriate place in the body of the Bonds, and said instrument shall be executed and attested under the corporate seal as indicated on the form. If the corporation has no seal, the fact shall be stated, in which case a scroll or adhesive seal shall appear following the corporate name. This also applies to execution by surety.

The date of the Bonds must not be prior to the date of the Contract for which given.
A power of attorney, authorizing the execution of the Bonds by an attorney-in-fact, or agent, shall be attached to one executed counterpart of the Bonds.

SC-5.03

Certificates of Insurance: Delete paragraph 5.03 of the General Conditions in its entirety and insert the following in its place:

SC-5.03 Contractor shall deliver to Owner, with copies to each additional insured or loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain in accordance with paragraphs 5.04, 5.06, 5.07, 5.08, 5.09 and 5.10 of the General Conditions.

SC-5.04

The Limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide the following coverages for not less than the following amounts or greater where required by Laws and Regulations:

Workers' Compensation, etc. under paragraphs 5.04.A.3 and 5.04.A.5 of the General Conditions:

(1)	State	Statutory
(2)	Applicable Federal (e.g., Longshoreman's)	Statutory
(3)	Employer's Liability	\$500,000

Contractor's Liability Insurance under paragraphs 5.04.A.3 through 5.04.A.5 of the General Conditions which shall also include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Contractor:

(1)	General Aggregate (Except Products - Completed Operations)	\$1,000,000
(2)	Products - Completed Operations Aggregate	\$1,000,000
(3)	Personal and Advertising Injury (Per Person/Organization)	\$1,000,000
(4)	Each Occurrence (Bodily Injury and Property Damage)	\$1,000,000
(5)	Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.	
(6)	Excess Liability	
	General Aggregate	\$1,000,000
	Each Occurrence	\$1,000,000

5.04.A.6

Automobile Liability:

(1)	Bodily Injury:	
	Each Person	\$1,000,000
	Each Accident	\$1,000,000
	Property Damage:	
	Each Accident	\$500,000
	OR	
(2)	Combined Single Limit (Bodily Injury and Property Damage):	
	Each Accident	\$1,000,000

5.04.B.1

Amend in paragraph 5.04.B.1 of the General Conditions the phrase "with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.6 inclusive" to read "with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.5, inclusive.

Add the following at the end of paragraphs 5.04.B.7 of the General Conditions:

Insurance certificates shall specifically indicate by name the additional insureds which are to include Owner and Engineer as well as other persons or entities so identified as follows:

OWNER: City of Prairie du Chien
Additional Insureds: Vierbicher Associates, Inc.

5.04.B.2

Umbrella:

1. Umbrella policy (pay on behalf form) with limits of \$2,000,000 for bodily injury, personal injury and property damage on a combined basis shall be provided with the stated underlying limits of paragraphs 5.04.A.3 to 5.04.A.6 of the Supplementary Conditions.
2. Policy shall include Owner, Engineer and any others required by paragraph 5.04.B.7 of the General Conditions as additional insureds.

5.04.B.3

The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:

(1) General Aggregate \$1,000,000
(2) Each Occurrence (Bodily Injury and Property Damage) \$1,000,000

SC-6.20.A

Modify paragraph to read as follows:

"To the fullest extent permitted by Laws and Regulations, Contractor shall defend, 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 performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury 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 ."

SC-8.11.B

Add paragraph 8.11.B to the General Conditions.

"The Owner may, by written consent of the Contractor, assign the Contract to an institutional lender providing construction financing of the project. In such event, the lender shall assume the Owner's rights and obligation under the Contract Documents. The Contractor shall execute all consents reasonable required to facilitate such assignment.

SC-9.02.C

Add paragraph 9.02 (C) to the General Conditions.

9.02 (C) The Contractor shall reimburse the owner for compensation paid to the Engineer or Engineer's Consultant for additional visits made necessary by the fault, neglect or request of the Contractor.

SC-10.05.B

Amend the first, second, and third sentences of paragraph 10.05.B of the General Conditions to read as follows:

NOTICE: Written notice stating the general nature of each Claim, shall be delivered by the claimant to Engineer and other party to the Contract promptly (but in no event later than 15 days) after the start of the event giving rise thereto. The responsibility to substantiate a claim shall rest with the party making claim. Notice of the amount or extent of the Claim with supporting data shall be delivered to the Engineer and the other party to the Contract within 30 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim.

and as so amended paragraph 10.05.B remains in effect.

SC-11.01.A.5.c.1

Add a new paragraph immediately after 11.01.A.5.c of the General Conditions which is to read as follows:

"Construction equipment or machinery used to determine the Cost of Work under Section 12.01.B.3 of the General Conditions shall be paid for at an hourly rate, including hourly operating costs, that will be agreed to by Owner. The construction equipment and machinery hourly rate determined for the cost of work shall be applied only while the construction equipment or machinery is actually being used or moved under its own power to the site. For construction equipment or machinery transported to the site, the hourly rate shall apply to the transporting vehicle only. The cost of equipment not being used on the site shall not be included in determining the cost of work.

SC-12.01.B.2

Amend paragraph 12.01.B.2 of the General Conditions to read as follows:

"Where the Work involved is not covered by unit prices contained in the Contract Documents (e.g. not included on Bid Form), by a mutually agreed lump sum or

unit price (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.01.C.2);"

and as so amended paragraph 12.01.B.2 remains in effect.

SC-12.01.B.3

Amend paragraph 12.01.B.3 of the General Conditions to read as follows:

"Where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum or unit price is not reached under paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 12.01.C);"

and as so amended paragraph 12.01.B.3 remains in effect.

SC-14.02.B.5.e

Add a new paragraph immediately after paragraph 14.02.B.5.d of the General Conditions which is to read as follows:

"liability for liquidated damages has been incurred by Contractor;"

SC-14.06.B

Add paragraph 14.06.B to the General Conditions.

14.06.B. Upon request by the Owner and prior to the expiration of one year from the date of substantial completion, the Engineer will conduct and the Contractor shall attend a meeting with the Owner to review the project, operations and performance.

The one-year period for correction of work shall be extended with respect to portions of work first performed after substantial completion by the period of the time between substantial completion and the actual performance of the work.

SC-17.07

Owner's Project Representative.

Larry Gates, Utility Director, the Owner's Project Manager, shall act as the Owner's Project Representative and contact person for this particular project.

SC-17.08

Add paragraph 17.08 to the General Conditions.

AIS Requirement: The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that:

- (1) the Contractor has reviewed and understands the American Iron and Steel Requirement,

- (2) 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
- (3) 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.

BABA Requirement: The Contractor hereby represents and warrants to and for the benefit of the Owner and Funding Authority

- (1) the Contractor has reviewed and understands the Build America, Buy America Requirements,
- (2) all of the iron and steel, manufactured products, and construction materials used in the project will be and/or have been produced in the United States in a manner that complies with the Build America, Buy America Requirements, unless a waiver of the requirements is approved, and
- (3) 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 Build America, Buy America Requirements, as may be requested by the Owner or the Funding Authority.

Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or Funding Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner or Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner). If the Contractor has no direct contractual privity with the Funding Authority, as a lender or awardee to the Owner for the funding of its project, the Owner and the Contractor agree that the Funding Authority 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 Funding Authority.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00 73 43

WAGE REQUIREMENTS

1.1. WAGE REQUIREMENTS

A. Federal Davis-Bacon Wage Scale

1. The following prevailing wage rate determination issued by the U.S. Department of Labor will be in effect during the time of this Contract.

This wage schedule does not prohibit the payment of a higher rate nor does it limit the amount of hours worked during a particular period of time.

A copy of the prevailing wage rate determination must be posted by the CONTRACTOR in at least one conspicuous and easily accessible place at the site of the project.

The CONTRACTOR must file the Statement of Compliance with the OWNER, prior to receiving final payment, which states that all of the provisions and requirements of Federal Davis-Bacon wage rates have been complied with, that the CONTRACTOR has received similar evidence of compliance from all agents and subcontractors and that full and accurate records have been kept. The OWNER will not authorize final payment to the CONTRACTOR until the Statement of Compliance is filed in proper form and order.

Heavy
WI20260015

"General Decision Number: WI20260015 01/02/2026

Superseded General Decision Number: WI20250015

State: Wisconsin

Construction Type: Heavy

Counties: Wisconsin Statewide.

HEAVY CONSTRUCTION PROJECTS (Excluding Tunnel, Sewer, and Water Lines).

Modification Number	Publication Date
0	01/02/2026

BOIL0107-001 01/01/2025

	Rates	Fringes
BOILERMAKER		
Boilermaker.....	\$ 46.52	34.63

BRWI0001-002 06/01/2025

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPLEAU, 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.....	\$ 45.46	31.52

CARP0310-002 06/01/2025		

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.....	\$ 44.43	29.95
Piledriver.....	\$ 44.43	29.95

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 06/02/2025

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.....	\$ 44.43	29.95
Piledriver.....	\$ 44.43	29.95

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, TREMPLEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes

MILLWRIGHT.....	\$ 42.00	28.85

CARP1074-002 06/02/2025

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.....	\$ 44.43	29.95
Piledriver.....	\$ 44.43	29.95

CARP1143-002 06/02/2025

BUFFALO, CRAWFORD, JACKSON, LA CROSSE, MONROE, TREMPLEAU AND
VERNON COUNTIES

	Rates	Fringes
Carpenter.....	\$ 44.43	29.95
Piledriver.....	\$ 44.43	29.95

CARP1146-002 06/02/2025

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, MENOMINEE, OCONTO,
AND SHAWANO (Western Portion of the County) COUNTIES

	Rates	Fringes
Carpenter.....	\$ 44.43	29.95
Piledriver.....	\$ 44.43	29.95

CARP2337-009 06/02/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
PILEDRIVERMAN.....	\$ 44.39	34.79

CARP2337-010 06/02/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
MILLWRIGHT.....	\$ 44.03	32.94

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, TREMPLEAU, VERNON, AND WASHBURN
COUNTIES

	Rates	Fringes
Electricians:.....	\$ 44.29	25.21

ELEC0014-007 05/25/2025

ADAMS, ASHLAND, BARRON, BAYFIELD, BROWN, BUFFALO, BURNETT,
CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE,
DOOR, DOUGLAS, DUNN, EAU CLAIRE, FLORENCE, FOND DU LAC, FOREST,
GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON,
JUNEAU, KENOSHA, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE,
LINCOLN, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE,
OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE, POLK, PORTAGE, PRICE,
RACINE, RICHLAND, ROCK, RUSK, SAUK, SAWYER, SHAWANO, SHEBOYGAN,
ST CROIX, TAYLOR, TREMPLEAU, VERNON, VILAS, WALWORTH,
WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO AND WOOD COUNTIES

	Rates	Fringes
Teledata System Installer		
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).

ELEC0127-002 06/01/2025

KENOSHA COUNTY

	Rates	Fringes
Electricians:.....	\$ 50.01	28.4

ELEC0158-002 05/25/2025

BROWN, DOOR, KEWAUNEE, MANITOWOC (except Schleswig), MARINETTE(Wausuakee and area South thereof), OCONTO, MENOMINEE (East of a line 6 miles West of the West boundary of Oconto County), SHAWANO (Except Area North of Townships of Aniwa and Hutchins) COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 42.00	23.93

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

ELEC0494-013 06/01/2025		

DODGE (East of Hwy 26 including Chester Twp, excluding Emmet Twp), FOND DU LAC (Except Waupuin), MILWAUKEE, OZAUKEE, MANITOWOC (Schleswig), WASHINGTON, AND WAUKESHA 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 carillon, 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

ELEC0577-003 06/01/2025

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:.....	\$ 41.76	23.65

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

ELEC0953-001 06/02/2019

	Rates	Fringes
Line Construction:		
(1) Lineman.....	\$ 47.53	21.43
(2) Heavy Equipment Operator.....	\$ 42.78	19.80
(3) Equipment Operator.....	\$ 38.02	18.40
(4) Heavy Groundman Driver..	\$ 33.27	16.88
(5) Light Groundman Driver..	\$ 30.89	16.11
(6) Groundsman.....	\$ 26.14	14.60

ENG10139-001 06/01/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1.....	\$ 55.21	28.55
Group 2.....	\$ 54.71	28.55
Group 3.....	\$ 54.21	28.55
Group 4.....	\$ 52.72	28.55
Group 5.....	\$ 48.74	28.55

Group 6.....\$ 43.59 28.55

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, Pedestal Tower Cranes and Derricks with or w/o attachments with a lifting capacity of over 100 tons; or Cranes, Tower Cranes, Pedestal Tower Cranes and Derricks with boom, leads, and/or jib lengths measuring 176 feet or longer; Self-Erecting Tower Cranes over 4000 lbs lifting capacity; All Cranes with Boom Dollies; Boring Machines (directional); Master Mechanic. \$0.50 additional per hour per 100 tons or 100 ft of boom over 200 ft or lifting capacity of crane over 200 tons to a maximum of 300 tons or 300 ft. Thereafter an increase of \$0.01 per ft or ton, whichever is greater.

GROUP 2: Cranes, Tower Cranes, Pedestal Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; or Cranes, Tower Cranes Portable Tower Cranes, Pedestal Tower Cranes and Derricks with boom, leads and/or jib lengths measuring 175 feet or less; Backhoes (excavators) 130,000 lbs and over; Caisson Rigs; Pile Drivers; Boring Machines (vertical or horizontal), Versi-Lift, Tri-Lift, Gantry 20,000 lbs & over.

GROUP 3: Backhoe (excavator) under 130,000 lbs; Self-erecting Tower Crane 4000 lbs & under lifting capacity; Traveling Crane (bridge type); Skid Rigs; Dredge Operator; Mechanic; Concrete Paver (over 27E); Concrete Spreader and Distributor; Forklift/ Telehandler (machinery- moving / steel erection); Hydro Blaster, 10,000 psi and over

GROUP 4: Material Hoists; Stack Hoists; Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 5 tons or under (tractor or truck mounted); Hoist (tuggers 5 tons & over); Hydro-Excavators/Daylighters; Concrete Pumps Rotec type Conveyors; Tractor/Bulldozer/End Loader (over 40 hp); Motor Patrol; Scraper Operator; Sideboom; Straddle Carrier; Welder; Bituminous Plant and Paver Operator; Roller over 5 tons; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Rotary Drill Operator and Blaster; Percussion Drill Operator; Air Track Drill and/or Hammers; Gantrys (under 20,000 lbs); Tencher (wheel type or chain type having 8 inch or larger bucket); Milling Machine; Off-Road Material Haulers.

GROUP 5: Backfiller; Concrete Auto Breaker (large); Concrete Finishing Machines (road type); Rubber Tired Roller; Concrete Batch Hopper; Concrete Conveyor Systems; Grout Pumps; Concrete Mixers (14S or over); Screw Type Pumps and Gypsum Pumps; Tractor, Bulldozer, End Loader (under 40 hp); Trencher (chain type, bucket under 8 inch); Industrial Locomotives; Rollers under 5 tons; Stump Grinder/Chipper (Large); Timber Equipment; Firemen (pile drivers and derricks); Personnel Hoist, Telehandler over 8000 lbs; Robotic Tool Carrier with or without attachments

GROUP 6: Tampers - Compactors (riding type); Assistant Engineer; A-Frames and Winch Trucks; Concrete Auto Breaker; Hydrohammers (small); Brooms and Sweepers; Hoist (tuggers

under 5 tons); Boats (Tug, Safety, Work Barges, Launch);
Shouldering Machine Operator; Prestress Machines; Screed
Operator; Stone Crushers and Screening Plants; Screed
Operators (milling machine), Farm or Industrial Tractor
Mounted Equipment; Post Hole Digger; Fireman (asphalt
plants); Air Compressors over 400 CFM; Generators, over 150
KW; Augers (vertical and horizontal); Air, Electric,
Hydraulic Jacks (slipform); Skid Steer Loaders (with or
without attachments); Boiler Operators (temporary heat);
Refrigeration Plant/Freeze Machines; Power Pack
Vibratory/Ultra Sound Drivers and Extractors; Welding
Machines; Heaters (mechanical); Pumps; Winches (small
electric); Oiler and Greaser; Rotary Drill Tender;
Conveyor; Forklifts/Telehandler 8000 lbs & under;
Elevators: Automatic Hoists; Pumps (well points);
Combination Small Equipment Operators

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 Sweepers; 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/Freeze 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

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

IRON0512-008 05/01/2025

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON,
PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPLEAU
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

LAB00113-002 06/02/2025

MILWAUKEE AND WAUKESHA COUNTIES

	Rates	Fringes
LABORER		
Group 1.....	\$ 38.81	25.53
Group 2.....	\$ 38.96	25.53
Group 3.....	\$ 39.16	25.53
Group 4.....	\$ 39.31	25.53
Group 5.....	\$ 39.46	25.53
Group 6.....	\$ 35.30	25.53

LABORERS CLASSIFICATIONS

GROUP 1: General Laborer; Tree Trimmer; Conduit Layer;
Demolition and Wrecking Laborer; Guard Rail, Fence, and
Bridge Builder; Landscaper; Multiplate Culvert Assembler;
Stone Handler; Bituminous Worker (Shoveler, Loader, and
Utility Man); Batch Truck Dumper or Cement Handler;
Bituminous Worker (Dumper, Ironer, Smoother, and Tamper);
Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawyer and Filler
(Pavement); Vibrator or Tamper Operator (Mechanical Hand
Operated); Chain Saw Operator; Demolition Burning Torch
Laborer

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter

(Curb, Sidewalk, and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster and Powderman

GROUP 6: Flagperson; traffic control person

LAB00113-003 06/02/2025

OZAUKEE AND WASHINGTON COUNTIES

	Rates	Fringes
LABORER		
Group 1.....	\$ 38.06	25.53
Group 2.....	\$ 38.16	25.53
Group 3.....	\$ 38.21	25.53
Group 4.....	\$ 38.41	25.53
Group 5.....	\$ 38.26	25.53
Group 6.....	\$ 35.15	25.53

LABORERS CLASSIFICATIONS

GROUP 1: General Laborer; Tree Trimmer; Conduit Layer; Demolition and Wrecking Laborer; Guard Rail, Fence, and Bridge Builder; Landscaper; Multiplate Culvert Assembler; Stone Handler; Bituminous Worker (Shoveler, Loader, and Utility Man); Batch Truck Dumper or Cement Handler; Bituminous Worker (Dumper, Ironer, Smoother, and Tamper); Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawyer and Filler (Pavement); Vibrator or Tamper Operator (Mechanical Hand Operated);

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter (Curb, Sidewalk, and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster; powderman

GROUP 6: Flagperson and Traffic Control Person

LAB00113-011 06/02/2025

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
LABORER		
Group 1.....	\$ 37.87	25.53
Group 2.....	\$ 38.02	25.53
Group 3.....	\$ 38.22	25.53
Group 4.....	\$ 38.19	25.53
Group 5.....	\$ 38.52	25.53
Group 6.....	\$ 35.02	25.53

LABORERS CLASSIFICATIONS:

GROUP 1: General laborer; Tree Trimmer; Conduit Layer; Demolition and Wrecking Laborer; Guard Rail, Fence, and

Bridge Builder; Landscaper; Multiplate Culvert Assembler;
Stone Handler; Bituminous Worker (Shoveler, Loader, and
Utility Man); Batch Truck Dumper or Cement Handler;
Bituminous worker (Dumper, Ironer, Smoother, and Tamper);
Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawyer and Filler
(Pavement); Vibrator or Tamper Operator (Mechanical Hand
Operated); Chain Saw Operator; Demolition Burning Torch
Laborer

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter
(Curb, Sidewalk, and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster and Powderman

GROUP 6: Flagman; traffic control person

LAB00140-002 06/02/2025

ADAMS, ASHLAND, BARRON, BAYFIELD, BROWN, BUFFALO, BURNETT,
CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DODGE, DOOR,
DOUGLAS, DUNN, EAU CLAIRE, FLORENCE, FOND DU LAC, FOREST,
GRANT, GREEN, GREEN LAKE, IRON, JACKSON, JUNEAU, IOWA,
JEFFERSON, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN,
MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE,
OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE, POLK, PORTAGE, PRICE,
RICHLAND, ROCK, RUSK, SAUK, SAWYER, SHAWANO, SHEBOYGAN, ST.
CROIX, TAYLOR, TREMPLEAU, VERNON, VILLAS, WALWORTH, WASHBURN,
WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
LABORER		
Group 1.....	\$ 43.77	19.97
Group 2.....	\$ 43.87	19.97
Group 3.....	\$ 43.92	19.97
Group 4.....	\$ 44.12	19.97
Group 5.....	\$ 43.97	19.97
Group 6.....	\$ 40.40	19.97

LABORER CLASSIFICATIONS

GROUP 1: General Laborer; Tree Trimmer; Conduit Layer;
Demolition and Wrecking Laborer; Guard Rail, Fence, and
Bridge Builder; Landscaper; Multiplate Culvert Assembler;
Stone Handler; Bituminous Worker (Shoveler, Loader, and
Utility Man); Batch Truck Dumper or Cement Handler;
Bituminous Worker (Dumper, Ironer, Smoother and Tamper);
Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawyer and Filler
(Pavement); Vibrator or Tamper Operator (Mechanical Hand
Operated); Chain Saw Operator, Demolition Burning Torch
Laborer

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter
(Curb, Sidewalk and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster; powderman

GROUP 6: Flagperson; Traffic Control

LAB00464-003 06/02/2025

DANE COUNTY

	Rates	Fringes
LABORER		
Group 1.....	\$ 44.05	19.97
Group 2.....	\$ 44.15	19.97
Group 3.....	\$ 44.20	19.97
Group 4.....	\$ 44.40	19.97
Group 5.....	\$ 44.25	19.97
Group 6.....	\$ 40.40	19.97

LABORERS CLASSIFICATIONS:

GROUP 1: General Laborer; Tree Trimmer; Conduit Layer; Demolition and Wrecking Laborer; Guard Rail, Fence, and Bridge Builder; Landscaper; Multiplate Culvert Assembler; Stone Handler; Bituminous Worker (Shoveler, Loader, and Utility Man); Batch Truck Dumper or Cement Handler; Bituminous Worker (Dumper, Ironer, Smoother, and Tamper); Concrete Handler

GROUP 2: Air Tool Operator; Joint Sawyer and Filler (Pavement); Vibrator or Tamper Operator (Mechanical Hand Operated); Chain Saw Operator; Demolition Burning Torch Laborer

GROUP 3: Bituminous Worker (Raker and Luteman); Formsetter (Curb, Sidewalk, and Pavement); Strike Off Man

GROUP 4: Line and Grade Specialist

GROUP 5: Blaster; Powderman

GROUP 6: Flagperson and Traffic Control Person

PAIN0106-008 05/05/2025

ASHLAND, BAYFIELD, BURNETT, AND DOUGLAS COUNTIES

	Rates	Fringes
Painters:		
New:		
Brush, Roller.....	\$ 38.17	27.26
Spray, Sandblast, Steel....	\$ 38.77	27.26
Repaint:		
Brush, Roller.....	\$ 36.67	27.26
Spray, Sandblast, Steel....	\$ 37.27	27.26

PAIN0108-002 06/01/2025

RACINE COUNTY

	Rates	Fringes
Painters:		

Brush, Roller.....	\$ 43.64	23.35
Spray & Sandblast.....	\$ 44.64	23.35

PAIN0259-002 05/01/2008

BARRON, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK,
SAWYER, ST. CROIX, AND WASHBURN COUNTIES

	Rates	Fringes
PAINTER.....	\$ 24.11	12.15

PAIN0259-004 05/01/2015

BUFFALO, CRAWFORD, JACKSON, LA CROSSE, MONROE, TREMPLEAU, AND
VERNON COUNTIES

	Rates	Fringes
PAINTER.....	\$ 22.03	12.45

PAIN0781-002 06/01/2025

JEFFERSON, MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Painters:		
Bridge.....	\$ 43.19	24.87
Brush.....	\$ 42.44	24.87
Spray & Sandblast.....	\$ 43.19	24.87

PAIN0802-002 06/01/2025

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, LAFAYETTE, RICHLAND,
ROCK, AND SAUK COUNTIES

	Rates	Fringes
PAINTER		
Brush.....	\$ 37.65	21.17

PREMIUM PAY:
 Structural Steel, Spray, Bridges = \$1.00 additional per
 hour.

PAIN0802-003 06/01/2025

ADAMS, BROWN, CALUMET, CLARK, DOOR, FOND DU LAC, FOREST, GREEN
LAKE, IRON, JUNEAU, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC,
MARATHON, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, ONEIDA,
OUTAGAMIE, PORTAGE, PRICE, SHAWANO, SHEBOYGAN, TAYLOR, VILAS,
WAUSHARA, WAUPACA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
PAINTER.....	\$ 37.65	21.17

PAIN0934-001 06/01/2025

KENOSHA AND WALWORTH COUNTIES

	Rates	Fringes
Painters:		
Brush.....	\$ 40.62	26.37
Spray.....	\$ 41.62	26.37
Structural Steel.....	\$ 40.77	26.37

PAIN1011-002 06/01/2025

FLORENCE COUNTY

	Rates	Fringes
Painters:.....	\$ 31.17	15.92

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, TREMPLEAU, 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

PLUM0011-003 05/05/2025

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, SAWYER, AND WASHBURN
COUNTIES

	Rates	Fringes
PLUMBER.....	\$ 52.24	27.56

PLUM0075-002 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
PLUMBER.....	\$ 60.05	27.90

PLUM0075-004 06/01/2025

DODGE (Watertown), GREEN, JEFFERSON, LAFAYETTE, AND ROCK

COUNTIES

	Rates	Fringes
PLUMBER.....	\$ 60.05	27.90

PLUM0075-009 06/01/2025		

COLUMBIA, DANE, IOWA, MARQUETTE, RICHLAND AND SAUK COUNTIES

	Rates	Fringes
PLUMBER.....	\$ 60.57	27.34

PLUM0111-007 06/03/2024		

MARINETTE COUNTY (Niagara only)

	Rates	Fringes
PLUMBER/PIPEFITTER.....	\$ 43.90	27.53

PLUM0118-002 06/01/2025		

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
Plumber and Steamfitter.....	\$ 57.35	29.37

PLUM0400-003 06/01/2025		

ADAMS,BROWN, CALUMET, DODGE (except Watertown), DOOR, FOND DU LAC, GREEN LAKE,KEWAUNEE, MANITOWOC, MARINETTE (except Niagara), MENOMINEE, OCONTO, OUTAGAMIE, SHAWANO, SHEBOYGAN, WAUPACA, WAUSHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER.....	\$ 53.23	23.40

PLUM0434-002 06/01/2025		

BARON, BUFFALO, CHIPPEWA, CLARK, CRAWFORD, DUNN, EAU CLAIRE, FLORENCE, FOREST, GRANT, JACKSON, JUNEAU, LA CROSSE, LANGLADE, LINCOLN, MARATHON, MONROE, ONEIDA, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RUSK, ST. CROIX, TAYLOR, TREMPLEAU, VERNON, VILAS, AND WOOD COUNTIES

	Rates	Fringes
PIPEFITTER.....	\$ 50.94	25.98

PLUM0601-003 06/01/2025		

Zone 1

DODGE (Watertown), GREEN, JEFFERSON, LAFAYETTE, MILWAUKEE, OZAUKEE, ROCK, WASHINGTON AND WAUKESHA COUNTIES

Rates	Fringes

PIPEFITTER.....	\$ 58.92	31.34

PLUM0601-009 06/01/2025

COLUMBIA, DANE, IOWA, MARQUETTE, RICHLAND AND SAUK COUNTIES

	Rates	Fringes
PIPEFITTER.....	\$ 60.13	30.16

TEAM0039-002 06/01/2025

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axle Trucks.....	\$ 39.57	28.70
3 or more axles; Euclids		
or Dumptor, Articulated		
Truck, Mechanic.....	\$ 39.72	28.70

SUWI2011-001 11/16/2011

	Rates	Fringes
WELL DRILLER.....	\$ 16.52	

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

=====

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>.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, 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 the contract in 2025. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections

under Executive Order 13658 is available at
www.dol.gov/whd/govcontracts.

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.

=====

END OF GENERAL DECISION

"

Building
WI2026001 1

"General Decision Number: WI20260011 01/02/2026

Superseded General Decision Number: WI20250011

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)

Modification Number	Publication Date
0	01/02/2026

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, TREMPLEAU, 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, TREMPLEAU, 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 06/01/2025

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 Acoustical Work & Drywall Hanging).....	\$ 41.43	29.99
PILEDRIVERMAN.....	\$ 41.43	29.99

CARP0310-008 06/01/2025

ASHLAND COUNTY

	Rates	Fringes

CABINET INSTALLER (Including Acoustical Work & Drywall Hanging).....	\$ 41.43	29.99

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 06/01/2025

FOND DU LAC (Eastern Portion of the County) AND MANITOWOC
COUNTIES

	Rates	Fringes

CARPENTER (Including Acoustical Work & Drywall Hanging).....	\$ 41.43	29.99
PILEDRIVERMAN.....	\$ 41.43	29.99

CARP0955-004 06/01/2025

FOND DU LAC (Western Portion of the County), GREEN LAKE,
MARQUETTE, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
CARPENTER (Including Acoustical Work & Drywall Hanging).....	\$ 41.43	29.99
PILEDRIVERMAN.....	\$ 41.43	29.99

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 06/01/2025

BARRON, BURNETT (East of Hwy 48), CLARK, DUNN, POLK (East of
Hwy 35, 48, 65), RUSK, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
CARPENTER (Including Acoustical Work & Drywall Hanging).....	\$ 41.43	29.99
PILEDRIVERMAN.....	\$ 41.43	29.99

CARP1143-006 06/01/2025

BUFALO, CRAWFORD, JACKSON, MONROE, TREMPLEALEAU, AND VERNON
COUNTIES

	Rates	Fringes
CARPENTER (Including Acoustical Work & Drywall Hanging).....	\$ 41.43	29.99
PILEDRIVERMAN.....	\$ 41.43	29.99

CARP1146-006 06/01/2025

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 Acoustical Work & Drywall		

Hanging).....	\$ 41.43	29.99
PILED RIVERMAN.....	\$ 41.43	29.99

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, TREMPEREAU,
VERNON, AND WASHBURN COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 44.29	25.21

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 05/25/2025

DOOR, KEWAUNEE, MANITOWOC (except Schleswig),
MARINETTE (Wausaukee and area South thereof), OCONTO, MENOMINEE
(East of a line 6 miles West of the West boundary of Oconto
County), SHAWANO (Except Area North of Townships of Aniwa and
Hutchins) COUNTIES

	Rates	Fringes
Electricians:.....	\$ 42.00	23.93

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 carillon, 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

ELEC0577-001 06/01/2025

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.....	\$ 41.76	23.65

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 TREMPLEAU 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

LAB00140-003 06/01/2025

BUFFALO, CRAWFORD, GRANT, JACKSON, JUNEAU, MONROE, RICHLAND, TREMPLEAU (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

LAB00268-005 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.

LAB00330-001 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.

LAB00464-005 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

LAB00464-008 06/01/2025

	Rates	Fringes

Landscape Laborer.....	\$ 21.52	18.94

LAB01091-001 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

LAB01091-002 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

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, TREMPLEAU,
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, TREMPLEAU, 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.

=====
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>.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, 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 the contract in 2025. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

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.

=====

END OF GENERAL DECISION

"

SECTION 00 91 13

ADDENDA

- 1.1. No Addenda at this time.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 00 94 10

CHANGE ORDER

Project:	Well No. 5 Production Well, Pumphouse, SCADA Updates, & Well No. 2	
	Demolition	
Project No.:	240564	
To:	City of Prairie du Chien	Contract Date:
	215 E. Blackhawk Avenue	
	Prairie du Chien, WI 53821	Contract Completion Date:

The Contract for the above Project shall be changed as follows:

These changes result in the following adjustment of Contract Price and Contract Time:

Original Contract Price	\$
Contract Price with Previously Approved Change Orders	\$
Net Change in Contract Price Due to This Change Order	\$
Current Contract Price Including This Change Order	\$
Contract Time Prior to This Change Order	
Contract Time with Previously Approved Change Orders	
Net Change in Contract Time Due to This Change Order	
Current Contract Time Including This Change Order	

NOTE: The above changes do not reflect changes in the Contract Price due to measured quantities for items constructed in conformance with the Contract Documents.

CHANGE ORDER IS VALID ONLY IF SIGNED BY THE ENGINEER, CONTRACTOR, AND OWNER

Vierbicher
ENGINEER

CONTRACTOR

City of Prairie du Chien
OWNER

999 Fourier Drive, Suite 201
Address

Address

215 E. Blackhawk Avenue
Address

Madison, WI 53717

Prairie du Chien, WI 53821

Signature

Signature

Signature

Date

Date

Date

THIS PAGE INTENTIONALLY LEFT BLANK

WDNR Requirements

- **8700-294A EIF DBE Contacts Worksheet***
- DBE Compliance Contract Packet
- Davis-Bacon and Related Acts (DBRA)
- Federal Labor Standards Provisions (Form 4010)
- Web Resources
- Employee Rights Poster (English/Spanish)

THIS PAGE INTENTIONALLY LEFT BLANK

Environmental Improvement Fund (EIF) DBE Direct Solicitation Worksheet

Form 8700-294A (R 05/2025)

Page 1 of 4

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 Clean Water Fund Program or Safe Drinking Water Loan Program to meet the DBE requirements. Use of this form is optional. Applicants may submit the form as the required documentation of solicitation efforts or provide the information in some other format. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Public Records Law. 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 <https://dnr.wisconsin.gov/sites/default/files/topic/Aid/loans/pubs/CF0029.pdf>

Contact DBEs on a Unified Certification Program (UCP) List to solicit bids from DBE firms (e.g., firms registered in the WisDOT UCP, <https://wisconsindot.gov/pages/doing-bus/civil-rights/dbe/certified-firms.aspx>). The individual that makes the contacts should document all contacts. Contact at least two minority business enterprises (MBEs) and two women's business enterprises (WBEs); additional contacts may be to any type of DBE. Only contacts made to DBEs on a UCP list can be considered in determining whether a good faith effort was made to solicit DBEs.

Project Information

Name of Municipality	Project Title
Name of Prime Contractor	Information Prepared By (Name and Phone or E-Mail Address)

Contacts

	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. Certifying list or agency (eg. WisDOT)			
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

Environmental Improvement Fund (EIF) DBE Direct Solicitation Worksheet

Form 8700-294A (R 05/2025)

Page 2 of 4

	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. Certifying list or agency (eg. WisDOT)			
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
	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. Certifying list or agency (eg. WisDOT)			
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

Environmental Improvement Fund (EIF) DBE Direct Solicitation Worksheet

Form 8700-294A (R 05/2025)

Page 3 of 4

	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. Certifying list or agency (eg. WisDOT)			
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
	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. Certifying list or agency (eg. WisDOT)			
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

Page 4 of 4

[illegible]

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 162.08\(4\)](#) and [NR 166.11\(4\)](#), Wis. Adm. Code. Information is also available on the [Environmental Loans website](#).



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



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 @ <i>or Below</i> \$250,000	CWFP and SDWLP Federal Equivalency w/ Project Cost <i>Over</i> \$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 CWFPP 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](#)
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 162.08\(4\)](#) and [NR 166.11\(4\)](#), 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 certified on an accepted directory. See the DNR's webpage of accepted DBE directories for lists of certified DBEs.

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 an accepted directory** to solicit bids. Individuals that make the contacts should document all the contacts, preferably using [Form 8700-294a](#), the DBE Contacts Worksheet. See the DNR’s [webpage of accepted DBE directories](#) for lists of certified DBEs.
3. **Utilize DBEs registered on an accepted directory**. 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. See the DNR’s [webpage of accepted DBE directories](#) for lists of certified DBEs.

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 CWFPP.

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 CWFPP.

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 CWFPP.

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), Section 504 of the Rehabilitation Act of 1973 (P.L. 93-1123, 87 Stat. 355, 29 U.S.C. Sec. 794), the Age Discrimination Act 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, 2 CFR Part 180, 2 CFR Part 1532, 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 on the [SAM.gov website](https://sam.gov).

FORMS

Use the following forms to document good faith efforts and DBE utilization. You can obtain all DBE-related forms from our [Forms and Publications webpage](#), 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 DNR Environmental Loans' [Disadvantaged Business Enterprise Requirements](#) webpage.

THIS PAGE INTENTIONALLY LEFT BLANK

DAVIS-BACON AND RELATED ACTS (DBRA)

*The current version of this Attachment is available on the [CDBG Implementation Handbook](#) website (under the "Chapter Attachments/Fillable Forms" section).
Also refer to the [USDOL 'Final Rule' for DBRA Regulations](#) (effective 10/23/2023) and [Comparison Chart](#).*

- A. Force Account - Under most Davis-Bacon statutes, only employees of contractors or sub-contractors are subject to Davis-Bacon wage requirements. In some instances, rather than contracting or sub-contracting out construction work, a grant recipient performs the construction in-house, with its own "force account" employees. Such force account work is not subject to Davis-Bacon wage requirements under statutes that cover only employees of contractors and sub-contractors. Furthermore, the United States Department of Labor (USDOL) 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 Section 5.2(h)). However, under the Housing and Community Development Act (HCDA) of 1974, a private firm that receives federal assistance funds indirectly from a recipient pursuant to a written procurement contract of sub-grant agreement that provides for the performance of construction work is considered a contractor or sub-contractor, and the force account exception **does not** apply to construction activity performed by employees of such a firm.

Laborers and mechanics employed by a local or state agency PHA (Public Housing Authority only), even though not employed by a contractor, are subject to Davis-Bacon when performing development work financed by the U.S. Housing Act of 1937, as amended. Davis-Bacon federal wage requirements are not applicable where such employees are used in work defined as major repairs (deferred maintenance) pursuant to 24 CFR 868.3 and 868.9(h), which constitute project operation rather than development.

- B. Compliance and Certification Parameters - HUD policy clearly affords federal wage protection for all laborers and mechanics, regardless of contractual relationship. There is no exception to this protection for self-employed laborers or mechanics, including owners of businesses, sole proprietors, partners, corporate officers, or others. Laborers and mechanics may not certify to the payment of their **own** federal wages **except** where the laborer or mechanic is the owner of a business working on the site of the work with his/her own crew.

Accordingly, HUD and program participants responsible for labor standards administration and enforcement may not accept certified payrolls reporting single or multiple owners (e.g., partners) are certifying that they have paid to themselves the prevailing wage for their craft. A sole proprietor may not submit a payroll reporting himself or herself as simply "Owner" signing the certification as to his/her own wage payment from "draws" or other payment methods. Nor may several mechanics submit a payroll reporting themselves as "partners" with one or more certifying as to the payment of their wages or salaries. Such mechanics must instead be carried on the certified payroll of the contractor or sub-contractor for whom they are working and with whom they have executed a "contract" for services.

In these cases, maintenance of an accurate accounting of weekly work hours including any overtime hours for such mechanics is essential. Whatever method of compensation computation is utilized (piecework, weekly contract draw performance), the amount of weekly compensation divided by the actual hours of work performed for that week must result in an "effective" hourly wage rate for that week that is not less than the prevailing hourly rate for the type of work involved. This computation must take into account overtime pay rates (i.e., one and one-half) for all hours worked in excess of 40 hours per week, pursuant to the CWHSSA, where applicable, and pursuant to the Fair Labor Standards Act where CWHSSA is not applicable.

The name, work classification, actual hours of work, effective hourly wage rate, and wage payment for each such mechanic and laborer must be reported and certified on the responsible employer's weekly payroll. Note that the effective hourly wage rate for such mechanics and laborers may fluctuate from week to week. However, the effective hourly wage rate may not be less than the minimum prevailing wage rate for the respective craft.

In any case, where the effective rate falls below the corresponding craft prevailing wage rate, the responsible employer must compensate the mechanic at no less than the prevailing wage rate on the wage determination for the craft.

- C. Business Owners Working with Their Crew - Owners of businesses working with their crew on the same HUD-assisted job site **may** certify to the payment of their own federal wages in conjunction with the prevailing wages paid to their employees. This exception to compliance standards **does not** suggest that such owners are not likewise entitled to prevailing wages for their labor. Rather, it accepts the wage payment certification on weekly payroll reports by the owner of his/her own wages as that certification **accompanies** the certification offered for payment of prevailing wages to his/her employees. On weekly payroll reports, include the owner's name, identifying him/her as "owner," and the daily and total hours worked on the covered project for the week. Omit the Rate of Pay and Amount Earned.
- D. Owner-operators of Power Equipment - Frequently, owner-operators of power equipment (e.g., backhoes, front-end loaders) will contract for services at a rate for both "man and machine." In these cases, the owner-operator includes liability, equipment maintenance, and salary in an hourly or contract rate for services. Because of the prevalence of such practice and the inherent difficulty in ascribing costs for liability and maintenance costs verses hourly labor salary, HUD and its program clients may accept a combined ("man and machine") hourly rate on the responsible contractor's certified payroll provided that such hourly rate may not be less than the rate on the wage determination for the respective power equipment operator. **Note:** Owner-operators of power equipment, like self-employed mechanics, **may not** submit their own payrolls certifying to the payment of their own wage **but** must be carried on the responsible contractor's certified payroll report. Include the name, work classification, and actual hours worked. Upon completion of the contract, verify the pay by taking the amount paid to the sub-contractor (documented with copies of all invoices identified for this job) and divide by the hours reported on the certified payrolls. Compare the actual hourly wage rate with the rate in the Wage Determination. If the actual hourly wage is less than the Davis-Bacon Wage Rate, collect and disburse the wage underpayments.
- E. "Owner Operator" Truck Drivers – USDOL policy excludes bona fide owner-operators of trucks who are independent contractors from Davis-Bacon/CWHSSA provisions concerning their own hours of work and rate(s) of pay. These truck "owner-operators" may certify to their own weekly payrolls **but** the payrolls do not need to show the hours worked or rates allegedly paid – only the notation "Owner-operator." **Note** that any laborers or mechanics, including truck drivers, employed by the owner-operator/independent contractor are subject to Davis-Bacon/CWHSSA provisions in the usual manner.

This policy **does not** pertain to owner-operator of other equipment such as backhoes, bulldozers, cranes and scrapers (i.e., power equipment as noted in the paragraph titled "Owner-operators of Power Equipment," above).

"Contractor's" Truck Drivers – Based on the USDOL 'Final Rule' for DBRA regulations (effective 10/23/2023), truck drivers employed by contractors or subcontractors must be paid applicable prevailing wage rates for all onsite driving time unrelated to offsite delivery (e.g., hauling materials on the site of the work from one location to another), for any time spent transporting "significant portions" of public works from secondary construction sites, for any time spent transporting materials to or from adjacent or virtually adjacent dedicated support sites, as well as for any onsite time related to offsite delivery if such time is not *de minimis*. Where workers spend a significant portion of their day or week onsite, short periods of time that in isolation might be considered *de minimis* may be added together. The total amount of time a driver spends on the site of the work during a typical day or workweek—not only the amount of time that each delivery takes—is relevant to a determination of whether the onsite time is *de minimis*.

De minimus may be interpreted as time spent on the job site that is not sufficient nor consequential enough to be tracked as an itemizable job function (i.e., "a few minutes"). Any single visit at the project site that is more than *de minimus* (more than a few minutes) is subject to the DBA wage rate requirements. Contractors must report hours worked, and pay at least the DBA wage rate for any time the truck driver spends on the project site if the driver is making multiple trips throughout the day that cumulatively challenge a *de minimus* determination. If a series of project site visits by the truck driver that individually are each a *de minimus* amount of time but cumulatively exceed 20% of the driver's hours in the same day, the employee's time on-site that day is subject to the DBA wage rate requirements. If a series of project site visits by the truck driver that individually are each a *de minimus* amount of time but cumulatively exceed 20% of the driver's hours in the same work week, the employee's time on-site time that week is subject to the DBA wage rate requirements.

- F. Determining Proper Classification for Various Work - Questions as to the proper classification of a laborer or mechanic for various types of work are resolved by making an area-practice determination. In determining the proper classification for work performed on a project, it is immaterial whether the contractor is union or nonunion.

On projects where the federal wage rate for the classifications in question within the applicable wage determination is based on negotiated rates, the prevailing practice concerning work performed in those classifications is to follow the practice observed on projects built by contractors who are a signatory to the collective bargaining agreements. Therefore, unless there is a jurisdictional dispute between the crafts, the duties ascribed to any job classification will be the same as those outlined in the appropriate collective bargaining agreements. If the collective bargaining agreements are silent on this issue, the local unions involved must be consulted. Conversely, in areas where open shop (non-union) rates are determined to prevail for the classifications in question, those prevailing job practices followed on projects by open shop contractors in the same area become area practice.

- G. Helpers - The **classification of Helper in any trade will be very difficult to have approved by the USDOL**. If the contractor wants to pursue a helper classification through the USDOL, they should contact the Labor Standards Specialist at DOA.
- H. Relatives - There are no exceptions made in the enforcement of Davis-Bacon on the basis of family relationship for relatives who are performing the work of laborers or mechanics. They **must be paid the federal wage rate for the classification of work performed and be included on the certified payrolls**.
- I. Volunteers - HUD allows for the waiver of Davis-Bacon wage rates for volunteers that are **not otherwise employed** at any time of the work for which the individual volunteers. Contact DOA's Labor Standards Specialist for more details if the community plans on using volunteers on the construction site.
- J. Job Corps Workers - USDOL staff in Washington, DC has informed HUD staff that Job Corps workers are not exempt from Davis-Bacon wage when they are working on a job subject to the Davis-Bacon Act.
- K. Employees of a Governmental Body - The USDOL has taken the position that the prevailing wage requirements does not apply to employees of a state or political subdivision of a state, but shall apply to employees of a private contractor who is sub-contractor of the state or political subdivision. This rule does not apply to the Public Housing Authority (PHA) employees under the U.S. Housing Act of 1937 (see paragraph A. in this section). **Employees of utilities are exempt providing they are only extending existing service to the property.**
- L. Employees Performing Work in More than One Classification - (Split Classification) if the UGLG/contractor has employees who perform work in more than one trade during a work week, it can pay the wage rates specified for each work classification in which work was performed **only** if maintaining accurate time records showing the amount of time spent in each classification. If the UGLG does not maintain accurate time records, it must pay these employees the highest wage rate of all the classifications of work performed. **Work, which is normally performed as part of the mechanic's craft, is not separable.**
- M. Laborers and Mechanics – Definition - The terms "laborers" and "mechanics" are construed to include at least those workers whose duties are manual or physical in nature as distinguished from mental or managerial. Since the classifications of laborers and mechanics to who specified wage rates are payable are identified in the Davis-Bacon wage rate, there is ordinarily no need to distinguish between laborers and mechanics. However, **mechanics are generally considered to include any worker who uses tools, or who is performing the work of a trade.**
- N. Precutting of Parts and Prefabrication of Assemblies - The precutting of parts and/or the prefabrication of assemblies are not covered unless conducted in connection with and at the site of the project, or in a temporary plant set up elsewhere solely to supply the needs of the project.
- O. Supply and Installation Contracts – The USDOL 'New Rule' (effective 10/23/2023) confirms that suppliers are deemed contractors (or subcontractors if their contract is with the prime contractor or another subcontractor). The manufacturing or furnishing of materials, articles, supplies, or equipment is not subject to prevailing wages *unless* conducted in connection with and at the site of the project, or in a temporary plant set up elsewhere solely to meet the needs of the project.

Installation work performed in conjunction with an equipment supply contract is subject to DBRA wage requirements where it involves more than an incidental amount of construction activity. Whether installation work involves more than an incidental amount of construction activity depends on the specific circumstances of each case. Factors requiring consideration include the nature of the prime contract work; the type of work performed by the employees installing the equipment (e.g., the techniques, materials and equipment used and the skills required for its performance); the extent to which structural modifications to buildings are needed to accommodate the equipment (e.g., widening entrances, relocating walls, installing wiring); and the cost of the installation work, either in terms of absolute amount or in relation to the cost of the equipment and the total project cost. (Source: [2023 HUD Handbook 1244.1: Ch. 11: Federal Labor Standards Requirements in HUD Programs, Section 11-29](#))

- P. Start of Construction - “Start of Construction,” as that term is used in connection with labor standards and prevailing wage requirements, means the beginning of initial site clearance and preparation, provided those activities are pursued diligently and are followed without appreciable delay by other construction activity.
- Q. Site of Work - The “site of work” is limited to the physical place or places where the construction called for in the contract will remain when work on it has been completed and to other adjacent or nearby property used by the contractor in such construction which can reasonably be said to be included in the “site” because of proximity. **Operations of a commercial or material supplier established in the proximity of but not on the active site of work prior to the opening of bids are not covered by the Act even if dedicated exclusively to the federal project for a time.**
- R. Fringe Benefits – Funded Plans - A contractor may credit contributions for “bona fide” fringe benefits regardless of whether the USDOL has found the particular benefits to be prevailing in the area. Such fringe benefits must be “bona fide.” Ordinarily, bona fide benefits are those common to the construction industry and are paid directly to the employee in cash or into a fund, plan, or program on the employee’s behalf. Contractors may take credit for contributions made under such conventional plans without requesting approval of the USDOL.
- S. Fringe Benefits – Unfunded Plans - Where fringe benefit plans are not of the conventional type, it will be necessary for the USDOL to determine if the benefits are “bona fide.” **Contractors seeking approval of unfunded plans must obtain approval from the USDOL.** Contact DOA for more details.
- T. Fringe Benefits – General
 - 1. Contributions to funded plans must be made at least quarterly.
 - 2. When the cash paid and the per-hour contribution for benefits do not equal the total rate set forth in the wage determination, the difference must be paid to the employee in cash.
 - 3. Fringe benefits must be paid for straight time and overtime; however, fringe benefits are not included when computing the overtime rate.
 - 4. Employees who are excluded from funded plans for whatever reason must be paid fringe benefits in cash.
 - 5. **Note:** Vacation and sick leave plans are generally unfunded, paid from the contractor’s own account, and require USDOL approval before a contractor takes credit toward meeting the fringe benefit obligation.
 - 6. In determining the cash equivalent credit for fringe benefits payments, the period of time to be used is the period covered by the contribution. For example, if an employer contributes to a plan on a weekly basis, the total hours worked each week (federal and nonfederal) by each employee should be divided into the contribution made by the employer.
 - 7. Acceptable fringe benefits include the following: medical or hospital care; pensions on retirement or death; compensation for injuries or illness resulting from occupational activity; or insurance to provide any of the foregoing, unemployment benefits, life insurance, disability and sickness insurance, accident insurance, vacation and holiday pay, defrayment of cost of apprenticeship or other similar programs, or other bona fide fringe benefits; but only where the contractor to sub-contractor is not required by other federal, state, or local law to provide any of such benefits. The Act excludes fringe benefits that a

contractor or sub-contractor is obligated to provide under other federal, state, or local law. No credit may be taken for such benefits. For example, payment for workmen's compensation insurance under either a compulsory or elective state statute is not considered payments for fringe benefits under the Act. Payments made for travel, subsistence, or to industry promotion funds are not normally payments for fringe benefits under the Act.

No type of fringe benefits is eligible for consideration as a so-call unfunded plan unless:

- a. It could be reasonably anticipated to provide benefits described in the act;
- b. It represents a commitment that can be legally enforced;
- c. It is carried out under a financially responsible plan or program; and
- d. The plan or program providing the benefits has been communicated in writing to the laborers and mechanics affected.

U. Summer Youth Employment - Youth who are bona fide students and part of a bona fide "youth opportunity program" may be employed on Davis-Bacon projects on a temporary basis during the summer months and paid below the predetermined Davis-Bacon rates. USDOL All Agency Memoranda #71 and #96 provide policy guidance in this area. HUD requires that the following stipulations be met before summer youth may be employed at less than Davis-Bacon rates:

1. Where collective bargaining agreements representing workers performing similar or related activities at the worksite to which youth are out stationed exists, the union or unions representing those workers must provide concurrence as to the design of the employment project and the use of the youth;
2. Such employment must be provided in accord with statutory safety and minimum wage requirements (both state and federal);
3. Competent supervision must be provided to all youth employment on the project worksites. Ratios of youth to such supervisors should be no greater than four-to-one.

In order to ensure that the administration of summer youth employment complies with USDOL policies and regulations, request for exceptions to the application of Davis-Bacon must be made to the HUD Field Office Labor Relations Staff who will advise the requesting contractor of its decision. The specific provisions of the agreement (between management and labor) or the plan of employment must be submitted to the USDOL, Wage and Hour and Public Contracts Division, for enforcement purposes. The HUD Field Office Labor Relations Staff will send such plans to the Headquarters Office of Labor Relations.

V. Non-Covered Job Classifications - Workers performing the normal duties of the following job classifications are not subject to Davis-Bacon federal wage requirements:

1. Project Superintendent.
2. Project Engineer.
3. Project Foreman, as distinguished from a working foreman (working foremen, who devote more than 20% of their time during the workweek to mechanic or laborer duties, are laborers and mechanics for the time spent and must be paid the applicable rate for the hours so worked).
4. Watchman.
5. Water Carrier.
6. Messenger, Clerical Workers.

Financing of Construction Work – CDBG - Laborers and mechanics employed by contractors and sub-contractors on construction work financed in whole or in part with Title I assistance are subject to Davis-Bacon wage rates under Section 110 of Title I. To the extent that Part 570 requires broader Davis-Bacon coverage, e.g., on construction work "assisted" under that Part, the regulations shall govern unless an individual waiver is requested and granted by the Assistant Secretary for Community Planning and Development. The use of Title I funds for any of the following items is an example of financing construction work, and Davis-Bacon wage rates shall apply to all construction work performed on the

building or property in question: construction loans or grants; payment for construction materials; payment of interest (or part of the interest) on a construction loan; payment of construction loan origination fees; provisions of a Title I funded permanent loan, mortgage or grant on a structure constructed with a private construction loan when the parties contemplate such ultimate Title I financing at the time of construction; Title I

funded "collateral" or "default" accounts established with the lending bank which receive no interest or less than the interest payable on demand accounts. Questions as to whether a use of Title I funds constitutes financing of construction work shall be referred to HUD headquarters for determination.

- W. Technical/Maintenance Wage Rates – Public Housing - Section 12 of the U.S. Housing Act of 1937 requires that wages prevailing in the locality shall be paid to all architects, technical engineers, draftsmen, and technicians employed in the development, and all maintenance laborers and mechanics employed in the operation of the project. Such wages are determined or adopted by HUD.
- X. Payment of Low- and Moderate-Income (LMI) assessments - In some projects federal funds are used to pay special assessments of LMI households, where those assessments are for the purpose of paying for a public improvement. This use of federal funds invokes the Federal Labor Standards Provisions and makes the construction subject to Davis-Bacon wage rates.
- Y. Piecework - Roofers and dry-wall hangers are sometimes paid by piecework. Piecework is work paid for at a fixed rate (piece rate) per piece of work done.

A. APPLICABILITY

The Project or Program to which the construction work covered by this Contract pertains is being assisted by the United States of America, and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

(1) MINIMUM WAGES

- (i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment, computed at rates not less than those contained in the wage determination of the Secretary of Labor (which is attached hereto and made a part hereof), regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH1321)) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place, where it can be easily seen by the workers.

(ii) Additional Classifications.

- (A) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:
- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination;
 - (2) The classification is utilized in the area by the construction industry; and
 - (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (B) If the contractor, the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division ("Administrator"), Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget ("OMB") under OMB control number 1235-0023.)
- (C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, or HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1235-0023.)

(D) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (1)(ii)(B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1235-0023.)

(2) **Withholding.** HUD or its designee shall, upon its own action or upon written request of an authorized representative of the U.S. Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The U.S. Department of Labor shall make such disbursements in the case of direct Davis-Bacon Act contracts.

(3) Payrolls and basic records.

(i) **Maintaining Payroll Records.** Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification(s), hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid.

Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1235-0023 and 1215-0018)

(ii) Certified Payroll Reports.

(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <https://www.dol.gov/agencies/whd/forms> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the U.S. Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1235-0008.)

- (B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
- (1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;
 - (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;
 - (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract; and
- (C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (a)(3)(ii)(b).
- (D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph (a)(3)(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the U.S. Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and Trainees.

- (i) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency (where appropriate), to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination.

Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program.

If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed, unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (iii) **Equal employment opportunity.** The utilization of apprentices, trainees, and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

- (5) **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this Contract.
- (6) **Subcontracts.** The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs (1) through (11) in this paragraph (a) and such other clauses as HUD or its designee may, by appropriate instructions, require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.
- (7) **Contract termination; debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
- (8) **Compliance with Davis-Bacon and Related Act Requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this Contract.
- (9) **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.
- (10) **Certification of Eligibility.**
- (i) By entering into this Contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

- (ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.
- (iii) Anyone who knowingly makes, presents, or submits a false, fictitious, or fraudulent statement, representation or certification is subject to criminal, civil and/or administrative sanctions, including fines, penalties, and imprisonment (e.g., 18 U.S.C. §§ 287, 1001, 1010, 1012; 31 U.S.C. §§ 3729, 3802).

(11) Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic, to whom the wage, salary, or other labor standards provisions of this Contract are applicable, shall be discharged or in any other manner discriminated against by the contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The provisions of this paragraph (b) are applicable where the amount of the prime contract exceeds **\$100,000**. As used in this paragraph, the terms “laborers” and “mechanics” include watchmen and guards.

- (1) Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work, which may require or involve the employment of laborers or mechanics, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek, unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in subparagraph B(1) of this paragraph, the contractor, and any subcontractor responsible therefor, shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph B(1) of this paragraph, **in the sum set by the U.S. Department of Labor at 29 CFR 5.5(b)(2)** for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph B(1) of this paragraph. In accordance with the Federal Civil Penalties Inflation Adjustment Act of 1990 (28 U.S.C. § 2461 Note), the DOL adjusts this civil monetary penalty for inflation no later than January 15 each year.
- (3) Withholding for unpaid wages and liquidated damages.** HUD or its designee shall, upon its own action or upon written request of an authorized representative of the U.S. Department of Labor, withhold or cause to be withheld from any moneys payable on account of work performed by the contractor or subcontractor under any such contract, or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages, as provided in the clause set forth in subparagraph B(2) of this paragraph.
- (4) Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph B(1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs B(1) through (4) of this paragraph.

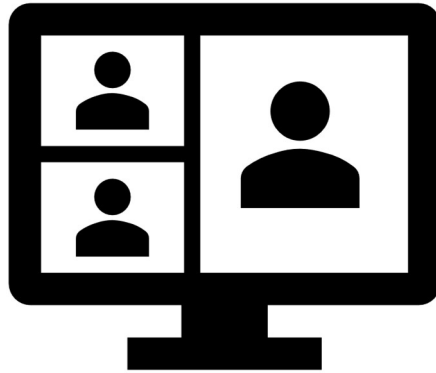
C. HEALTH AND SAFETY

The provisions of this paragraph (c) are applicable where the amount of the prime contract exceeds **\$100,000**.

- (1)** No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety, as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
- (2)** The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96), 40 U.S.C. § 3701 et seq.
- (3)** The contractor shall include the provisions of this paragraph in every subcontract, so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

THIS PAGE INTENTIONALLY LEFT BLANK

MBE/WBE/DBE & SECTION 3 WEB RESOURCES



Resources for outreach to, contracting with, and certified registration for **Minority-owned Business Enterprise (MBE)**, **Woman-owned Business Enterprise (WBE)** and **Disadvantaged Business Enterprise (DBE)** firms and **Section 3 Business concerns**:

Department of Administration Certified Minority-Owned Business Enterprise (MBE) and Woman-Owned Business Enterprise (WBE) Directory:

<https://wisdp.wi.gov/search.aspx>

Department of Administration Certified Minority-Owned Business Enterprise (MBE) and Woman-Owned Business Enterprise Registration:

<https://doa.wi.gov/Pages/StateEmployees/HowtoApply.aspx>

Department of Transportation

Disadvantaged Business Enterprise (DBE) Program

<https://wisconsindot.gov/Pages/doing-bus/civil-rights/dbe/default.aspx>

U.S. Department of Housing and Urban Development (HUD) Section 3 Resources
Website for Grantees and Contractors

<https://www.hud.gov/section3>

City of Madison Targeted Business Enterprise Program Directories:

<http://www.cityofmadison.com/dcr/aaTBDir.cfm>

THIS PAGE INTENTIONALLY LEFT BLANK

WORKER RIGHTS

UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS WORKING ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

The law requires employers to display this poster where workers can readily see it.

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 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.

RETALIATION

The law prohibits discharging or otherwise retaliating against workers for filing a complaint, cooperating in an investigation, or testifying in a proceeding under the Davis-Bacon and Related Acts.

PROPER PAY

If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

Scott Jennings, Grant Administrator
Vierbicher Associates, Inc.
201 E, Main St., Suite 100
Reedsburg, WI 53959
sjen@vierbicher.com

or contact the U.S. Department of Labor's Wage and Hour Division.



WAGE AND HOUR DIVISION
UNITED STATES DEPARTMENT OF LABOR

866-487-9243
dol.gov/agencies/whd



DERECHOS DE LOS TRABAJADORES BAJO LA LEY DAVIS-BACON

PARA OBREROS Y MECÁNICOS QUE TRABAJAN EN PROYECTOS DE CONSTRUCCIÓN FEDERAL O CON ASISTENCIA FEDERAL

La ley exige que los empleadores coloquen este cartel en un lugar donde los trabajadores puedan verlo fácilmente.

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 Davis-Bacon permiten la rescisión del contrato y la exclusión de los contratistas de futuros contratos federales durante 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.

REPRESALIAS

La ley prohíbe despedir o tomar represalias contra los trabajadores por presentar una queja, cooperar en una investigación o testificar en un procedimiento bajo la Ley Davis-Bacon y Leyes Relacionadas.

PAGO APROPIADO

Si no recibe el pago apropiado, o precisa de información adicional sobre los salarios aplicables, póngase en contacto con el Contratista Oficial que aparece abajo:

Scott Jennings, Grant Administrator
Vierbicher Associates, Inc.
201 E, Main St., Suite 100
Reedsburg, WI 53959
sjen@vierbicher.com

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.

866-487-9243
dol.gov/agencies/whd



SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Contract description.
- B. Contractor's use of Site.
- C. Work sequence.
- D. Permits.
- E. Specification conventions.

1.2 CONTRACT DESCRIPTION

- A. Work of the Project includes the following:
 - 1. Construction of a 1,200 gallon per minute (gpm) municipal well to a depth of 106 feet, well development, performance pump testing of constructed well, WDNR NR 809 water quality analysis, erosion control restoration of the work area, and other miscellaneous items in conformance with the Contract Documents.
 - 2. Construction of the Well No. 5 Pumphouse building, including furnishing and installing all well pump equipment, piping, valves, accessories and controls. The building includes a pump room, chemical room, and restroom. The Well No. 5 Pumphouse contract also includes installation of a natural gas-powered emergency electrical generator, erosion control measures, site work, site piping, driveway, pavement, restoration of the work area, pump testing, water quality testing, and other miscellaneous items in conformance with the Contract Documents.
 - 3. The Well No. 2 Pumphouse is to be demolished. This work is to include building demolition, building hazardous materials abatement, excavation, water main abandonment, backfilling, grading, site restoration, and other miscellaneous items in conformance with the Contract Documents. The existing Well No. 2 motor control center and well pump equipment are to be salvaged and reused in the proposed Well No. 5 Pumphouse.
 - 4. The SCADA system is to be updated including removal and disposal of existing SCADA system equipment and installation of new equipment at the existing Well Nos. 1, 3, & 4 pumphouses, reservoirs site, and the proposed Well No. 5 Pumphouse, restoration of the work area, and other miscellaneous items in conformance with the Contract Documents.
- B. Owner reserves the right to award all or portions of the work included in the bid documents following evaluation of the bids and in accordance with Owner's budget.
- C. Perform Work of Contract under Unit Price Contract with Owner in accordance with Conditions of Contract.

- D. All iron and steel (AIS) and Build America, Buy America (BABA) products must be consumed in, incorporated into, or affixed to an infrastructure project produced in the United States and meet American Iron and Steel (AIS) and Build America, Buy America (BABA) requirements as described in the contract documents. The term “iron and steel products” means the following products are 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.**

1.3 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Access to Site:
1. City Staff & Representatives
 2. Emergency Services
 3. Work by Others.
- B. Construction Operations: Limited to areas noted on Drawings. Specifically;
1. City's Wells Site and public right-of-way limits
 2. Permanent Easements obtained for installation of utilities and permanently constructed streets and facilities.
 3. Temporary construction easements obtained for grading and restoration of the work site.
- C. Time restrictions for performing work: 7 am – 7 pm Monday through Friday; 8 am – 7 pm Saturday or per individual municipal ordinance.
- D. Utility Outages and Shutdown: Provide minimum of 48 hours notice prior to service interruption.

1.4 WORK SEQUENCE

- A. Well No. 5 Production Well:
1. Mobilize & install erosion control measures
 2. Strip & stockpile topsoil
 3. Construct settling ponds & drill rig pad
 4. Construct production well.
 5. Develop well
 6. Conduct Performance test & water quality sampling
 7. Seal well casings, site clean-up and demobilization
 8. Mobilize for abandonment of Well 2 after construction of pumphouse by others.
- B. Well No. 2 Pumphouse:
1. Salvage Items Scheduled for Reuse in Well No. 5 Pumphouse.
 2. Install anti tracking pad at entrance of the project.
 3. Building Demolition, Clearing and Grubbing and Removals.
 4. Place and Compact Backfill in Excavated Areas.
 5. Grade and Restore Site.
- C. Well No. 5 Pumphouse:

1. Mobilize, install erosion control measures, strip & stockpile topsoil
2. Install site piping & pressure test.
3. Complete site rough grading.
4. Install well pump equipment into well including salvaged items from Well No. 2.
5. Construct pumphouse & concrete pads for transformer & generator.
6. Complete finish grading.
7. Remove Excess Material from Site.
8. Restore Site.

D. Work Locations and Phasing

1. Complete work in phases to provide continuous access to local residents and emergency services providers.

1.5 PERMITS

A. Permits Obtained by Owner or Owner's Representative:

1. Well Site Approval (WDNR)
2. Public Water Supply Wells Plan Approval (WDNR)
3. Construction Authorization (Public Service Commission of Wisconsin) - Pending

B. Permits Obtained by Contractor:

1. Other permits as required to execute the work.

C. Posting Permits and Notifications

1. Post permits and wage rate documents when required in a visible location on the job site. Laminate or sufficiently waterproof posted materials to protect from the weather.
2. Post documents in the same location used by the Owner for posting public notices when a suitable work site location is not available.

1.6 SPECIFICATION CONVENTIONS

- A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Tax Exemption for Municipalities
- B. Application for Payment
- C. Change Procedures
- D. Defect Assessment
- E. Unit Prices
- F. Alternates

1.2 TAX EXEMPTION FOR MUNICIPALITIES

Municipalities are an exempt entity for sales tax purposes pursuant to §77.54(9a)(b), Wis. Stats. Materials purchased by contractors for incorporation into any municipal facility (other than roads, highways or streets) under a contract with a Municipality are similarly exempt from the imposition of sales taxes pursuant to §77.54(9m), Wis. Stats. Bids should not include sales tax on exempt materials or other tangible personal property which will become components of the facility. A copy of the Municipalities' Certificate of Tax Exempt Status will be provided to the successful bidder at the time of contracting for use in documenting tax-exempt purchases.

1.3 APPLICATIONS FOR PAYMENT

- A. Submit application on form provided by the Engineer.
- B. Content and Format: Utilize Unit Price Bid Items for listing items in Application for Payment.
- C. Payment Period: Submit applications for payment once per month. Payments will be reviewed by the City's Common Council which meets the first and third Tuesday of each month.
- D. Substantiating Data: When Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
 - 1. Partial release of liens from major subcontractors and vendors.
 - 2. Record documents.
 - 3. Affidavits attesting to off-site stored products.
 - 4. Payroll information.

1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Architect/Engineer of any error, inconsistency, omission, or apparent discrepancy.
- C. The Engineer will advise of minor changes in the Work not involving adjustment to Contract Price or Contract Time by issuing supplemental instructions.
- D. The Engineer may issue a Notice of Change including a detailed description of proposed change with supplemental or revised drawings and specifications, a change in Contract Time for executing the change with stipulation of overtime work required and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within 3 days.
- E. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors.
- F. Stipulated Price Change Order: Based on Notice of Change and Contractor's fixed price quotation or Contractor's request for Change Order as approved by engineer.
- G. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under Construction Change Directive. Changes in Contract Price or Contract Time will be computed as specified for Time and Material Change Order.
- H. Work Directive Change: Engineer may issue directive, on EJCDC C-940 Work Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Price or Contract Time. Promptly execute change.
- I. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Engineer will determine change allowable in Contract Price and Contract Time as provided in Contract Documents.
- J. Maintain detailed records of Work done on time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- K. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.

- L. Change Order Forms: EJCDC C-941 Change Order.
- M. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- N. Correlation of Contractor Submittals:
 - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
 - 2. Promptly revise Progress Schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of Work affected by the change, and resubmit.
 - 3. Promptly enter changes in Record Documents.

1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Engineer will direct appropriate remedy or adjust payment.
- C. Individual Specification Sections may modify these options or may identify specific formula or percentage sum/price reduction.
- D. Authority of Engineer and Owner to assess defects and identify payment adjustments is final.
- E. Nonpayment for Rejected Products: Payment will not be made for rejected products for any of the following reasons:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products placed beyond lines and levels of the required Work.
 - 4. Products remaining on hand after completion of the Work.
 - 5. Loading, hauling, and disposing of rejected products.

1.6 UNIT PRICES

- A. Engineer will take measurements and compute quantities accordingly. Provide assistance in taking of measurements.
- B. Unit Quantities: Quantities and measurements indicated on Bid Form are for Contract purposes only. Actual quantities provided shall determine payment.
 - 1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at contracted unit prices.
 - 2. When actual Work requires 25 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim a Contract Price adjustment.

- C. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, off-site disposal, services and incidentals; erection, application or installation of item of the Work; overhead and profit.
- D. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit price for Work incorporated in or made necessary by the Work.
- E. Measurement of Quantities:
 - 1. Weigh Scales: Inspected, tested and certified by applicable State weights and measures department within past year.
 - 2. Platform Scales: Of sufficient size and capacity to accommodate conveying vehicle.
 - 3. Metering Devices: Inspected, tested and certified by applicable State department within past year.
 - 4. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
 - 5. Measurement by Area: Measured by square dimension using mean length and width or radius.
 - 6. Linear Measurement: Measured by linear dimension, at item centerline or mean chord.
 - 7. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the Work.
- F. Unit Price Schedule:
 - 1. Refer to Bid Form

1.7 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement. The Owner-Contractor Agreement may identify certain Alternates to remain an Owner option for a stipulated period of time.
- B. Coordinate related Work and modify surrounding Work. Description for each Alternate is recognized to be abbreviated but requires that each change shall be complete for scope of Work affected.
 - 1. Coordinate related requirements among Specification Sections as required.
 - 2. Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.
 - 3. Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.
- C. Schedule of Alternates:
 - 1. Refer to Bid Form

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination and Project conditions.
- B. Field Engineering.
- C. Preconstruction meeting.
- D. Progress meetings.
- E. Protection of Existing Structures and Utilities.
- F. Permits.
- G. Right of Way and Construction Easements.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- C. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.
- D. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.
- E. The contractor shall notify the engineer not less than three (3) working days prior to the date of commencement of work.
- F. The contractor shall give notice to the fire and police departments of the municipality in which the work is being performed and/or to the sheriff's department at least twenty-four (24) hours before closing off or in any manner affecting through vehicular traffic of any street.
- G. Contractor shall be responsible for coordinating all construction activities with utility companies including but not limited to electric, gas, telephone, cable,

communication, etc., as well as service companies (mail, trash collection, etc.) in the work area. This work including sub-surface investigations to determine utility locations shall be incidental to all other construction.

- H. The locations of utilities shown on the Plans are from existing records and/or field locations and may not be complete or accurate. The contractor shall contact Digger's Hotline at (800) 242-8511, as well as other utilities not served by Digger's Hotline but having facilities in the work area, at least three (3) full business days prior to construction to allow the utilities to locate their underground facilities.
- I. Contractor shall be responsible for locating all utilities, including but not limited to sewer, water, electric, telephone, cable television, and gas and repairing any damage he shall cause to the same. The Contractor shall, in writing, bring to the attention of the engineer the location of any utilities that interfere with the proposed construction. Notwithstanding, contractor shall be responsible for any damage he shall cause to the same.
- J. Utility Outages and Shutdown: No sanitary or water service shall be disconnected or otherwise disrupted without prior authorization from the Owner. The contractor shall notify the Owner no less than forty-eight (48) hours in advance of any disruption of service so that the Owner may notify affected property owners.
- K. An engineer or an engineer technician will provide construction review as the project proceeds to determine conformity to the contract accounts. Said construction review shall not relieve the contractor of any obligation to construct the project in conformity with the Contract Documents, nor shall it, in any manner, make Vierbicher Associates, Inc., an insurer of, nor relieve the contractor of any obligations or guarantees concerning the contractor's performance.
- L. The General Contractor shall provide the Owner and Engineer with a list of emergency contacts.
- M. Utility Contacts
 - 1. Digger's Hotline (800) 242-8511
 - 2. Gas - MG&E (Mark Oehler) (608) 326-2417
 - 3. Telephone - Century Link (Steve Nelson) (608) 342-4369
 - 4. Electric - Alliant Energy (Al Mumm) (608) 732-7825
 - 5. Cable TV - Mediacom (608) 326-4487
 - 6. Water Works - City of Prairie du Chien (Larry Gates) (608) 306-0360
 - 7. Sanitary - City of Prairie du Chien (Larry Gates) (608) 306-0360
 - 8. OWNER - City of Prairie du Chien (608) 326-6406

1.3 FIELD ENGINEERING

- A. When included in Engineer's contract with Owner, Engineer will provide one time staking for each utility line, grading, curb and gutter. The Contractor shall provide the Engineer a 48 hour notice prior to the time the Contractor needs stakes. Any restaking needed after the initial staking has been completed shall be charged to the Contractor on a time and materials basis.

- B. The contractor shall check the accuracy of line and grade stakes by means of visual and taping checks and shall be responsible for the protection and preservation of such stakes.
- C. The contractor shall bear sole responsibility for the correct transfer of all construction lines and grades from the primary line and grade points, and for the correct alignment and grade of the finished structure, based upon the primary line and grade established by the engineer.
- D. Control survey that is established by Owner provided survey shall be the responsibility of the contractor to maintain and protect unless approved otherwise by Engineer or Owner.
- E. Contractor shall confirm drawing dimensions and elevations.
- F. Contractor shall protect survey control points prior to starting site work; preserve permanent reference points during construction.
- G. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- H. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.

1.4 PRECONSTRUCTION MEETING

- A. Engineer will schedule and conduct meeting after Notice of Award and prior to start of construction.
- B. Attendance Required: Owner, Engineer, and Contractor. Utility representative will also be invited. Prime Contractor shall invite sub contractors as necessary.
- C. Minimum Agenda:
 - 1. Execution of Owner-Contractor Agreement, if not already completed.
 - 2. Submission of executed bonds and insurance certificates, if not already completed.
 - 3. Distribution of Contract Documents, if not already completed.
 - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing parties in Contract, Owner and Engineer.
 - 6. Communication procedures.
 - 7. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
 - 8. Scheduling.
 - 9. Critical Work sequencing.
 - 10. Other items may be included
- D. Engineer shall record minutes and distribute copies to participants.

1.5 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. All surface structures and features that are to be saved, including buildings, pavements, trees and shrubs, shall be properly protected against all damage. Unless otherwise denoted on the drawings, the CONTRACTOR shall assume all existing buildings, fences, trees and shrubs, etc. are to be saved.
- B. All existing gas pipes, water pipes, steam pipes, electric and telephone conduits, sewers, drains, fire cisterns and hydrants, and other surface or subsurface structures, either of a private or of public ownership, shall be carefully supported and protected from damage by the Contractor. The Contractor shall contact utilities to determine their procedure and schedule for supporting and/or relocating poles and shall notify any above ground utility as necessary to relocate or reinforce any poles, ties or anchors which may be on or near the line of the proposed utility, weakened by excavation for the proposed utility, or within road construction grading limits. All such work shall be done by or at the expense of the Contractor and according to his own plans, subject always to the approval of the Engineer. The fact that the Owner may be under no legal obligation to provide for doing such work will be no excuse for the Contractor neglecting or refusing to perform the same.
- C. In the event of damage to any of these surface or subsurface structures, the Contractor shall replace or make repairs to the satisfaction of the Engineer at no additional cost to the Owner.
- D. The Contractor, while on this job, shall be solely responsible for the protection and/or replacement of all survey corners which exist throughout the area. These corners will be located and marked by the ENGINEER, upon request by the Contractor, prior to commencing his work. Any corners damaged by the Contractor shall be replaced by a Professional Land Surveyor at the Contractor's expense.

1.6 PERMITS

- A. Permits and licenses of a temporary nature necessary for the prosecution of the work shall be secured and paid for by the Contractor unless otherwise stated below. Permits, licenses, and easements for permanent structures or permanent changes in existing facilities will be secured and paid for by the Owner, unless otherwise specified.

1.7 RIGHT OF WAY AND CONSTRUCTION EASEMENTS

- A. The Contractor shall confine his operations to the limits of the right-of-way or construction easements as shown on the plans. Equipment shall at no times be stored or parked on private property without the written permission of the property owner. At the conclusion of the workday, equipment shall be parked on the project site or at such other location for which the Contractor has made arrangements.
- B. No easements, permanent or temporary have been provided by the Owner unless such easements are shown on the plans.

- C. Where easements are provided, the Contractor shall restrict operations to minimize damage within easements and shall use only that land which is reasonably necessary to conduct his work operations.
- D. Trees shall not be removed from within easement areas unless their removal is approved by the Engineer. The Engineer will mark all trees to be removed from easement areas.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Schedule Requirements.
- B. Liquidated Damages.
- C. Warranty.
- D. Submittals.
- E. Format of Schedule.
- F. Revisions to Schedules.
- G. Delays and Recovery.

1.2 SCHEDULE REQUIREMENTS

- A. Submit a proposed work schedule for the entire project at the pre-construction conference. This schedule shall include any and all restrictions and special considerations indicated in the Contract Documents. After review by the Engineer, resubmit required revised data within ten days.
- B. Distribute copies of reviewed schedules to Engineer, subcontractors, suppliers, and other concerned parties.
- C. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- D. Submit computer generated horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week.
- E. Complete the work in a continuous and timely manner, in coordination with the Owner and other Contractors working on the project.
- F. Comply with and complete the Work in accordance with the following construction schedule:

Contract A - Well No. 5 Production Well:

- 1. Award Contract (March 2026)
- 2. Notice to Proceed (April 2026)
- 3. Start Construction: Work may begin following the execution of the Contract documents, issue of Notice to Proceed, and the preconstruction meeting.

4. Substantial Completion: The work shall be substantially completed by June 2026 (Well construction complete).
5. Final Completion: The work shall be complete and ready for final payment by July 2026 (Water quality test results obtained). Final completion shall include all work as shown on the Contract Drawings and detailed in these specifications, including all the items addressed in final project closeout punchlist.
6. 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.

Contract B - Well No. 5 Pumphouse, SCADA Updates, & Well No. 2 Demolition:

1. Award Contract (March 2026)
2. Notice to Proceed (July 2026)
3. Start Construction: Work may begin following the execution of the Contract documents, issue of Notice to Proceed, and the preconstruction meeting.
4. Substantial Completion: The work shall be substantially completed by January 2027
5. Final Completion: The work shall be complete and ready for final payment by February 2027. Final completion shall include all work as shown on the Contract Drawings and detailed in these specifications, including all the items addressed in final project closeout punchlist.
6. 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.

1.3 LIQUIDATED DAMAGES

Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 1.2 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense, and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner One Thousand Five Hundred Dollars (\$1,500.00) for each day that expires after the time specified in paragraph 1.2 for Substantial Completion until the Work is substantially complete.

1.4 WARRANTY

A. Provide a one-year warranty for the project against any defects in the materials and workmanship. The date of the one-year warranty shall commence on the date that the project is accepted by the Public Works Committee. It shall be the responsibility of the Contractor to request acceptance of the improvements.

1.5 SUBMITTALS

- A. Furnish four (4) copies of preliminary schedule, and subsequent revisions thereof, to Engineer three (3) days before each progress meeting or by such date agreed to at the preconstruction meeting.

1.6 FORMAT 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.

1.7 REVISIONS TO SCHEDULE

- A. Each month Contractor shall receive updated 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.

1.8 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 activities 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 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Product data.
- D. Use of electronic CAD files of Project Drawings.
- E. Shop Drawings.
- F. Test reports.

1.2 DEFINITIONS

1.3 SUBMITTAL PROCEDURES

- A. All iron and steel (AIS) and Build America, Buy America (BABA) products must be consumed in, incorporated into, or affixed to an infrastructure project produced in the United States and meet American Iron and Steel (AIS) and Build America, Buy America (BABA) requirements as described in the contract documents. The term "iron and steel products" means the following products are 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. Contractor shall certify upon substation completion of the project that all iron and steel products installed were produced in the United States.**
- C. Transmit each submittal with Engineer accepted form.
- D. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- F. Schedule submittals to expedite Project and deliver to Engineer at business address or electronic submittals via email as PDF electronic files. Coordinate submission of related items.

- G. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- H. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.
- I. Allow space on submittals for Contractor and Engineer review stamps.
- J. When revised for resubmission, identify changes made since previous submission.
- K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- L. Submittals not requested will not be recognized nor processed.
- M. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Comply with Section 01 32 16 – Construction Progress Schedule.

1.5 PRODUCT DATA

- A. Submit electronic submittals via email as PDF electronic files.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.6 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

- A. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:
 - 1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
 - 2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for

- determining and complying with these conditions and for incorporating addenda and modifications.
3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
 4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
 5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
 6. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

1.7 SHOP DRAWINGS

- A. Submit electronic submittals via email as PDF electronic files.
- B. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
 1. Include signed and sealed calculations to support design.
 2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- C. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.
- D. Use of Salvaged Materials
 1. With the exception of normal suitable fill materials, Contractor shall not use salvaged materials in the proposed construction without the prior written approval of the Owner. It is intended that new, high-quality materials be used in the proposed construction.

1.8 TEST REPORTS

- A. Submit for Engineer's knowledge as contract administrator or for Owner.
- B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances.
- C. References.
- D. Testing and inspection services.
- E. Examination.
- F. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions.
- C. When 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 required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

1.3 TOLERANCES

- A. Monitor installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of 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 specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.
- F. Comply with codes and standards applicable to each type of work and as listed in individual sections.
 - 1. Where a conflict occurs between referenced documents and the Project Specifications, the Project Specifications shall govern.
 - 2. Where conflicts occur between two or more referenced documents, the document containing the most stringent requirements governs.
 - 3. Where referenced documents are not specified by date, the current document published as the date set for Receipt of Bids applies.
 - 4. Materials, applications, and tests specified by reference to published standards of a society, association, code, or other published standards are included in the specifications as if written in their entirety.
- G. The following may be referenced in the Contract Documents for work on this project.
 - 1. *Standard Specifications for Sewer and Water Construction in Wisconsin*,
 - 2. State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*. This publication can be found at: <http://roadwaystandards.dot.wi.gov/standards/stndspec/index.htm>
 - 3. *Wisconsin Construction Site Best Management Practice Handbook*, DNR Nonpoint Source and Land Management Section WR/2.

1.5 TESTING AND INSPECTION SERVICES

- A. Owner will employ and pay for specified services of an independent firm to perform testing and inspection unless otherwise noted in this document.
- B. Cooperate with independent firm; furnish samples of materials, design mix, 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.

- C. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Price.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.

1.2 PRODUCTS

- A. **All iron and steel (AIS) and Build America, Buy America (BABA) products must be consumed in, incorporated into, or affixed to an infrastructure project produced in the United States and meet American Iron and Steel (AIS) and Build America, Buy America (BABA) requirements as described in the contract documents. The term "iron and steel products" means the following products are 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. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- C. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure 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.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.

- B. Store with seals and labels intact and legible.
- C. For exterior storage of fabricated products, place on sloped supports above ground.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- E. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT 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 one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Engineer will consider requests for Substitutions only within 15 days after date established in Notice to Proceed.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for Substitution as for 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 Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- 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 Contract Documents.
- F. Substitution Submittal Procedure:
 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 3. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Protecting installed construction.
- D. Project record documents.

1.2 CLOSEOUT PROCEDURES

- A. Contractor shall certify upon substantial completion that all Work and Materials has complied with American Iron and Steel requirements as mandated by Section 746 of Title VII of the Consolidated Appropriations Act of 2017 and subsequent statutes mandating domestic preference. Contractor shall provide said Certification to Owner.**
- B. All iron and steel (AIS) and Build America, Buy America (BABA) products must be consumed in, incorporated into, or affixed to an infrastructure project produced in the United States and meet American Iron and Steel (AIS) and Build America, Buy America (BABA) requirements as described in the contract documents. The term "iron and steel products" means the following products are 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.**
- C. 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.
- D. Submit final Application for Payment identifying total adjusted Contract Price, previous payments, and amount remaining due.

1.3 FINAL CLEANING

- A. Clean site; sweep paved areas, rake clean landscaped surfaces.
- B. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.4 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. Prohibit traffic from landscaped areas.

1.5 PROJECT RECORD DOCUMENTS

- A. Maintain on site 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. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Field changes of dimension and detail.
 - 3. Details not on original Contract drawings or as directed by the Engineer.
- F. Submit documents to Engineer with claim for final Application for Payment.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

SECTION 02 41 16
STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolishing designated structures.
 - 2. Demolishing designated foundations.
 - 3. Demolishing designated slabs-on-grade.
 - 4. Disconnecting and capping designated utilities.
 - 5. Removing designated items for reuse and Owner's retention.
 - 6. Removing demolished materials.
- B. Related Sections:
 - 1. Section 31 05 13 - Soils for Earthwork: Backfill materials.
 - 2. Section 31 05 16 - Aggregates for Earthwork: Backfill materials.
 - 3. Section 31 10 00 - Site Clearing: Clearing outside periphery of structures.
 - 4. Section 31 23 23 - Fill.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Salvage Designated Equipment & Materials and Deliver to Owner:
 - 1. Basis of Measurement: By lump sum.
 - 2. Basis of Payment: Includes payment for removal, loading, and transporting to Owner designated location.
- B. Building Demolition & Demolished Materials Disposal:
 - 1. Basis of Measurement: By lump sum.
 - 2. Basis of Payment: Includes payment for proper abatement and disposal of all material, including hazardous material identified by the Asbestos and Pb Based Paint Inspection by Advanced Testing & Inspections LLC and those found prior and during demolition, for coordination with on-site utilities and removal or abandonment of utilities identified on the plans and through project coordination, all necessary permits to complete the abatement and demolition work, demolition, loading, hauling, removal from site, disposal at licensed waste disposal facility, all associated disposal fees and costs, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Schedule of Demolition Activities: Indicate the following:

1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.
 2. Interruption of utility services.
 3. Coordination for shutoff and capping of utility services.
- C. Landfill Records: Indicating receipt and acceptance of wastes by a landfill facility licensed to accept wastes.
- D. Submit copy of permits required by regulatory agencies for demolition.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Accurately record actual locations of capped utilities, and subsurface obstructions.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing State of Wisconsin & USEPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
1. Submit a "Notification of Demolition and /or Renovation" form to the appropriate agencies of the State of Wisconsin 10 working days prior to starting demolition.
- B. Conform to applicable State of Wisconsin codes for demolition of structures, safety of adjacent structures, dust control, runoff control, and disposal.
- C. Conform to applicable State of Wisconsin codes for procedures when hazardous or contaminated materials are discovered.
- D. Obtain required permits from authorities having jurisdiction.

1.6 QUALIFICATIONS

- A. Demolition Firm: Company specializing in performing work of this section with minimum five years documented experience.
- B. Design shoring, bracing, and underpinning under direct supervision of Professional Engineer experienced in design of this Work and licensed in the State of Wisconsin.

1.7 PRE-DEMOLITION MEETING

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

- C. Inspect and discuss condition of construction to be demolished.
- D. Review and finalize demolition schedule to discuss: demolition personnel, equipment, and facilities needed to make progress and avoid delays.
- E. Review and finalize protection requirements.

1.8 PROJECT CONDITIONS

- A. Buildings indicated to be demolished will be vacated before start of Work.
- B. Owner assumes no responsibility for actual condition of buildings to be demolished.
- C. Notify Engineer upon discovery of hazardous materials.
- D. Do not sell demolished materials on-site.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine existing buildings indicated to be demolished before demolition.
- B. Determine where removals may result in structural deficiency or unplanned building collapse during demolition. Coordinate demolition sequence and procedures to prevent structures from becoming unstable.
- C. Determine where demolition may affect structural integrity or weather resistance of adjacent buildings indicated to remain.
 - 1. Identify measures required to protect buildings from damage.
 - 2. Identify remedial work including patching, repairing, bracing, and other work required to leave buildings indicated to remain in structurally sound and weathertight and watertight condition.
- D. Perform and verify hazardous material abatement is complete before beginning demolition.

3.2 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding demolition area.

- B. Notify affected utility companies before starting work and comply with utility's requirements.
- C. Do not close or obstruct roadways without permits.
- D. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.
- E. Protect existing landscaping materials, trees, appurtenances, and structures indicated to remain.
- F. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

3.3 DEMOLITION REQUIREMENTS

- A. Use of explosives is not permitted.
- B. Conduct demolition to minimize interference with adjacent structures.
- C. Cease operations immediately when adjacent structures appear to be in danger. Notify Engineer. Do not resume operations until directed.
- D. Conduct operations with minimum interference to public or private accesses to occupied adjacent structures. Maintain protected egress and access from adjacent structures at all times.
- E. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.
- F. Sprinkle Work with water to minimize dust. Provide hoses and water connections required for this purpose.

3.4 DEMOLITION

- A. Remove and cap utilities to street connections. Identify utilities at termination of demolition. Record termination or capped location on Record Documents.
- B. Remove foundation walls and footings to minimum of three feet below finished grade.
- C. Remove concrete slabs-on-grade.
- D. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01 60 00 - Product Requirements.
- E. Backfill areas excavated from demolition in accordance with Section 31 23 16 - Earthwork.

- F. Rough grade and compact areas affected by demolition to maintain site grades and contours.
- G. Continuously clean-up and remove demolished materials from site. Do not allow materials to accumulate in building on site.
- H. Do not burn or bury materials on site. Leave site in clean condition.

3.5 SCHEDULES

- A. Items to be removed and delivered to Owner for Reuse in the proposed Well No. 5 Pumphouse:
 - 1. Well Pump including motor, base, column assembly, bowl assembly.
 - 2. Motor Control Center.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete for the following:
 - 1. Concrete Sidewalks
 - 2. Concrete Driveways and Driveway Aprons.
 - 3. Curb and gutter.
 - 4. Removals
 - 5. Control, expansion and contraction joint devices.
 - 6. Curb Ramp Detectable Warning Field
- B. Related Sections:
 - 1. Section 31 23 16 – Excavation.
 - 2. Section 32 11 23 – Aggregate Base Courses.
 - 3. Section 31 10 00 – Site Clearing

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Concrete Sidewalk:
 - 1. Basis of Measurement: By square foot for each thickness as indicated on the Bid Form.
 - 2. Basis of Payment: Includes full compensation for furnishing all materials including granular base, expansion joints; for all excavation, for placing, furnishing, protecting and curing, for doweling into the curb (when required by project details), reinforcing fibers and for all labor, tools, equipment, and incidentals necessary to complete the work.
 - 3. Concrete removal shall be measured and paid for at the contract unit price per square foot.
- B. Concrete Driveway:
 - 1. Basis of Measurement: By square foot for each thickness as indicated on the Bid Form.
 - 2. Basis of Payment: Includes full compensation for furnishing all materials including granular base, expansion joints; for all excavation, for placing, furnishing, protecting and curing, for doweling into the curb (when required per project details), reinforcing fibers and for all labor, tools, equipment, and incidentals necessary to complete the work.
 - 3. Concrete removal shall be measured and paid for at the contract unit price per square foot.
- C. Concrete Curb and Gutter:
 - 1. Basis of Measurement: By the lineal foot as measure in the flow line.
 - 2. Basis of Payment: Full compensation for all excavation and preparation of foundation; for furnishing all materials including concrete, reinforcing fibers and for

- all labor, tools, equipment, testing, reinforcing, and incidentals necessary to complete the work.
3. Concrete curb removal will be measured and paid for at the contract unit price per lineal foot.
- D. Curb Ramp Detectable Warning Field:
1. Basis of Measurement: By Each (when bid item is included, if not it is incidental to ramp construction).
 2. Basis of Payment: Includes full compensation for providing the warning field of the specified color and all labor, tools, equipment and incidentals necessary to complete the work.

1.3 REFERENCES

- A. American Concrete Institute:
1. ACI 305 - Hot Weather Concreting.
 2. ACI 306.1 - Standard Specification for Cold Weather Concreting.
 3. ACI 308.1 - Standard Specification for Curing Concrete.
 4. ACI 360 – Design of Slabs on Grade.
- B. State of Wisconsin Department of Transportation Standard Specifications.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on joint devices, attachment accessories, and admixtures.
- C. Design Data:
1. Submit concrete mix design for each concrete strength requirement. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
 - b. Air entrained concrete work.
 2. Identify mix ingredients and proportions, including admixtures.
 3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301.
- B. Conform to ACI 305 when concreting during hot weather.
- C. Conform to ACI 306.1 when concreting during cold weather.
- D. Acquire cement and aggregate from one source for Work.

- E. Perform Work in accordance with the State of Wisconsin, Department of Transportation, Standard Specifications, latest Edition.
- F. Maintain one copy of each document on site.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Take all precautions necessary to prevent freezing of the concrete until it has developed sufficient strength to open it to service and to produce quality concrete. Frozen or frost damaged concrete shall be removed and replaced.
- B. Except by specific written permission, concreting operations shall not be continued when a descending air temperature in the shade and away from artificial heat falls below 40°F nor resumed until an ascending air temperature in the shade and away from artificial heat reaches 35°F. When operations are so permitted, and for all concrete pavement placed on and after October 1 and on or prior to May 15, the temperature of the mixed concrete as placed shall be not less than 50°F nor more than 80°F.
- C. If necessary, the water or aggregates or both may be heated. When the aggregates are frozen or contain frost, they shall be heated. Aggregates shall be heated by steam or by other means in a manner which will heat the mass uniformly and preclude the possible occurrence of overheated areas. Mixing water shall be heated in such a manner that its temperature is accurately controlled. The temperature of the mixing water or the aggregates shall not exceed 100° F when placed together with the cement in the mixer. The temperature should be controlled so the concrete discharged from the mixer is between 50° F and 80° F inclusive.
- D. Heating of cement shall not be permitted. The addition of salt or chemical admixtures to the concrete mix to prevent freezing will not be permitted.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: ASTM C150, For concrete used for curb and gutter, sidewalks, and driveways use Grade A or A2 meeting the requirements of Section 501, Concrete Masonry, in the State of Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, Latest Edition.
 - 1. Air entrained concrete shall be used for all concrete construction. Slip formed concrete pavement shall contain 7.0% air, +/- 1.5%. Other concrete shall contain 6.0% air, +/- 1.5%
- B. Water: ACI 318: The contractor may use drinking water from municipal water supplies for cement, except the Engineer may test this water for compliance with the requirements of Section 501 of Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, Latest Edition.

2.2 ADMIXTURES

- A. Subject to the written approval of Engineer and in strict conformance with manufacturer's recommendations.
- B. Furnish materials in accordance with Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, Latest Edition.
- C. Air Entrainment: ASTM C260.
- D. Chemical: ASTM C494/C494M.
 - 1. Type A - Water Reducing.
 - 2. Type B - Retarding.
 - 3. Type C - Accelerating.
 - 4. Type D - Water Reducing and Retarding.
 - 5. Type E - Water Reducing and Accelerating.
 - 6. Type F - Water Reducing, High Range.
 - 7. Type G - Water Reducing, High Range and Retarding.
- E. Fly Ash, Calcined Pozzolan: ASTM C618 Class C except limit the loss of ignition to a maximum of 2 percent.
- F. Silica Fume: ASTM C1240.
- G. Slag: ASTM C989; Grade 100 or 120; ground granulated blast furnace slag.

2.3 JOINT DEVICES AND FILLER MATERIALS

- A. Expansion Joint Filler Type A: AASHTO M213 Asphalt impregnated fiberboard or felt; tongue and groove profile.

2.4 CURING

- A. Liquid Curing Compound: Shall conform to the requirements of Section 415, Concrete Pavement, in the Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, Latest Edition.
- B. Polyethylene Sheeting: Furnish sheeting conforming to AASHTO M171 for white opaque polyethylene film, except that the contractor may use clear or black polyethylene for cold weather protection.

2.5 FORMS

- A. Furnish and use wood or metal forms straight and of sufficient strength to resist springing, tipping, or other displacement during depositing and consolidating the concrete. If using wood forms, provide surfaced planks, at least 2-inch nominal thickness stock except for sharply curved sections. If using metal forms, ensure they are engineer-approved section with a flat surface on top. Use forms as deep as the depth of the concrete. Securely stake, brace, and hold the forms firmly to the required line. Make the

forms tight to prevent mortar leakage. Clean and oil all before placing concrete against them.

2.6 CONCRETE MIX

- A. Select proportions for normal weight concrete in accordance with State of Wisconsin Department of Transportation, Standard Specifications, Latest Edition; Grade A or A2, meeting Section 501. Concrete shall conform to AASHTO M154 for 7- and 28-day compressive and flexural strengths and resistance to freezing and thawing.
 - 1. Compressive Strength: 4000 PSI – 28 Day Compressive Strength.
 - 2. Water Content: 27 Gallons/CY.
 - 3. Air Content Range: 7% +/- 1.5% (Slip Formed) 6% +/- 1.5% (All other Concrete).
 - 4. Slump Range: 1-4 inches.
 - 5. Coarse Aggregate Maximum: 3/4" Inches.
- B. Ready Mixed Concrete: Mix and deliver concrete in accordance with ASTM C94/C94M.
- C. Site Mixed Concrete: Mix concrete in accordance with ACI 318.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- C. Remove debris and ice from formwork, reinforcement, and concrete substrates.
- D. Remove water from areas receiving concrete before concrete is placed.
- E. The foundation shall be prepared by excavating to the lines, grades, and cross section shown on the plans and required for placing the concrete masonry. All soft or unsuitable material shall be removed and replaced with suitable material and the foundation or material underlying the proposed curb and gutter, driveway, or sidewalk shall be compacted thoroughly and finished to a firm, true surface. On embankments, construct the foundation at least 2 feet wider than the proposed concrete and extend it at least one foot beyond each end of the concrete.

- F. Place crushed aggregate base course or granular fill under curb or curb and gutter, driveway, and sidewalk at the locations, thickness, and according to sections shown on the plans.

3.3 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301.
- B. Notify testing laboratory and Engineer minimum 24 hours prior to commencement of operations.
- C. Curb and gutter contractor shall notify all residents a minimum of 24 hours in advance of installing curb and gutter.
- D. Contractor may be required to provide driveway access under special circumstances as directed by the Engineer. This shall be incidental to the work.
- E. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.
- F. The contractor may use a machine to place, form, and consolidating curb & gutter. The resulting curb and gutter shall equal or exceed that produced by forming.
- G. Deposit, consolidate, and slip form the concrete to the required section while preventing segregation of mix. If not using a slip form process, deposit the concrete in the forms to the proper depths, spade against the forms, and consolidate thoroughly. Use mechanical vibration for concrete with slump less than 2 inches. After consolidation strike off, and finish to the required section.
- H. Place concrete in continuous operation for each panel or section determined by predetermined joints.
- I. Unless constructed integrally with concrete pavement, securely anchor concrete curb and gutter to adjoining concrete pavement by placing specified tie bars if and as the plans show.
- J. Tie new work to existing concrete pavement using tie bars driven or epoxied into the existing concrete. Use only cast-in-place tie bars in construction joints between pavement and curb and gutter placed under the contract.
- K. Form contraction joints by sawing or by forming an induced plane of weakness at least 2 inches deep in the curb and gutter directly opposite all construction or contraction joints in abutting concrete pavement and at the required spacing in curb and gutter adjoining asphaltic pavement. Such spacing shall not be less than six feet nor more than approximately 12 feet in length, as the Engineer directs.
- L. The depth of cut shall be $\frac{1}{4}$ depth of slab thickness unless otherwise directed by the Engineer. The sawing shall be done within 12 hours after placing or as soon as practicable after the concrete has set sufficiently to preclude raveling during the sawing and before any shrinkage cracking takes place in the concrete. If this method results in

random cracking, the contractor shall be required to form an induced plane of weakness.

- M. Separators if used, shall be removed as soon as practicable after the concrete has been struck off, consolidated and set sufficiently to preserve the width and shape of the joint. Face forms, if used, may be removed for finishing curb face and fillets as soon as the concrete will retain its shape. Back forms may be removed after the concrete has been in place for six hours.
- N. Construct depressions in or revisions of the curb and gutter to accommodate driveways and curb ramps at locations with the detail as the plans show or as directed by the Engineer.
- O. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- P. Place concrete continuously between predetermined expansion, control, and construction joints.
- Q. Do not interrupt successive placement; do not permit cold joints to occur.

3.4 JOINTS

- A. Expansion joints shall be placed in curb, curb and gutter, driveways and sidewalks as indicated on the plans or directed by the Engineer. They shall be located in curb and gutter on each side of every inlet about three feet from the inlet, but no closer than 6 feet from another joint; or at all locations where tangent and radial curb and gutter meet; and on tangent sections at a maximum spacing of 300 feet.
- B. If constructing curb & gutter next to, or on concrete pavement constructed with expansion joints, then place expansion joints to match the expansion joint locations in the pavements.
- C. Joints shall be set at right angles to the face and top of the curb, and at right angles to the flow line and surface of gutters using 3/4-inch expansion joint filler.
- D. Curb contraction joints shall be located transversely, every 12 feet and at a depth of 1".
- E. For sidewalks of uniform width, transverse joints shall be constructed at right angles to the centerline of the sidewalk and longitudinal joints shall be constructed parallel to the centerline of the walk, unless otherwise provided. For sidewalks of variable or tapering widths, the transverse and longitudinal joints shall be at right angles to each other insofar as feasible and the joints shall be constructed as laid out in the field by the engineer.
- F. Sidewalk shall be divided into sections by means of contraction joints. Unless otherwise directed by the Engineer, sidewalk contraction joints shall be located transversely every 5 feet.
- G. One-half-inch transverse expansion joint filler shall be placed through the sidewalk at uniform intervals of not more than 96 feet and at each property line.

- H. One-half-inch expansion joint filler shall be placed between the sidewalk and back of abutting parallel curb or gutter and 1 inch between sidewalk and buildings or other rigid structures.
- I. One-half-inch expansion joint filler shall be placed between sidewalk approaches and the back of curb or gutter or edge of pavement.
- J. No joint shall deviate more than five degrees from a position perpendicular to the surface of the finished sidewalk, nor shall the axis of any joint deviate more than ½-inch either way from a straight line or from the designated alignment at any point. If the joints are constructed in sections, there shall be no offsets or concrete struts between adjacent units.
- K. When the sidewalk is constructed in partial width slabs, transverse joints in adjacent slabs shall be placed in line with like joints in the previously constructed slabs. In the case of widening existing sidewalks, transverse joints shall be placed in line with like joints in the existing sidewalk.
- L. Insofar as feasible, sidewalks shall be divided into sections not less than three feet or more than 12 feet in any dimension. The unit areas shall be produced by use of metal slab division forms extending to the full depth of the concrete or by contraction joints, as described hereinafter.
- M. A contraction joint in sidewalk may consist of a slot or groove, at least one inch in depth and 1/4-inch in width, formed by inserting a metal parting strip in the concrete after it has been struck off and consolidated and while the concrete is still plastic. As soon as the concrete will retain its shape, the parting strip shall be removed and the joint edge-finished.
- N. Contraction joints may be formed by cutting the concrete through for not less than 1/4 total depth with a pointed trowel or other suitable tool. The joint shall be edge-finished.
- O. Contraction joints at least 1-inch in depth and approximately 1/8-inch in width may be sawed in the concrete sidewalk.
- P. The expansion joint filler shall be extended to the concrete's full depth and make the top slightly below the finished surface of the sidewalk.
- Q. Concrete shall be consolidated thoroughly at all expansion joint faces to fill the voids, and finish the surface smooth and true to grade. The sidewalk edges shall be rounded along forms, un-sawed joints, and metal slab division forms with a 1/2 inch radius edger. Mechanical vibration at all expansion joint faces shall be used for other work in this section to fill the voids, and finish the surface smooth and true to grade.
- R. Do not seal joints.

3.5 CONCRETE FINISHING

- A. Broom Finish: The face surfaces of concrete shall be thoroughly troweled and brushed. Unless otherwise provided, the back edge of the curbs, the edge of the gutter adjacent

to the pavement and edges adjacent to expansion joints or induced contraction joints shall be rounded with an edger of 1/4-inch radius. All honeycombed areas occurring along forms on back of curbs or edges of gutters shall be pointed with mortar. The cementing material shall be only portland cement.

3.6 CURING AND PROTECTION

- A. Protect and cure concrete in accordance with Section 415 of the State of Wisconsin, Department of Transportation, Standard Specifications, latest Edition.
- B. Cure concrete in accordance with ACI 308.1.
- C. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- D. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- E. The Contractor shall erect and maintain suitable barricades and employ such watchers as may be necessary to exclude vehicle and pedestrian traffic from the newly construction concrete until adequate concrete curing has occurred.
- F. Any part of the concrete construction damaged by traffic or otherwise damaged prior to its acceptance shall be repaired or replaced by and at the expense of the Contractor in a manner satisfactory to the Engineer. The Contractor shall provide protection against both public traffic and the traffic caused by the Contractor's own employees and agents.
- G. The Contractor shall have available materials for protecting the unhardened concrete against damage by rain. When rain is imminent, the unhardened concrete shall be immediately covered with paper, plastic film or other suitable material, and planks or forms placed along slip-formed pavement edges.
- H. As soon as water has disappeared from finishing operations, the concrete surface shall be sealed by spraying on it a uniform coating of curing compound. Curing compound shall be applied at the rate of one gallon per 150 square feet of surface for tined surfaces and one gallon per 200 square feet for other surface finishes.
- I. Curing compound coating that has been damaged within 72 hours after application shall be immediately recoated to the affected area. When forms are removed within 72 hours of placing the concrete, curing compound coating shall be applied within 30 minutes after form removal.
- J. Contractor shall arrange to have enough thermal protection material available to protect concrete that has yet to conform to the opening to service criteria as defined in Section 3.7.
- K. Beginning not later than October 1 and continuing at least until May 16, the Contractor shall provide along the works a sufficient supply of polyethylene sheeting to protect all of the concrete structures placed within the preceding 72 hours.

If the national weather service forecast for the construction area predicts freezing temperature within the next 24 hours, or if freezing temperatures actually occur, thermal protection shall be provided as specified below for concrete that has yet to conform to the opening to service criteria as defined in Section 3.7.

ACTUAL/PREDICTED AIR TEMPERATURE	MINIMUM LEVEL OF CONCRETE PROTECTION
22° F TO <28° F	Single layer of polyethylene
17° F TO <22° F	Double layer of polyethylene
<17° F	6" of loose, dry straw between 2 layers of polyethylene

- L. Other approved materials, including treated straw or hay, may be used in lieu of the loose, dry straw or hay, when such materials are placed to the thickness necessary to provide the same insulating protection as the 6 inches of loose, dry straw or hay. Such covering shall remain in place until the concrete conforms to the opening of service requirements.
- M. Protective materials shall be placed as soon as the concrete is finished and sets sufficiently to prevent surface marring. When removal of the coverings is necessary to saw joints or to perform other required work, such removal shall be done as directed by the Engineer and for the minimum time required.

3.7 OPENING TO SERVICE

- A. Contractor shall maintain moisture, temperature, and physical protection for concrete until the concrete develops sufficient strength to open it to service.
- B. The Engineer will allow the pavement to be open to construction and public traffic when concrete attains a verified compressive strength of 3,000 pounds per square inch.
- C. Without compressive strength information, the concrete shall be open to service as specified in Section 415.3.15 of the State of Wisconsin, Department of Transportation, Standard Specifications, Latest Edition.

3.8 DETECTABLE WARNING FIELDS

- A. Detectable warning plates shall be constructed in conformance with manufacturer's recommendations. When painting is required, painting shall occur between 30 to 40 days following installation.

3.9 SEALANT

- A. Sealant, when required, shall be installed per manufacturer's recommendations after placing concrete.

3.10 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements; 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Field inspection and staking will be performed by the Engineer.
- C. Contractor shall provide their own quality control testing and furnish the test results to the Engineer for slump, air and cylinder break results. Owner may hire an independent testing laboratory in addition to the contractors testing.
- D. Provide free access to Work and cooperate with appointed firm.
- E. Submit proposed mix design of each class of concrete to Engineer for review prior to commencement of Work.
- F. Strength Test Samples:
 - 1. Sampling Procedures: ASTM C172.
 - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
 - 3. Sample concrete and make one set of four cylinders for every 200 cu yds or less of each class of concrete placed each day.
 - 4. Test cylinders shall be broken at 7 and 28 day intervals. The fourth cylinder shall be held for 60 days.
 - 5. Make one additional cylinder during cold weather concreting, and field cure.
- G. Field Testing:
 - 1. Slump Test Method: ASTM C143/C143M.
 - 2. Air Content Test Method: [ASTM C173/C173M] [ASTM C231].
 - 3. Temperature Test Method: ASTM C1064/C1064M.
 - 4. Measure slump and temperature for each compressive strength concrete sample.
 - 5. Measure air content in air entrained concrete for each compressive strength concrete sample.
- H. Cylinder Compressive Strength Testing:
 - 1. Test Method: ASTM C39/C39M.
 - 2. Test Acceptance: In accordance with ACI 318.
 - 3. Test one cylinder at 7 days.
 - 4. Test two cylinders at 28 days.
 - 5. Dispose remaining cylinders when testing is not required.
- I. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.11 PATCHING

- A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

- C. Patch imperfections as directed by Engineer in accordance with ACI 301 and ACI 318.

3.12 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

END OF SECTION

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE - BUILDING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete foundation walls and footings.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Underslab vapor retarder.
- G. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 35 11 - Concrete Floor Finishes.
- B. Section 04 20 00 - Unit Masonry.
- C. Section 05 05 19 - Concrete and Masonry Anchors.
- D. Section 07 21 00 - Thermal Insulation.
- E. Section 07 92 00 - Joint Sealants.
- F. Division 22 - Plumbing.
- G. Division 23 - Heating, Ventilating, and Air Conditioning.
- H. Division 26 - Electrical.

1.03 REFERENCE STANDARDS

- A. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.
- B. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.
- C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.
- E. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.
- F. ACI PRC-308 - Guide to External Curing of Concrete; 2016.
- G. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- H. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- I. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- K. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- L. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.
- M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2023.
- N. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2024.

- O. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2023.
- P. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
- Q. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- R. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2023.
- S. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- T. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- U. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.
- V. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- W. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
- X. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For fiber reinforcement, include manufacturer's data of the history use, performance characteristics and recommended dosage rate.
 - 2. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Shop Drawings, Reinforcing: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
 - 1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.
- D. Shop Drawings, Formwork: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
 - 1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.
- E. Shop Drawing, Construction Joint Layout: Indicate pouring sequence and locations of proposed construction joints required to construct the structure.
- F. Mix Design: Submit proposed concrete mix design.
 - 1. Include:
 - a. Proportions of cement, fine and coarse aggregates and water.
 - b. Combined aggregate gradation.
 - c. Aggregate specific gravities and gradations.
 - d. Water/cement ratio, design strength, slump, and air content.
 - e. Type of cement and aggregates.
 - f. Type and proportion of admixtures.
 - 1) MVRA characteristics and dosage instructions.
 - g. Special requirements for pumping.
 - h. Range of ambient temperature and humidity for which design is valid.
 - i. Special characteristics of mix requiring precautions in mixing, placing, or finishing techniques to achieve finished product.

- G. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI PRC-305 when concreting during hot weather.
- C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
 - 2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Type: Deformed billet-steel bars.
 - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Plain type, ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
 - 2. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement, including slab on grade reinforcement.
 - 3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 - 1. Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement. Chemical admixtures shall comply with AWWA B451.
- B. Air Entrainment Admixture: ASTM C260/C260M.

- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Accelerating Admixture: ASTM C494/C494M Type C.
- H. Retarding Admixture: ASTM C494/C494M Type B.
- I. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder:
 - 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
 - 2. Thickness: 15 mils, minimum.
 - 3. Water Vapor Permeance: 0.03 perm or less, when tested in accordance with ASTM E1643.
 - 4. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 5. Products:
 - a. Henry Company; Moistop Ultra 15: www.henry.com/#sle.
 - b. Stego Industries, LLC; Stego Wrap: www.stegoindustries.com.
 - c. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils: www.wrmeadows.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.
 - 1. Grout: Comply with ASTM C1107/C1107M.
 - 2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.
 - 1. Products:
 - a. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
 - b. W. R. Meadows, Inc; ACRY-LOK: www.wrmeadows.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Slab Isolation Joint Filler: 1/2-inch thick, height equal to slab thickness, with removable top section forming 1/2-inch deep sealant pocket after removal.
 - 1. Material: ASTM D1751, cellulose fiber.
 - a. Basis of Design Manufacturer: W. R. Meadows, Inc; Fiber Expansion Joint Filler with Snap-Cap: www.wrmeadows.com/#sle.
 - 1) Substitutions: See Section 01 60 00 - Product Requirements.

2.07 CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309, Type 1-D, Class B.
 - 1. Application: To cure slabs to receive sealer.
- C. Moisture-Retaining Sheet: ASTM C171.

1. Application: Use at interior slabs to receive sealer, stain, or adhesively applied flooring.
 2. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
 3. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- D. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
 1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, or silica fume as is consistent with ACI recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete:
 1. General:
 - a. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
 - b. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - c. Total Air Content: As specified and tested in accordance with ASTM C173/C173M.
 2. Footings and Foundation Walls:
 - a. Fly Ash Content: Maximum 20 percent of cementitious materials by weight.
 - b. Water-Cement Ratio: 0.50.
 - c. Total Air Content:
 - 1) Footings: Exclude.
 - 2) Foundation Walls: 6.0 percent.
 - d. Maximum Slump: As indicated on drawings.
 - e. Maximum Aggregate Size: 1-1/2 inch.
 3. Slab-on-Grade and Concrete Toppings:
 - a. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - b. Water-Cement Ratio: 0.48.
 - c. Total Air Content:
 - 1) Exterior: 6 percent, plus/minus 1.5 percent.
 - 2) Interior: Exclude.
 - d. Maximum Slump: As indicated on drawings.
 - e. Maximum Aggregate Size: 3/4 inch.
 4. No Otherwise Specified or Scheduled:
 - a. Compressive Strength: 3,000 pounds per square inch.
 - b. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - c. Water-Cement Ratio: 0.48.
 - d. Total Air Content: Exclude.
 - e. Maximum Slump: 4 inches.
 - f. Maximum Aggregate Size: 3/4 inch.

2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

- B. Verify under slab vapor retarder is placed. Use methods during placement of reinforcing and concrete to avoid damage; make repairs as specified in Section 07 26 00.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use latex bonding agent only for non-load-bearing applications.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
 - 1. Repair underslab vapor retarder damaged during placement of concrete reinforcement and other embeded items; make repairs in accordance with manufacturer's recommendations.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Place concrete for floor slabs in accordance with ACI PRC-302.1.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.
 - 1. Before excess bleedwater appears on the surface, float with bull floats or darbies to form a uniform and open-textured surface plane.
 - a. Adjust levelness, flatness or slope uniformity by floating; do not adjust by troweling.
 - b. Do not further disturb slab surfaces before starting finishing operations.

3.05 SLAB JOINTING

- A. Locate joints as indicated on the drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
 - 1. Saw and blade shall be appropriate for cutting concrete within one or two hours of finishing and before final set; "soff cut" type.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
 - 2. Flatness measurement with a 10 foot straight edge shall be made full width of pour, across joints and across different pours.
- B. Correct the slab surface if tolerances are less than specified.
- C. Floors shall be sloped to floor drains where indicated. Areas which do not drain properly shall be corrected at the Contractor's expense.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
 - 1. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:50 nominal.

3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than seven days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by saturated burlap.
 - a. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
 - 2. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.

3.09 FIELD QUALITY CONTROL

- A. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- B. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- C. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

**SECTION 03 35 11
CONCRETE FLOOR FINISHES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface treatments.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 07 92 00 - Joint Sealants.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures for submittal procedures.
- B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.
- C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.06 FIELD CONDITIONS

- A. Maintain light level equivalent to a minimum 200 W, incandescent, light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

PART 2 PRODUCTS

2.01 DENSIFIERS AND HARDENERS

- A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores, hardening, and dustproofing.
 - 1. Composition: Sodium silicate.
 - a. Products:
 - 1) Curecrete Distribution, Inc; Ashford Formula: www.curecrete.com.
 - 2) Dayton Superior Corporation; Densifier J13: www.daytonsuperior.com.
 - 3) Euclid Chemical Company; EUCO DIAMOND HARD: www.euclidchemical.com.
 - 4) L&M Construction Chemicals, Inc; SEAL HARD: www.lmcc.com.
 - 5) W. R. Meadows, Inc; Liqui-Hard: www.wrmeadows.com.
 - 6) Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that floor surfaces are acceptable to receive the work of this section.
- B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

- A. Apply materials in accordance with manufacturer's instructions.

3.03 PROTECTION

- A. Protect areas that received concrete sealer finish from damage and wear during the remainder of construction period.
 - 1. Use protective methods and materials, including temporary covering, recommended in writing by floor finish installer.

- a. Protective covering shall be over the entire sealed floor.
- b. Workers, tools or materials shall not be on unprotected floors.
- c. After construction activities of other trades are complete, touch up and restore damaged or defaced surfaces.

END OF SECTION

**SECTION 04 20 00
UNIT MASONRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim.
- D. Section 07 92 00 - Joint Sealants.
- E. Section 08 11 13 - Hollow Metal Doors and Frames.
- F. Section 08 51 13 - Aluminum Windows.
- G. Section 09 91 23 - Interior Painting.
- H. Division 21 - Fire Suppression.
- I. Division 22 - Plumbing.
- J. Division 23 - Heating, Ventilating, and Air Conditioning.
- K. Division 26 - Electrical.

1.03 REFERENCE STANDARDS

- A. ACI 530/530.1/ERTA - - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; Current.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.
- F. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.
- G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- I. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- J. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- K. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- L. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.

- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
- E. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Special Shapes: Provide nonstandard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
 - a. Provide bullnose units at where indicated on drawings.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Concrete block units with factory installed insulation inserts.
 - 4. Non-Loadbearing Units: ASTM C129. Normal weight
 - a. Concrete masonry units with factory installed insulation inserts.
- B. Units with Integral Water Repellent: Concrete block units as specified in this section with polymeric liquid or powder admixture added to concrete masonry units at the time of manufacture.
 - 1. Performance of Units with Integral Water Repellent:
 - a. Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
 - 1) No water visible on back of wall above flashing at the end of 24 hours.
 - 2) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
 - 3) No more than 25 percent of wall area above flashing visibly damp at end of test.
 - b. Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
 - c. Compressive Strength: ASTM C1314; maximum 5 percent decrease.
 - 2. Use only in combination with mortar that also has integral water repellent admixture.
- C. Units with Factory-Installed Insulation Inserts: ASTM C90, normal weight.
 - 1. Type: Standard and special shape without end webs; with continuous horizontal insulation inserts and integral water repellent.
 - 2. Insulation Type: Manufacturer's standard expanded polystyrene (EPS) with minimum R-value of R-19.9.
 - 3. Size: Nominal face dimensions of 16 inches by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 4. Exposed Faces, Color and Texture: Split-face and smooth as indicated on drawings.

- a. Split Face: Randomly textured face and rugged pattern resulting from splitting two units cast together.
 - b. Colors: As selected by Architect and Engineer from manufacturer's full range.
- 5. Manufacturers:
 - a. Omni Block, Inc; The System 8: www.omniblock.com.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Mortar Aggregate: ASTM C144.
- C. Grout Aggregate: ASTM C404.
- D. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1. Color(s): As selected by Architect and Engineer from manufacturer's full range.
 - 2. Manufacturers:
 - a. Davis Colors, a division of Venator Materials PLC: www.daviscolors.com.
 - b. Lambert Corporation: www.lambertusa.com.
 - c. Solomon Colors, Inc: www.solomoncolors.com.
 - d. Spec Mix, Inc.: www.specmix.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- E. Water: Clean and potable.
- F. Integral Water Repellent Admixture for Mortar and Grout: Polymeric liquid admixture added to mortar at the time of manufacture.
 - 1. Use only in combination with masonry units manufactured with integral water repellent admixture.
 - 2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
 - 3. Meet or exceed performance specified for water repellent admixture used in masonry units.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Blok-Lok Limited: www.blok-lok.com.
 - 2. Hohmann & Barnard, Inc: www.h-b.com.
 - 3. WIRE-BOND www.wirebond.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Single Wythe Joint Reinforcement: Truss type; ASTM A1064/A1064M steel wire, galvanized as specified; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
 - 1. Exterior Walls: Hot dip galvanized after fabrication to ASTM A153/A153M, Class B.

2.04 ACCESSORIES

- A. Preformed Control Joints: Rubber, neoprene, or polyvinyl chloride material. Provide with corner and tee accessories, fused joints.
 - 1. Manufacturers:
 - a. Blok-Lok Limited: www.blok-lok.com/#sle.
 - b. Hohmann & Barnard, Inc: www.h-b.com.
 - c. WIRE-BOND: www.wirebond.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

- B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.05 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Interior, loadbearing masonry: Type S.
 - 2. Interior, non-loadbearing masonry: Type N.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
 - 1. Bond Beams, Lintels, and Cells Containing Reinforcement: 3,000 psi strength at 28 days; 8-10 inches slump.
- C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that 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 for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- C. Assure that mechanical, plumbing and electrical work is coordinated prior to installation.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
 - 1. When tooling joints, apply sufficient pressure to compress the surface and promote bond between the mortar and concrete masonry units.
 - 2. Where exposed to view, transitions from head to bed joints shall not have ridges.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave, unless otherwise specified.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

- F. Interlock intersections and external corners.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Isolate masonry partitions from vertical structural framing members with a control joint.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
- K. Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
 - 1. Provide continuity at corners by using prefabricated L-shaped units
 - 2. Provide continuity at intersecting and abutting walls by using prefabricated T-shaped units.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.

3.07 GROUTED COMPONENTS

- A. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- B. Place and consolidate grout fill without displacing reinforcing.
- C. At bearing locations, fill masonry cores with grout for a minimum 12 inches each side of opening.

3.08 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.09 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
 - 1. Where door frames cannot be built-in, provide continuous wood blocking, securely attached to masonry, around openings to anchor frames. See Section 06 10 00.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.10 TOLERANCES

- A. Maximum Variation from Alignment of Columns: 1/4 inch.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.11 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 CLEANING

- A. As Work Progresses:
 - 1. Remove excess mortar and mortar droppings.
 - 2. Replace defective mortar. Match adjacent work.
 - 3. Clean soiled surfaces with cleaning solution.
 - 4. Use non-metallic tools in cleaning operations.
- B. Final, New Masonry:
 - 1. Verify mortar is fully set and cured.
 - 2. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.
 - 3. Scrub walls with cleaning solution mixed with water in accordance with manufacturer's instructions. Apply acid solution and scrub masonry with stiff fiber brushes. Do not scrub the mortar joints.
 - 4. Protect area below and adjacent to cleaning operation and keep masonry soaked with water and flushed free of acid and dissolved mortar continuously for the duration of cleaning
 - 5. Before solution dries, rinse and remove acid solution and dissolved mortar, using clean, pressurized water.

3.13 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 05 19
CONCRETE AND MASONRY ANCHORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Post-installed anchors in concrete or masonry for attachment of miscellaneous metal components and wood.

1.02 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 04 20 00 - Unit Masonry.

1.03 REFERENCES

- A. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2013.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A193/A193M - Standard Specification for Alloy - Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications; 2014.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- F. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use; 2010.
- G. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel; 2013.
- H. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2007a (Reapproved 2014).
- I. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.
- J. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2013a.
- K. ASTM F594 - Standard Specification for Stainless Steel Nuts; 2009 (Reapproved 2015).
- L. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal Procedures for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Structural design criteria.
 - 2. Preparation instructions and recommendations.
 - 3. Installation methods.
 - 4. Storage and handling requirements and recommendations.
- C. Manufacturer Installation Instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.06 PROJECT CONDITIONS

- A. Adhesive Anchors; Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hilti, Inc.: www.hilti.com
- B. Powers Fasteners Inc.: www.powers.com.
- C. Simpson Strong-Tie Co., Inc.: www.strongtie.com.
- D. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 MATERIALS

- A. Fasteners and Anchors:
 - 1. Bolts and Studs of Carbon Steel Wire: ASTM A510/A510M or ASTM A108.
 - 2. Bolts and Studs, High Strength Steel: ASTM A307 or ASTM A449.
 - 3. Carbon and Alloy Steel Nuts: ASTM A563.
 - 4. Carbon Steel Washers: ASTM F436.
 - 5. Carbon Steel Threaded Rod: ASTM A36/A36M or ASTM A193/A193M, Grade B7.
 - 6. Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593, Type 304.
 - 7. Stainless Steel Nuts: ASTM F594, Type 304.
 - 8. Hot-Dip Galvanizing: ASTM A153/A153M.
- B. Accessories and Tools: As recommended by anchor manufacturer:
 - 1. Screens for use in hollow substrates and unreinforced masonry.
 - 2. Retaining plugs to hold adhesive and anchor in place in overhead applications.
 - 3. Brushes for cleaning anchor holes.
 - 4. Dispensing tools for adhesive.

2.03 EXPANSION OR WEDGE ANCHORS

- A. Torque-controlled with impact section to prevent thread damage complete with appropriate nuts and washers. Provide anchors with length identification markings conforming to ICC-ES AC01. Type and size as indicated on drawings.
 - 1. Interior Use: Hot-dipped galvanized steel bolt or threaded rod with nuts and washers of matching alloy group and minimum proof stress equal to or greater than specified minimum full-size tensile strength of externally threaded fastener.
 - 2. Exterior Use: Stainless steel bolt or threaded rod with nuts and washers of matching alloy group and minimum proof stress equal to or greater than specified minimum full-size tensile strength of externally threaded fastener.

2.04 ADHESIVE ANCHORS

- A. Cartridge Injection Adhesive Anchors: Polymer or hybrid mortar adhesive injection system for bonding bolt, threaded rod, inserts or reinforcing dowels to substrate. Type and size as indicated on drawings.
- B. Capsule Adhesive: Glass or foil capsule containing polyvinyl or urethane methacrylate-based resin and accelerator for bonding bolt, threaded rod, inserts or reinforcing dowels having a 45 degree chisel-point on the embedded end. Type and size as indicated on drawings.
- C. Bolt or Threaded Rod:
 - 1. Interior Use: Hot-dipped galvanized steel with nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener
 - 2. Exterior Use: Stainless steel with nuts and washers of matching alloy group and minimum proof stress equal to or greater than specified minimum full-size tensile strength of externally threaded fastener.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging embedded items.
 - 1. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Avoid installing galvanized steel anchors in contact with galvanically dissimilar metals.
 - 3. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
- B. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3.02 PREPARATION

- A. Do not begin installation until substrates have been properly prepared.
 - 1. Ensure that anchors are free of grease, oil, dirt, and other foreign material.
- B. Do not begin installation until conditions are such that anchors will not be disturbed before complete adhesive curing is complete.
- C. Plan installation so that adhesive can be installed in optimum manner to achieve good bonding.

3.03 INSTALLATION

- A. Install anchors in compliance with manufacturer's published structural design information and installation instructions.
 - 1. Adhesive anchors shall be installed within temperatures recommended by manufacturer.
- B. Drill holes of diameter and depth, in compliance with manufacturer's published structural design information unless otherwise shown on drawings.
 - 1. Drill holes perpendicular to substrate surface.
 - 2. Clean holes to remove loose material and drilling dust prior to installation of anchor.
 - 3. Remove water from holes in a manner to achieve a surface dry condition.
- C. Wedge Anchors, Heavy-Duty Sleeve Anchors, and Undercut Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in part to be fastened. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10 percent of the specified torque, 100 percent of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Architect.
- D. Cartridge Injection Adhesive Anchors: Comply with manufacturer's instructions to assure proper mixing of adhesive components. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in a manner as to avoid introduction of air pockets in the adhesive. Inject sufficient adhesive in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.
 - 1. Hollow Masonry: Use adhesive screen in accordance with manufacturer's instructions.
- E. Capsule Anchors: Perform setting in accordance with manufacturer instructions. Install with equipment conforming to manufacturer recommendations. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

3.04 PROTECTION

- A. Protect installed products until completion of project.
 - 1. Replace damaged and defective anchors and anchors not adequately secured.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roofing nailers.
- B. Preservative treated wood materials.
- C. Sheathing.
- D. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 17 53 - Shop-Fabricated Wood Trusses.
- C. Section 07 31 13 - Asphalt Shingles.

1.03 REFERENCE STANDARDS

- A. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2018.
- B. APA PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels (Form E445); 2001.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- D. AWWA U1 - Use Category System: User Specification for Treated Wood; 2024.
- E. PS 2 - Performance Standard for Wood Structural Panels; 2018.
- F. PS 20 - American Softwood Lumber Standard; 2025.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: As indicated on drawings, unless otherwise indicated.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Any agency with rules approved by American Lumber Standards Committee (ALSC).
- B. Sizes: Nominal sizes as indicated on drawings, unsurfaced.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Roof Sheathing: Plywood, PS 2 type or APA PRP-108, rated Structural I Sheathing.
 1. Bond Classification: Exterior.
 2. Panel Edges:
 - a. Standard or Steep Slope; Slope of 4/12 or Greater: Square, with panel clips.
 - b. Low Slope; Slope of 4/12 or Less: Tongue and groove.
 3. Thickness:
 - a. Standard or Steep Slope; Slope of 4/12 or Greater: 5/8 inch.
 - b. Low Slope; Slope of 4/12 or Less: 3/4 inch.
- B. Wall Sheathing: Any PS 2 type or APA PRP-108.
 1. Bond Classification: Exposure 1.
 2. Grade: Structural I Sheathing.
 3. Span Rating: 24/16.
 4. Edge Profile: Square edge.
 5. Thickness: As indicated on drawings.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for carpentry exposed to weather and with preservative-treated wood at any location; unfinished steel elsewhere.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Preservative Treatment:
 1. Products:
 - a. Lonza Group: www.wolmanizedwood.com/#sle.
 - b. Hoover Treated Wood Products, Inc: www.frtw.com.
 - c. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com.
 - d. Viance, LLC: www.treatedwood.com/#sle.
 - e. Substitutions: See Section 01 25 00 - Substitution Procedures.
 2. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing or flashing.
 - d. Treat lumber in contact with masonry or concrete and located below grade.
 - e. Treat lumber in other locations as indicated.
 3. Preservative Pressure Treatment of Plywood Above Grade: AWWA U1, Use Category UC2, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with roofing, flashing, or waterproofing.
 - c. Treat plywood in contact with masonry or concrete and located below grade.
 - d. Treat plywood in other locations as indicated.

4. Preservative Pressure Treatment of Lumber in Contact with Soil: AWP A U1, Use Category UC4A, Commodity Specification A using waterborne preservative.
 - a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
 - b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 1. Provide H-clips at joints between panels having square edges.
- B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws.

3.06 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 06 17 53
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop-fabricated wood trusses.
- B. Bridging, bracing and anchorage.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 06 83 16 - Fiberglass Reinforced Plastic Panels
- D. Section 07 21 00 - Thermal Insulation.
- E. Section 07 42 13 - Metal Wall Panels.

1.03 REFERENCE STANDARDS

- A. ANSI/TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. PS 20 - American Softwood Lumber Standard; 2025.
- D. SBCA (BCSI) - Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses; 2018 (Updated 2020).
- E. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Structural Component Submittal; Product Data: Truss material and manufacturing specifications.
 - 1. Lumber species and grade of truss and bracing members.
 - 2. Metal connector plate capacity or material approval number.
 - a. Material approval number shall be by the State in which the Project is located or an independent third party evaluation service approval, such as ICC Evaluation Service (ICC-ES). Documentation shall include information required by the state or third party for approval.
 - 3. Fabrication tolerance or quality control factor, Cq, in accordance with TPI 1.
 - 4. Other connector specifications; size, strength and number of bolts, nails, or other timber connectors.
- C. Structural Component Submittal; Shop Drawings: Truss geometry and member locations for each truss type/designation.
 - 1. Truss shape, member configuration, and member and bracing sizes.
 - 2. Truss pitch, span and joint locations.
 - 3. Bearing locations and sizes.
 - 4. Truss spacing, number of truss plies, and required connections between plies or truss types such as piggy back trusses.
 - 5. Metal connector plate type, size/gage, location and orientation.
 - 6. Permanent bracing requirements, individual members and/or continuous lateral bracing.

7. Shop drawings shall be signed and sealed by professional engineer registered in the state of Wisconsin.
- D. Structural Component Submittal; Design Calculations: For each truss type/designation.
 1. Applicable design loads; dead, live, snow, wind and special loads such as snow drift, equipment, and alike.
 2. Calculation of member loads and stresses including applicable adjustment factors for wood design considering all applicable loading conditions and combinations
 3. Combined stress index of less than or equal to 1.0 for applicable members.
 4. Vertical and horizontal reactions at bearing locations.
 5. Not less than one of the following:
 - a. Calculations to determine the allowable capacities of nails, bolts, or other timber connectors.
 - b. A report of test results to determine metal connector plate capacities.
 - c. A metal plate connector material approval number, which provides the plate capacities.
 - 1) Material approval number shall be by the State in which the Project is located or independent third party evaluation service approval, such as ICC Evaluation Service (ICC-ES).
 6. Not less than two of the following:
 - a. Required metal connector plate area, or number of nails, bolts, or similar fasteners, for each member at each joint
 - b. Provided metal connector plate area, or number of nails, bolts, or similar fasteners, for each member at each joint
 - c. The Joint Stress Index (JSI) for each joint which must be less than or equal to 1.0 component; designer considering all applicable loading conditions and combinations, such as truss or joist hangars for jack trusses, connection of piggy back trusses, and alike.
 7. Analysis and design of all connections between members and trusses supplied by the component designer considering all applicable loading conditions and combinations, such as truss or joist hangars for jack trusses on girder truss, connection of piggy back trusses, and alike.
 8. Calculations shall be signed and sealed by professional engineer registered in the state of Wisconsin.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle trusses in accordance with SBCA (BCSI).
- B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Truss Plate Connectors:
 1. Alpine, an ITW Company: www.alpineitw.com.
 2. MiTek Industries, Inc: www.mii.com.
 3. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 TRUSSES

- A. Wood Trusses: Design and fabricate trusses in accordance with ANSI/TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
 - 1. Species and Grade: As required by truss design calculations.
 - 2. Connectors: Steel plate.
 - 3. Structural Design: Comply with applicable code for structural loading criteria and as indicated on drawings.
 - 4. Design Roof Live and Dead Loads: As indicated on Structural Drawings.
 - 5. Deflection Limitations: As indicated on Structural Drawings.

2.03 MATERIALS

- A. Lumber:
 - 1. Species and grade as required by truss design calculations.
 - a. Provide lumber that complies with PS 20 and the applicable rules of any rules writing agency certified by the ALSC Board of Review.
 - 2. Moisture Content: Not greater than 19 percent at time of fabrication.
 - 3. Lumber fabricated from old growth timber is not permitted.
- B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G40/Z120 coating; die stamped with integral teeth; thickness as required by truss design calculations.
- C. Truss Bridging: Same lumber species as truss, size and spacing recommended by truss manufacturer.
- D. Touch-Up for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
 - 1. Basis-Of-Design Product: ZRC Worldwide; ZRC Galviline Cold Galvanizing Compound: www.zrcworldwide.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.04 ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.
- B. Fasteners: Electrogalvanized steel, type to suit application.
- C. Bearing Plates: Electrogalvanized steel.

2.05 FABRICATION

- A. Cut members accurately to length to achieve tight fit.
- B. Jig trusses during fabrication to obtain tight joint connections. Assemble truss members in design configuration indicated.
- C. Press connectors into lumber to full depth.
- D. Connect multiple trusses into configuration indicated.
- E. Trusses exposed to view, grading stamps visible after fabrication shall be removed by sanding.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated on shop drawings.
- B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install trusses in accordance with manufacturer's instructions, SBCA (BCSI); maintain a copy of applicable documents on site until installation is complete.
- B. Set members level and plumb, in correct position.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Do not field cut or alter structural members without approval of Structural Engineer of Record through Architect.
- E. Install permanent bridging and bracing.
- F. Install headers and supports to frame openings required.
- G. Frame openings between trusses with lumber in accordance with Section 06 10 00.
- H. Coordinate placement of decking with work of this section.
- I. After erection, touch-up galvanized surfaces with touch-up for galvanized surfaces.

3.04 TOLERANCES

- A. Framing Members: 1/4 inch maximum, from true position.

END OF SECTION

SECTION 06 20 00 FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood casings and moldings; standing and running trim.
- C. Attic access panel.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 06 83 16 - Fiberglass Reinforced Plastic Panels.
- C. Section 07 21 00 - Thermal Insulation.
- D. Section 09 91 23 - Interior Painting.

1.03 REFERENCE STANDARDS

- A. PS 20 - American Softwood Lumber Standard; 2025.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- C. Verification Samples - Trim Profiles (Moldings, Bases, Casings: Submit two samples of each type of trim not less than 8 inch long for each species required and finish specified.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Interior Woodwork Items: Profiles and dimensions indicated on drawings, unless otherwise specified; with back out or kerf backs.
 - 1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.
 - 2. Attic Access Panel: FRP laminated to BCX plywood. See Section 06 83 16.
 - 3. Other items as indicated on drawings in species and finish indicated.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 LUMBER MATERIALS

- A. Softwood Lumber: Clear Pine species, S4S surfacing unless otherwise specified or indicated, maximum moisture content of 6 percent, of quality suitable for specified finish.
 - 1. Grading: In accordance with rules certified by ALSC; www.alsc.org.
 - a. Comply with PS 20 as applicable.

2.04 FASTENERS

- A. Fasteners: Of size and type to suit application.
 - 1. Finished Wood Surface: Use finish nails or trim screws; set below surface and filled.

2.05 ACCESSORIES

- A. Edge Trim and Wall Covering: Milled shaped; smooth finish; of width to match component thickness or width shown on drawings.
- B. Primer: Alkyd primer sealer.
- C. Wood Filler: Solvent base, tinted to match surface finish color.

2.06 FABRICATED ITEMS

- A. Attic Access Panel, Site Fabricated: Components and dimensions as indicated on drawings.
 - 1. Panel: FRP laminated to BCX plywood. See Section 06 83 16.
 - 2. Insulation: Extruded polystyrene (XPS) board insulation. See Section 07 21 00.

2.07 FINISHING - BEFORE INSTALLATION

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail indentations. Use plugs to cover screw heads; align grain.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
- D. Interior items shall be finished using materials and application requirements specified in Section 09 91 23.
 - 1. Color: As selected by Architect from manufacturer's full range.
- E. Prime paint surfaces in contact with cementitious materials.
- F. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Set and secure materials and components in place, plumb and level.
- B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.
 - 1. Cuts made to components finished before installation shall be made without damage to finish.
- C. Install components with concealed fasteners appropriate to component and substrate.
 - 1. Apply wood filler in exposed nail indentations.
 - 2. Items having opaque finish, sand smooth to blend with the surrounding surface.

3.03 FINISHING - AFTER INSTALLATION

- A. Set exposed fasteners. Fill fastener holes to match surrounding surfaces. Sand work smooth.
 - 1. Apply wood filler in exposed nail indentations.
 - 2. Fill threaded fastener holes with plugs.
- B. Site Finishing: See Section 09 91 23.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 83 16
FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass reinforced plastic (FRP) panels.
- B. Trim.

1.02 RELATED REQUIREMENTS

- A. Section 06 17 53 - Shop-Fabricated Wood Trusses.
- B. Section 06 20 00 - Finish Carpentry.
- C. Section 07 21 00 - Thermal Insulation.
- D. Section 07 92 00 - Joint Sealants.

1.03 REFERENCE STANDARDS

- A. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- C. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal procedures for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Samples: Submit two samples not less than 5 by 5 inch in size illustrating material and surface design of panels.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Product: Crane Composites, Inc; Kempty.
- B. Other acceptable manufacturers include:
 - 1. Marlite, Inc: www.marlite.com/#sle.
 - 2. Nudo Products, Inc: www.nudo.com/#sle.
 - 3. Panolam Industries International, Inc: www.panolam.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements for substitution procedures.

2.02 PANEL SYSTEMS

- A. Panels: Reinforced fiberglass (FRP) laminated to BCX plywood.
 - 1. Panel Size: 4 by 8 feet.
 - 2. Panel Thickness: As indicated in Interior Finish Materials List on drawings.
 - 3. Facing Thickness: 0.075 inch, minimum.
 - 4. Surface Design: Embossed.
 - 5. Color: White.
 - 6. Attachment Method: Mechanical fasteners concealed by trim, with sealant in joints.

2.03 MATERIALS

- A. Panel Facing: Glass fiber reinforced plastic (FRP), complying with ASTM D5319.
 - 1. Surface Burning Characteristics: Maximum flame spread index of 200 and smoke developed index of 450; when system tested in accordance with ASTM E84.
- B. Plywood Substrate: PS 1 BCX plywood.
- C. Trim: Vinyl; color coordinating with panel.
 - 1. Provide two-piece moldings for panels having plywood substrate.
- D. Adhesive: Type recommended by panel manufacturer.
- E. Sealant: Type recommended by panel manufacturer; color matching panel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - GENERAL

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut panels with carbide tipped saw blades, or snips.
- C. Pre-drill fastener holes in panels, 1/8 inch greater in diameter than fastener, spaced as indicated by panel manufacturer.
- D. Install panels with manufacturer's recommended gap for panel field and corner joints.
- E. Place trim on panel before fastening edges, as required.
- F. Install trim with screws.
- G. Seal gaps at walls and between panels with applicable sealant to prevent moisture intrusion.
- H. Remove excess sealant after paneling is installed and prior to curing.

3.03 INSTALLATION - CEILINGS

- A. Lay out system to a balanced design, with edge units greater than 50 percent of panel size.
- B. Apply panels as ceilings with seams square to walls and aligned with adjoining panels.

END OF SECTION

**SECTION 07 21 00
THERMAL INSULATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation for locations indicated at perimeter foundation wall.
- B. Fiberglass Batt insulation..
- C. Spray (pliable) foam insulation for filling door frame and window perimeter shim spaces.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 06 17 53 - Shop-Fabricated Wood Trusses: Supporting construction for insulation.
- C. Section 06 20 00 - Finish Carpentry
- D. Section 07 26 00 - Vapor Retarders.
- E. Section 08 11 13 - Hollow Metal Doors and Frames.
- F. Section 08 51 13 - Aluminum Windows.

1.03 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- D. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016 (Reapproved 2023).
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- F. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.
- G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.

3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
5. Board Edges: Square.
6. Products:
 - a. Dow Chemical Company; STYROFOAM Brand: www.dow.com.
 - b. Kingspan Insulation LLC; GreenGuard XPS: www.kingspan.com.
 - c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
 4. Thermal Resistance: R-value as indicated on drawings.
 5. Thickness: As required to provide thermal resistance indicated on drawings.
 6. Facing: Unfaced.
 7. Products:
 - a. CertainTeed Corporation; Sustainable Insulation: www.certainteed.com.
 - b. Johns Manville; Formaldehyde-free Fiber Glass Insulation: www.jm.com.
 - c. Knauf Insulation; EcoBatt: www.knaufinsulation.us.
 - d. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.owenscorning.com/en-us/#sle.
 - e. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SPRAY (PLI)FOAM INSULATION

- A. Single component, minimal expanding, flexible polyurethane foam. Formulation shall repel and deflect water; adhere to masonry, metal, wood, most plastics and glass. When cured, the foam shall remain soft and flexible.
 1. Products:
 - a. Dow Chemical Company; Window & Door Insulating Foam Sealant: www.dow.com
 - b. DuPont; Window & Door Foam: www.greatstuff.dupont.com
 - c. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

- A. Sheet Vapor Retarder: As specified in Section 07 26 00.
- B. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify concrete substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Apply adhesive to back of boards:
 1. Three continuous beads per board length.
- B. Install boards horizontally on foundation perimeter.

1. Place boards to maximize adhesive contact.
 2. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Extend boards over expansion joints, unbonded to foundation on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 SPRAY FOAM INSULATION

- A. Install in accordance with manufacturer's instructions.
1. Place in shim spaces of exterior doors and windows without binding operable parts.
 2. Fill crevices in exterior wall assembly and roof assembly to prevent uncontrolled air passage and water penetration.
 3. Trim neatly to fit spaces.

3.04 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and ceiling spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

**SECTION 07 26 00
VAPOR RETARDERS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vapor retarders.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 07 21 00 - Thermal Insulation.
- C. Section 07 92 00 - Joint Sealants.
- D. Division 22 - Plumbing.
- E. Division 23 - Heating, Ventilating, and Air Conditioning.
- F. Division 26 - Electrical.

1.03 DEFINITIONS

- A. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to degree specified, with seams and joints sealed to adjacent surfaces.
- B. Vapor Retarder Class: A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class is defined using Procedure A, Desiccant Method at 73 degrees F and 50 percent Relative Humidity (RH), in accordance with ASTM E96/E96M, as follows:
 - 1. Class I: 0.1 perm or less.
 - 2. Class II: Greater than 0.1 perm to 1.0 perm.
 - 3. Class III: Greater than 1.0 perm to 10 perms.

1.04 REFERENCE STANDARDS

- A. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing; 2020.
- B. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2016 (Reapproved 2023).
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- D. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Installation Instructions: Indicate preparation.

PART 2 PRODUCTS

2.01 VAPOR RETARDERS

- A. Vapor Retarder Sheet: Polyethylene sheeting complying with ASTM D4397, clear.
 - 1. Water Vapor Permeance: Class I; 0.1 perm or less, maximum, when tested in accordance with ASTM E96/E96M.
 - 2. Dart Impact Strength: 370 grams (0.82 pounds), minimum, when tested in accordance with ASTM D1079.
 - 3. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2 inches wide; compatible with sheet material.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

- A. General:
 - 1. Install materials in accordance with manufacturer's installation instructions.
 - 2. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.
 - 3. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- B. Underslab Vapor Retarders:
 - 1. Vapor retarders in contact with earth or granular fill under concrete slabs shall be installed in compliance with ASTM E1643.
 - 2. Ensure surface under vapor retarder is smooth, without sharp projections.
 - 3. Seam joints over solid material/surface. Lap joints a minimum of 12 inches. Seal joint with manufacturer's recommended tape. Ensure surfaces to be in contact with tape are clean and dry.
 - 4. Provide pipe boots for sealing pipe penetrations.
- C. Mechanically Fastened Sheets - Vapor Retarder On Interior:
 - 1. When insulation is installed within assembly, install vapor retarder over insulation.
 - a. Walls: Position sheet to avoid horizontal joints. Locate joints over framing members or other solid substrate.
 - 1) Lap joints not less than than two framing members and seal with manufacturer's recommended tape.
 - b. Ceilings: Position sheet to locate joints over framing members.
 - 1) Lap joints not less than than one framing members and seal with manufacturer's recommended tape.
 - 2) Where gypsum board is not a ceiling, provide strapping, batten strips or similar support to vapor retarder.
 - 2. Anchor to wood framing using large-headed nails or staples at 12 to 18 inches on center along each framing member covered; cover fasteners with seam tape.
 - 3. Anchor to metal framing using seam tape, adhering at least one-half of tape width to metal substrate.
 - 4. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, providing an airtight seal.
 - 5. Locate laps at framing members; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet in shingle fashion to shed water.
 - 6. Seal entire perimeter to structure, window and door frames, and other penetrations.
 - 7. Where conduits, pipes, wires, ducts, outlet boxes, and other items are installed within insulation cavity, pass vapor retarder sheet behind these items and over insulation to maintain airtight seal.

3.04 FIELD QUALITY CONTROL

- A. Do not cover installed vapor retarders until required inspections have been completed.

- B. Take digital photographs of each portion of installation prior to covering up vapor retarders.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 07 27 00
AIR/WEATHER-RESISTIVE BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air/Weather-resistive barriers.
- B. Instruction to and inspection of penetrations made by other trades.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 07 42 13 - Metal Wall Panels.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim.
- D. Division 22 - Plumbing.
- E. Division 23 - Heating, Ventilating, and Air Conditioning.
- F. Division 26 - Electrical.

1.03 DEFINITIONS

- A. Air/Weather-Resistive Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.04 REFERENCE STANDARDS

- A. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2014.
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- E. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Contractor has option to use either sheet air barrier or fluid-applied air barrier. Prior to submitting information required of article titled SUBMITTALS, Contractor shall inform Architect which air barrier will be utilized.
- B. Coordination:
 - 1. Instruct trades, such as door frames, windows, piping, conduit and alike, method of sealing penetrations by building components to the barrier.
 - a. Furnish materials required to seal to barrier with written instructions for their use.
 - b. Inspect work by other trades to verify correct sealing to barrier.
 - 1) Submit written report of inspections.
 - 2) Should unacceptable work be discovered, include recommendations for correcting.
 - 2. Schedule installation of exterior cladding/siding to be completed with-in the exposure time limited by the barrier manufacturer.

1.06 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, limitations, and substrate preparation recommendations.

- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of barrier assembly installation.

1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's warranty for barrier assembly for a period of ten years from the date of final barrier installation.
 - 1. Approval by barrier manufacturer for warranty is required prior to cladding installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air/Weather-Resistive Barrier Sheet, Mechanically Fastened:
 - 1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 - 2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
 - 3. Water Penetration Resistance: Withstand a water head of 110 inches, minimum, for at least 5 hours, when tested in accordance with AATCC Test Method 127.
 - 4. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
 - 5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, Class A, when tested in accordance with ASTM E84.
 - 6. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2-1/2 inches wide, compatible with sheet material; unless otherwise indicated.
 - 7. Products, Flat Sheet:
 - a. DuPont de Nemours, Inc; Tyvek Construction Wrap with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap, StraightFlash, VersaFlange, Tyvek Wrap Caps, and Tyvek Tape: building.dupont.com/#sle.
 - b. National Shelter Products, Inc; DRYLine HP: www.drylinewrap.com/#sle.
 - c. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
 - 8. Products, Drainage Sheet:
 - a. DuPont de Nemours, Inc; Tyvek CommercialWrap D with Tyvek Fluid Applied Flashing - Brush Formulation, Tyvek Fluid Applied Flashing and Joint Compound, FlexWrap NF, StraightFlash, StraightFlash VF, Tyvek Wrap Caps, and Tyvek Tape: building.dupont.com/#sle.
 - b. Kingspan Insulation LLC; GreenGuard RainDrop 3D Building Wrap: www.trustgreenguard.com/#sle.
 - c. National Shelter Products, Inc.; DRYLine RainDrain: www.drylinewrap.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- B. Air/Weather-Resistive Barrier, Fluid Applied:
 - 1. Air Barrier Coating:
 - a. Wet Film Thickness (WFT): 10 mils (0.010 inch), minimum.
 - b. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 - c. Water Vapor Permeance: 11 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F.

- d. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
- e. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
- f. VOC Content: Zero.
- g. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
- h. Products:
 - 1) DuPont de Nemours, Inc; Tyvek Fluid Applied WB+ with Tyvek Fluid Applied Flashing and Joint Compound, Sealant for Tyvek Fluid Applied System, and StraightFlash: building.dupont.com/#sle.
 - 2) Momentive Performance Materials, Inc/GE Silicones; GE Elemax 2600 AWB: www.siliconeforbuilding.com/#sle.
 - 3) PROSOCO, Inc; R-GUARD Spray Wrap MVP: www.prosoco.com/r-guard/#sle.
 - 4) W. R. Meadows, Inc; Air-Shield TMP: www.wrmeadows.com/#sle.
 - 5) Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement waived if not installed on roof.
 - 1. Width: 4 inches.
 - 2. Products: As required or recommended by barrier manufacturer.
- C. Fasteners:
 - 1. Metal Framing: Rust resistant screw having 2 inch diameter plastic cap with metal gasketed washer.
 - 2. Wood Framing: Nails having 1 inch inch diameter plastic cap fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this section.
- B. Where existing conditions are responsibility of another installer, notify Contractor of unsatisfactory conditions.
- C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Mechanically Fastened Sheets - On Exterior:
 - 1. Install sheets shingle fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer, 6 inches, minimum.

3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
 4. Attach to framed construction with fasteners extending through sheathing into framing, and space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
 5. Seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
 6. Install barrier underneath jamb flashings.
 7. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.
- E. Fluid-Applied Coatings or Membranes:
1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
 2. Apply a continuous unbroken membrane to substrate in thickness required by manufacturer for performance characteristics specified.
 3. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.
- F. Openings and Penetrations in Exterior Air Barriers:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
 4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal barrier to flashing.
 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 6. Service and Other Penetrations: Form flashing around penetrating item and seal to barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Manufacturer's representative shall inspect areas of completed barrier installation for compliance with manufacturer's warranty requirements.
- C. Do not cover installed barriers until required inspections have been completed.
- D. Repair or remove and replace barrier components where inspections reveal non-compliance with manufacturer's requirements.
- E. Take digital photographs of each portion of installation prior to covering up air barriers.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

**SECTION 07 31 13
ASPHALT SHINGLES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for eave protection and underlayment.
- C. Accessories for ventilation.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim.
- C. Section 07 92 00 - Joint Sealants.

1.03 REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
- B. ASTM D3161/D3161M - Standard Test Method for Wind Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2020.
- C. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2023.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).
- E. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2011.
- F. NRCA (RM) - The NRCA Roofing Manual; 2017.

1.04 SUBMITTALS

- A. See Section 01 33 00 Submittal procedures for submittal procedures.
- B. Product Data: Provide data indicating material characteristics and general construction dimensions of individual components profiles fastening methods and locations and installation details.
- C. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern; for color verification.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements for additional provisions.
 - 2. Extra Shingles: 100 sq ft of each type and color.

1.05 FIELD CONDITIONS

- A. Do not install shingles, eave protection membrane or underlayment when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Provide lifetime manufacturer's warranty for coverage against black streaks caused by algae.
- C. Provide 5-year manufacturer's warranty for wind damage.
- D. Warranty Transferability: Make available to Owner shingle manufacturer's standard option for transferring warranty to a new owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Asphalt Shingles:
 - 1. CertainTeed Corporation; Landmark Shingles: www.certainteed.com.
 - 2. GAF: www.gaf.com/#sle.
 - 3. Owens Corning Corp: www.owenscorning.com.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 ASPHALT SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
 - 1. Type: Laminated strip (Architectural).
 - 2. Fire Resistance: Class A, complying with ASTM E108.
 - 3. Wind Resistance: Class F, when tested in accordance with ASTM D3161/D3161M.
 - 4. Warranted Wind Speed: Not greater than 60 mph.
 - 5. Algae resistant.
 - 6. Self-sealing type.
 - 7. Style: Square.
 - 8. Hip and Ridge Accessory Shingles: Of like color; as recommended by manufacturer.
 - 9. Color: As selected by Architect and Engineer.

2.03 SHEET MATERIALS

- A. Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; not less than 40 mil total thickness; with strippable treated release paper and manufacturer's standard top surface.
 - 1. Products: As recommended by shingle manufacturer, or one of the following.
 - a. CertainTeed Corporation; WinterGuard: www.certainteed.com.
 - b. GAF; WeatherWatch Leak Barrier: www.gaf.com.
 - c. GCP Applied Technologies; Ice & Water Shield: www.gcpat.com.
 - d. Owens Corning Corp; WeatherLock: www.owenscorning.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- B. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type II ("No.30").

2.04 ACCESSORIES

- A. Roofing Nails: Standard round wire shingle type, galvanized steel or aluminum roofing nails, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1-1/2 inch long and conforming to ASTM F1667.
- B. Asphalt Roof Cement: ASTM D4586/D4586M, asbestos-free.
- C. Ridge Vents: Plastic, extruded with vent openings that do not permit direct water or weather entry; flanged to receive shingles .
 - 1. Net Free Area: 18 sq in per lineal foot, minimum.
 - 2. Color: Black.
 - 3. Dimensions: 11 inches wide by 48 inches long strips.
 - 4. Basis of Design Products: As recommended by shingle manufacturer.
 - a. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Proper Baffle: Insulation baffle constructed of 1/8 inch thick corrugated plastic with double bending routes. Suitable for fiberglass insulation, loose fill insulation, and spray foam insulation.
 - 1. Basis of Design Product: DCI Products; StarterBaffle 2-In-1: www.dciproducts.com.
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 METAL FLASHINGS

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, and other flashing indicated.
 - 1. Form flashings to profiles indicated on drawings and to protect roofing materials from physical damage and shed water.
 - a. Where edge termination is parallel to shingle length, provide style "D" roof edge.
 - 2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
 - 3. Hem exposed edges of flashings minimum 1/4 inch on underside.
 - 4. Coat concealed surfaces of flashings with bituminous paint.
- B. Sheet Metal: Prefinished aluminum, 26 gage, 0.017 inch minimum thickness; fluoropolymer coating, color as selected by Architect and Engineer from manufacturers full range..
- C. Bituminous Paint: Acid and alkali resistant type; black color.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof penetrations and plumbing stacks are in place and flashed to deck surface.
- B. Verify roof openings are correctly framed.
- C. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

- A. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
- B. Broom clean deck surfaces before installing underlayment or eave protection.
- C. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced 8 inches on center.

3.03 INSTALLATION

- A. Eave Protection Membrane:
 - 1. Install eave protection membrane from eave edge to minimum 6 feet up-slope beyond interior face of exterior wall.
 - 2. Install eave protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Underlayment:
 - 1. Roof Slopes Up to 4:12: Install one layer of organic roofing felt over one layer of eave protection membrane on entire roof area. Ends and edges to be weather lapped minimum 4 inches, stagger end laps of each consecutive layer, and nail in place.
 - 2. Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches; stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches over eave protection.
 - 3. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.
- C. Metal Flashing:
 - 1. Install flashings in accordance with manufacturer's instructions and Section 07 62 00.
 - a. Eave Drip Edges: Install below underlayment and fasten to roof sheathing.
 - b. Rake Drip Edges: Install over underlayment and fasten to roof deck
 - 2. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.
 - 3. Secure in place with nails at not greater than 16 inches on center, and conceal fastenings.
 - 4. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.
- D. Shingles:

1. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
 - a. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
 - b. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
 - c. Place fasteners at double shingle thickness area, typically designated by fastener line and in accordance with manufacturer's instructions for slope and anticipated wind conditions.
 2. Place shingles in straight coursing pattern with 5-inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
 3. Cap ridge vents with individual shingles, maintaining 5-inch weather exposure, and place to avoid exposed nails.
 4. Coordinate installation of roof mounted components or work projecting through roof with weathertight placement of counterflashings.
 5. Complete installation to provide weathertight service.
- E. Attic Ventilation Accessories
1. Install vents and baffles in accordance with manufacturer's instructions.
 2. Ridge Vents: Butt each successive vent piece up snugly, assuring straight alignment.
 - a. Fit end cap onto end of the first and last piece of the vent.
 - 1) Lay a bead of sealant on the under side of the end cap, press the piece and cap into position, and nail through the end cap, the vent, and into the roof sheathing.

3.04 PROTECTION

- A. Do not permit traffic over finished roof surface; protect roofing until completion of project.

END OF SECTION

**SECTION 07 42 13
METAL WALL PANELS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Manufactured metal panels for walls and soffits, with related flashings and accessory components.

1.02 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 07 27 00 - Air/Weather-Resistive Barrier.
- C. Section 07 31 13 - Asphalt Shingles.
- D. Section 07 92 00 - Joint Sealants.

1.03 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.
- C. Samples: Submit two samples of wall panel and soffit panel, 12 inches by 12 inches in size illustrating finish color, sheen, and texture.
- D. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.
- B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 15-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
- C. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design:
 - 1. Metal Wall Panels - Exposed Fasteners: 7.2 Panel manufactured by Petersen Aluminum Corporation.

2. Metal Soffit Panels: PAC-750 Siffit, Half Vent manufactured by Petersen Aluminum Corporation.

2.02 METAL WALL PANEL SYSTEM

- A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.
 1. Provide exterior wall panels and soffit panels.
 2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
 3. Maximum Allowable Deflection of Panel: $L/90$ for length(L) of span.
 4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
 5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
- B. Soffit Panels:
 1. Profile: 12 inch panel exposure with centered V-groove, 1/2 inch tall concealed interlocking joint.
 - a. Half vented panels shall have not less than 6 percent open air.
 2. Material: Precoated aluminum sheet, 20 gauge, 0.032 inch minimum thickness.
 3. Color: As selected by Architect and Engineer from manufacturer's full line.
- C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- E. Anchors: Aluminum.

2.03 MATERIALS

- A. Precoated Aluminum Sheet: ASTM B209/B209M, 3105 alloy, O temper, with smooth surface texture; continuous-coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 PANEL FINISH

- A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color as specified.

2.05 ACCESSORIES

- A. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 92 00
- B. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
- C. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
 1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.
- D. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that building framing members are ready to receive panels.
- B. Verify that air/weather-resistive barrier has been installed over substrate completely and correctly.

3.02 INSTALLATION

- A. Install panels on walls in accordance with manufacturer's instructions.
- B. Fasten panels to structural supports; aligned, level, and plumb.
- C. Locate joints over supports.
- D. Lap panel ends 2 inches, minimum.
- E. Provide expansion and control joints where indicated.
- F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 TOLERANCES

- A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
- B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch, maximum.

3.04 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings.
 - 1. Flashings and sheet metal not specified in other sections but required to prevent penetration of water through exterior cladding.
- B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 07 27 00 - Air/Weather-Resistive Barrier.
- D. Section 07 31 13 - Asphalt Shingles.
- E. Section 07 42 13 - Metal Wall Panels.
- F. Section 07 92 00 - Joint Sealants.
- G. Division 22 - Plumbing.
- H. Division 23 - Heating, Ventilating, and Air Conditioning.
- I. Division 26 - Electrical.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Air/Weather-Resistive Barrier Coordination: Receive materials and instructions for sealing flashing to barrier specified in Section 07 27 00.

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Verification Samples: Submit two samples not less than 4 x 4 inch in size illustrating metal finish color.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

- A. Pre-Finished Aluminum: ASTM B209M (ASTM B209); 20 gage (0.032 inch) thick; plain finish shop pre-coated with:
 - 1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; pretreated metal with two-coat system including primer and color coat with at least 70 percent PVDF coating.
 - 2. Finish Side: As selected by Architect and Engineer from manufacturer's full colors.

2.02 FABRICATION - GENERAL

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.
- G. Where edge termination of shingled assembly is parallel to shingle length, provide style "D" roof edge.

2.03 ACCESSORIES

- A. Underlayment: ASTM D226/D226M, organic roofing felt, Type II, No. 30.
- B. Primer Type: Zinc chromate.
- C. Protective Backing Paint: Zinc molybdate alkyd.
- D. Concealed Sealants: Non-curing butyl sealant or tape.
 - 1. Sealant: See Section 07 92 00.
 - 2. Tape: Highly rubbery, tacky, 100 percent solids, asbestos-free compound designed for sealing metal lap joints. Width shall be appropriate to use.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
 - 1. Products: See Section 07 92 00 .

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify pipes and sleeves are solidly set, reglets are in place, and nailing strips located.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Comply with drawing details.
- B. Apply butyl sealant or tape between metal flashings and felt flashings.
- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

- E. Door and window head flashing shall be installed immediately after door frames and windows have been installed.
 - 1. Place a bead of sealant where the head flashing interfaces with the frame.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

**SECTION 07 92 00
JOINT SEALANTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete
- B. Section 03 35 11 - Concrete Floor Finishes.
- C. Section 04 20 00 - Unit Masonry.
- D. Section 06 83 16 - Fiberglass Reinforced Plastic Panels.
- E. Section 07 26 00 - Vapor Retarders.
- F. Section 07 27 00 - Air/Weather-Resistive Barrier.
- G. Section 07 31 13 - Asphalt Shingles.
- H. Section 07 42 13 - Metal Wall Panels.
- I. Section 07 62 00 - Sheet Metal Flashing and Trim.
- J. Section 08 11 13 - Hollow Metal Doors and Frames.
- K. Section 08 51 13 - Aluminum Windows.
- L. Division 22 - Plumbing.
- M. Division 23 - Heating, Ventilating, and Air Conditioning.
- N. Division 26 - Electrical.

1.03 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2014.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- D. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).
- E. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Should Contractor require a trade that makes a penetration through an assembly responsible for sealing the penetration, said trade shall comply with the requirements of this section.
 - 1. Requirements of this Section shall supersede and take precedence of requirements specified in Divisions 21, 22, 23, 26, 27, and 28
- B. VOC Regulated Materials: VOC content shall comply with limits of authorities having jurisdiction. Should specified materials exceed allowable VOC content, Contractor shall submit appropriate product substitution information.

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 2. List of backing materials approved for use with the specific product.
 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 4. Substrates the product should not be used on.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- D. Installation Plan: Submit at least four weeks prior to start of installation.
- E. Installation Log: Submit filled-out log for each length or instance of sealant installed.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- C. Installation Plan: Include schedule of sealed joints, including the installation Log Form with the following data fields, with known information completed:
1. Size and actual backing material used.
 2. Date of installation.
 3. Name of installer.
 4. Actual joint width; provide space to indicate maximum and minimum width.
 5. Actual joint depth to face of backing material at centerline of joint.
 6. Air temperature.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Include warranty coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Exterior Joints for which no other sealant type is indicated: Nonsag Polyurethane or Silicone Sealant:
1. Exterior joints to be sealed include, but are not limited to:
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Voids around penetrations in walls or soffits.
- B. Lap Joints in Exterior Sheet Metal Work: Butyl Sealant.
- C. Interior Joints for which no other sealant is indicate: Acrylic Emulsion Latex Sealant.
1. Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to:
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. Voids around penetrations in walls and ceilings, not fire or smoke rated.
- D. Control and Expansion Joints Exposed to View in Interior Concrete Slabs and Floors: Polyurethane Sealant for Water Immersion.
1. Joints to be sealed include, but are not limited to:
 - a. Expansion joints in floors exposed to view; not covered by a finish material.

- E. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Mildew Resistant (Bathtub/Tile) Sealant.
 - 1. Joints to be sealed include, but are not limited to:
 - a. Joints between plumbing fixtures and floor and wall surfaces.
 - b. Joints between toilet room countertops and wall surfaces.
- F. Do not seal the following types of joints:
 - 1. Intentional weep holes in masonry.
 - 2. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
 - 3. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - 4. Joints where installation of sealant is specified in another section.
- G. Colors: Match surrounding finishes unless indicated other wise on drawings

2.02 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
 - 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 4. Products:
 - a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
 - b. Momentive Performance Materials, Inc (GE Silicones products); SCS2700 SilPruf LM: www.momentive.com.
 - c. Pecora Corporation; 890NST Ultra Low Modulus Architectural Silicone Sealant - Class 100: www.pecora.com.
 - d. Sika Corporation, Construction Products Division; Sikasil WS-290: <http://usa.sika.com>.
 - e. Tremco Global Sealants; Spectrem 1: www.tremcosealants.com
 - f. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Products:
 - a. Dow Corning Corporation; 786-M: www.dowcorning.com/construction/#sle.
 - b. Momentive Performance Materials; Sanitary 1700 Construction Sealant: www.momentive.com.
 - c. Pecora Corporation; 898NST Sanitary Silicone Sealant - Class 50: www.pecora.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Products:
 - a. Bostik Inc; Chem-Calk GPS1: www.bostik-us.com.
 - b. Master Builders Solutions by BASF; MasterSeal TX1: www.master-builders-solutions.basf.us/en-us/#sle.
 - c. Pecora Corporation; DynaTrol I-XL General Purpose One Part Polyurethane Sealant: www.pecora.com.
 - d. Sherwin-Williams Company; Stampede-1/-TX Polyurethane Sealant: www.sherwin-williams.com/#sle.

- e. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- D. Acrylic Emulsion Latex Sealant: Water-based; ASTM C834, single component, non-staining, non-bleeding, nonsagging; not intended for exterior use. Formulation shall be compatible with commercial grade latex based paints.
 - 1. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
 - 2. Products:
 - a. Master Builders Solutions by BASF; MasterSeal NP520: www.master-builders-solutions.basf.us/en-us/#sle.
 - b. Pecora Corporation; AC-20 + Silicone Acrylic Latex Caulking Compound: www.pecora.com.
 - c. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- E. Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
 - 1. Products:
 - a. Bostik Inc; Chem-Calk 300: www.bostik-us.com.
 - b. Pecora Corporation; BC-58: www.pecora.com.
 - c. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.
 - d. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.03 SELF-LEVELING JOINT SEALANTS

- A. Self-Leveling Silyl-Terminated Polyether/Polyurethane (STPE/STPU) Sealant: ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.
 - 1. Movement Capability: Plus and minus 35 percent.
 - 2. Products:
 - a. Bostik Inc; Chem-Calk 950: www.bostik-us.com.
 - b. Master Builders Solutions by BASF; MasterSeal SL 1: www.master-builders-solutions.basf.us.
 - c. Pecora Corporation; NR-201 Self-Leveling Traffic and Loop Sealant: www.pecora.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.04 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 - 1. Open Cell: 40 to 50 percent larger in diameter than joint width.
 - 2. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- H. Concrete Floor Joint Filler: Defer filler installation until after concrete has cured for not less than 6 months, and construction traffic has permanently ceased.
 - 1. Prepare joint, install filler and slightly overfill.
 - 2. After full cure, shave joint filler flush with top of concrete slab.

3.04 SCHEDULE - EXTERIOR JOINT SEALANTS

- A. Where No Other Sealant Type is Indicated: Polyurethane or Non-Staining Silicone Sealant.
 - 1. Applications: Such as, but not limited to the following:
 - a. Voids around penetrations in walls.
 - b. Control, expansion, and soft joints in masonry work.
 - c. Butt joints of siding, trim and fill space between siding, trim and adjacent materials.
 - d. Sheet metal work, lap joints, exposed to view.
 - e. Seal face covering of preformed joint seal to adjacent construction.
 - f. Joints between dissimilar materials.
 - 2. Color: Match adjacent finished surfaces.
 - a. Exception: In masonry, color shall match mortar.
- B. Concrete Slab On Grade: Nonsag "Traffic-Grade" Polyurethane Sealant.
 - 1. Applications: Control, expansion and isolation joints.
 - a. Joints between concrete and dissimilar elements.

2. Color: Grey.
- C. Sheet Metal Work, Lap Joints: Butyl Sealant.
 1. Applications: Concealed sealant bead in sheet metal.

3.05 SCHEDULE - INTERIOR JOINT SEALANTS

- A. Where No Other Sealant is Indicated: Acrylic Emulsion Latex Sealant.
 1. Applications: Such as, but not limited to the following:
 - a. Voids around penetrations in walls or ceilings, not fire or smoke rated.
 - b. Close air exfiltration paths around or through assemblies in rooms protected by clean agent fire suppression system.
 - c. Control joints and soft joints in masonry walls.
 - d. Control joints and soft joints in gypsum walls and ceiling assemblies.
 - e. Joints between dissimilar materials; such as, but not limited to the following:
 - 1) Frames, door, borrow lite, or window to wall surfaces.
 2. Color: White for painting.
- B. Concrete Floors, Non-Wet Areas: Self-Leveling Silyl-Terminated Polyurethane (STPU) Sealant.
 1. Applications: Control, expansion and isolation joints.
 - a. When exposed to view and not covered by a finish material.
 - b. Joints separating floor from other elements, such as but not limited to columns, walls, footings, and drains.
 2. Color: Match adjacent finished surfaces.
- C. Concrete Floors, Wet Areas: Self-Leveling Polyurethane Sealant for Continuous Water Immersion.
 1. Applications: Control, expansion and isolation joints
 - a. When exposed to view and not covered by a finish material.
 - b. Joints separating floor from other elements, such as but not limited to columns, walls, footings, and drains.
 2. Color: Match adjacent finished surfaces.
- D. Restrooms: Mildew-Resistant Silicone Sealant.
 1. Applications: Such as, but not limited to the following:
 - a. Ceramic tile to adjacent wall finishes.
 - b. Countertops to walls.
 - c. Plumbing fixtures to floor or wall surfaces.
 2. Color: Clear unless otherwise directed by the Architect.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Thermally insulated hollow metal doors with frames.
- C. Hollow metal borrowed lites glazing frames.
- D. Hollow metal window frames.
- E. Accessories, including glazing.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 10 00 - Rough Carpentry.
- C. Section 07 21 00 - Thermal Insulation.
- D. Section 07 62 00 - Sheet Metal Flashing and Trim.
- E. Section 07 92 00 - Joint Sealants.
- F. Section 08 71 00 - Door Hardware.
- G. Section 08 80 00 - Glazing.
- H. Section 09 91 13 - Exterior Painting.
- I. Section 09 91 23 - Interior Painting.
- J. Division 23 - Heating, Ventilating, and Air Conditioning.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- I. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- J. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- K. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- L. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of anchorages for hollow metal frames.
 - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to project site in time for installation.

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, frame profiles, and any indicated finish requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide all products from a single manufacturer who is a member of the Steel Door Institute.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
 - 3. Republic Doors, an Allegion brand: www.republicdoor.com.
 - 4. Steelcraft, an Allegion brand: www.allegion.com/us.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.
 - 5. Typical Door Face Sheets: Flush.
 - 6. Glazed Lights: Non-removable stops on non-secure side. Style: Manufacturers standard.
 - 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - 8. Galvanizing, Exterior Use: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.

- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated. Excluding ICC 500 / FEMA P-361 compliant doors.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 16 gauge, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 2. Door Core Material: Polystyrene, 1 lbs/cu ft minimum density.
 - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
 3. Door Thermal Transmission: U-factor of 0.45 maximum.
 4. Door Thickness: 1-3/4 inches, nominal.
 5. Weatherstripping: Refer to Section 08 71 00.
 6. Door Finish: Factory primed and field finished.
 7. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 0.053 inch (16 gage), welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached.
 8. Vertical Edges: Spot weld and epoxy fill vertical edges. Welds shall be ground, filled, and dressed smooth.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
1. Throat opening shall be equal to finished wall thickness, unless otherwise indicated.
 2. Prepared to receive silencers.
- B. Exterior Door Frames: Face welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvanized) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 2. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
 3. Thermal Break: With positive vinyl thermal break.
 4. Frame Finish: Factory primed and field finished.
 5. Weatherstripping: Separate, see Section 08 71 00.
- C. Interior Door Frames: Face welded type.
1. Fire Rating: Same as door, labeled.
 2. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
 3. Frame Finish: Factory primed and field finished.
- D. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- E. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Glazing: As specified in Section 08 80 00.
- B. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
- C. Silencers: Resilient rubber or vinyl, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Exterior Assemblies:
 - 1. Fill frame cavities with spray (pliable) foam insulation. See Section 07 21 00.
- E. Coordinate installation of hardware specified in Section 08 71 00.
- F. Comply with glazing installation requirements of Section 08 80 00.

3.04 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

**SECTION 08 51 13
ALUMINUM WINDOWS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash.
- B. Factory glazing.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 07 21 19 - Foamed-In-Place Insulation.
- C. Section 07 62 00 - Sheet Metal Flashing and Trim.
- D. Section 07 92 00 - Joint Sealants.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.
- C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- F. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
- G. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Include component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.
- D. Selection Samples: Submit 2 sets of samples illustrating manufacturer's full range of frame finishes and colors.
- E. Verification Samples: Submit two samples not less than 12 inches in length illustrating finished aluminum surface.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.

1.08 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a two year period after the Date of Substantial Completion.
- C. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with manufacturer.
- D. Manufacturer Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Wojan Window & Door Corp.; M-85 Series: www.wojan.com.
- B. Other Acceptable - Aluminum Windows Manufacturers:
 - 1. Crystal Window & Door Systems, Ltd.: www.crystalwindows.com.
 - 2. Kawneer Co.: www.kawneer.com.
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ALUMINUM WINDOWS

- A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
 - 1. Frame Depth: 2-11/16 inches, nominal.
 - 2. Provide factory-glazed units.
 - 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
 - 4. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 5. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
 - 6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 7. Nailing (Mounting) Flange: Integral to frame assembly, providing weather stop at entire perimeter of frame.
- B. Fixed, Non-Operable Type:
 - 1. Construction: Thermally broken.
 - 2. Glazing: Double; clear; low-e.
 - 3. Exterior Finish: Class I color anodized.
 - 4. Interior Finish: Class I color anodized.

2.03 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
 - 1. Performance Class (PC): CW.
 - 2. Performance Grade (PG): Not less than 30.
- B. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
- C. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 4.60 psf.
- D. Air Leakage:

1. Fixed Type: Maximum of 0.1 cu ft/min sq ft per unit area of outside frame dimension, with 1.57 psf differential pressure when tested in accordance with ASTM E283.
- E. Overall Thermal Transmittance (U-value): Following values, maximum, including glazing, measured on window sizes required for this project.
 1. Fixed Type: 0.37.
- F. Solar Heat Gain Coefficient (SHGC): 0.40 percent, maximum.

2.04 COMPONENTS

- A. Frames: Thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.
- B. Glazing: Insulated double pane, clear, low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.
 1. Thickness of Each Glass Lite: 1/8 inch.
 - a. Annealed glass except when bottom edge of exposed glass is within 18 inches from floor.
 - b. Tempered glass when bottom edge of exposed glass is within 18 inches from floor.
 2. Air Space: 3/4 inch fixed sash.
 3. Basis of Design: Wojan Window & Door Corp.; CS36-3-Argon-Techno-CS73-3.
- C. Fasteners: Stainless steel.
- D. Sill Pan Flashing: Molded high impact polymer plastic forming depth in one piece with integral back dam, end dam and lip. Seal connection of back dam to end dam. Length shall be adjustable by use of multiple units.
 1. Depth: As recommended by manufacturer, but not less than depth of aluminum framing.
 2. Manufacturers:
 - a. Jamsill, Inc.; Product Jamsill Guard: www.jamsill.com.
 - b. Astro Plastics; Product Astropan: www.astroplastics.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- E. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.
 1. See Section 07 92 00 for additional requirements.

2.05 MATERIALS

- A. Sheet Aluminum: ASTM B209/B209M, 5005 alloy, H12 or H14 temper.
- B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.06 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41, clear anodic coating not less than 0.7 mil thick.
- B. Finish Color: As selected by Architect and Engineer from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 WINDOW INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install windows in accordance with ASTM E2112.
 1. Seal frame perimeter to air/weather-resistive barrier specified in Section 07 27 00 using materials and complying with instructions furnished by that trade.

- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Install sill and sill end angles.
- F. Set sill members and sill pan flashing in continuous bead of sealant.
 - 1. Turn up sill pan ends and edges; seal to adjacent work to form water tight dam.
- G. Fill shim space voids of window frame with spray (pliable) foam. See Section 07 21 00.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 CLEANING

- A. Remove protective material from factory finished aluminum surfaces.
- B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

END OF SECTION

SECTION 08 71 00 DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for hollow metal doors.
- B. Thresholds, metal.
- C. Weatherstripping and gasketing.
- D. Fire department lock box.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants.
- B. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. BHMA A156.1 - American National Standard for Butts and Hinges; 2013.
- C. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
- D. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2014.
- E. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2012.
- F. BHMA A156.21 - American National Standard for Thresholds; 2014.
- G. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012.
- H. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.
- J. NFPA 101 - Life Safety Code; 2015.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Hardware Schedule: Submit detailed listing that includes each hardware item to be installed on each door. Use door numbering scheme as included in Contract Documents.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- F. Keying Schedule: Submit for approval of Owner.
- G. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match Door Hardware Schedule.

1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

- B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Allegion Brands, Ives, LCN, Schlage, Steelcraft, or Von Duprin: www.allegion.com/us.
- B. Assa Abloy Brands; Adams Rite, Corbin Russwin, HES, Markar, McKinney, Pemko, Norton, Rixon, Rockwood, Sargent, Yale, or Securitron: www.assaabloydss.com.
- C. Best Access Systems, division of Stanley Security Solutions: www.bestaccess.com.
- D. Hager Companies: www.hagerco.com.
- E. Hiawatha, Inc, division of Activar Construction Products Group, Inc: www.activarcpg.com/hiawatha.
- F. National Guard Products: www.ngp.com.
- G. Reese Enterprises, Inc.: www.reeseuse.com.
- H. Trimco Hardware: www.trimcohardware.com.
- I. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 DOOR HARDWARE - GENERAL

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Accessibility: ADA Standards and ICC A117.1.
 - 3. Applicable provisions of NFPA 101.
- D. Finishes: Provide door hardware of the same finish unless otherwise indicated.
 - 1. Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US32D or US26D).
 - 2. Finish Definitions: BHMA A156.18.
 - 3. Exceptions:
 - a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
 - b. Door Closer Covers and Arms: Color to be selected by Architect from manufacturer's standard colors.
- E. Fasteners:
 - 1. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.

2.03 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
 - 1. Hardware Sets indicate locking functions required for each door.
 - 2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
 - 3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, match Owner's existing core used on other buildings.
 - 1. Provide cams and/or tailpieces as required for locking devices required.
- C. Keying: Owner's to confirm keying requirements at time of submittal.

2.04 HINGES

- A. Hinges: Provide hinges on every swinging door.
 - 1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 - 2. Provide ball-bearing hinges at each door with closer.
 - 3. Provide hinges in quantities indicated.
 - 4. Provide non-removable pins on exterior outswinging doors.
- B. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - 1. Provide hinge width required to clear surrounding trim.
 - 2. Quantity of Hinges Per Door:
 - a. Doors up to 60 inches High: Two hinges.
 - b. Doors From 60 inches High up to 90 inches High: Three hinges.
 - c. Doors 90 inches High up to 120 inches High: Four hinges.
- C. Manufacturers - Hinges:
 - 1. Assa Abloy Brands; McKinney: www.assaabloydss.com.
 - 2.
 - 3. Ives, an Allegion brand: www.allegion.com/us.
 - 4. Stanley Black & Decker: www.stanleyblackanddecker.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.05 MORTISE LOCKSETS

- A. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
 - 1. Locking Functions: As defined in BHMA A156.13, and specified in the Schedule.
 - 2. Lever Design: Tubular lever with return to door.
 - a. Basis of Design: Schlage; 03 lever with escutcheon (N).
- B. Manufacturers - Mortise Locksets:
 - 1. Assa Abloy Brands; Corbin Russwin, Sargent, or Yale: www.assaabloydss.com.
 - 2. Best Access Systems, division of Stanley Security Solutions: www.bestlock.com.
 - 3. Schlage, an Allegion brand: www.allegion.com/us.
 - 4. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.06 CLOSERS

- A. Closers: Comply with BHMA A156.4, Grade 1.
 - 1. Type: Provide surface-mounted, on door, overhead (SOH) closers..
 - 2. Provide heavy duty door closer on every exterior door.
 - 3. At corridors, locate door-mounted closer on room side of door.
 - 4. At outswinging exterior doors, mount closer on interior side of door.
- B. Manufacturers - Closers:
 - 1. Assa Abloy Brands; Norton: www.assaabloydss.com.
 - 2. DORMA USA, Inc.: www.dorma.com.
 - 3. LCN, an Allegion brand: www.allegion.co
 - 4. Stanley Door Closers: www.stanleydoorclosers.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.07 GASKETING AND THRESHOLDS

- A. . Gaskets: Comply with BHMA A156.22.
 - 1. Perimeter Seal: On each scheduled door, provide on head and sides.
 - 2. Sweep: On each exterior door, provide door bottom sweep.
 - 3. Manufacturers - Gaskets:
 - a. Hager Companies: www.hagerco.com.
 - b. National Guard Products: www.ngpinc.com.
 - c. Pemko Manufacturing Co.: www.pemko.com.

- d. Reese Enterprises, Inc.: www.reeseusa.com.
 - e. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- B. Thresholds: Complying with BHMA A156.21 and ADA Standards. Where specified to be by door/frame manufacturer, provide manufacturer's standard. Fabricate to full width of opening indicated.
 - 1. Provide threshold at each exterior door, unless otherwise indicated.
 - 2. Field cut threshold to frame for tight fit.
 - 3. Provide non-corroding fasteners at exterior locations.
- C. Fasteners At Exterior Locations: Non-corroding.
- D. Manufacturers - Thresholds:
 - 1. National Guard Products, Inc: www.ngpinc.com.
 - 2. Pemko Manufacturing Co: www.pemko.com.
 - 3. Reese Enterprises, Inc.: www.reeseusa.com.
 - 4. Zero International, Inc: www.zerointernational.com.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.08 FIRE DEPARTMENT LOCK BOX

- A. Heavy-duty, recessed, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers. Box shall be tested and listed by Underwriters Laboratories as anti-theft devices.
 - 1. Lock: Key access shall be as required by local Fire Department.
 - 2. Capacity: Holds 10 keys.
 - 3. Finish: Manufacturer's standard dark bronze.
 - 4. Location: Outside entry where Fire Alarm Control Panel is located or where required by authority having jurisdiction.
 - 5. Manufacturers - Fire Department Lock Box:
 - a. Kidde Safety; Rapid Entry System, SupraSafe: www.kidde.com.
 - b. Knox Company; Knox-Box Rapid Entry System, 3200: www.knoxbox.com.
 - c. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item.
 - 1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 - 2. Mounting heights in compliance with ADA Standards.
- D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.02 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.03 PROTECTION

- A. Do not permit adjacent work to damage hardware or finish.

3.04 SCHEDULE

- A. Use of manufacturer's product names in this schedule is to designate performance characteristics and not intended to imply that products named are required to be used to the exclusion of comparable products of other specified manufacturers.

SET #1

- 3 Hinges, BB1199, 4-1/2" X 4-1/2", 32D, Hager
- 1 Lockset, Entrance Function L9453-03N, 26D, Schlage
- 1 Closer, SOH; Stop/Hold Open 4116, LCN
- 1 Perimeter Seal, 110SA, National Grd Prod.
- 1 Threshold, 426, Reese
- 1 Door Sweep, 201NA, National Grd Prod.

SET #2

- 3 Hinges, BB1199, 4" X 4", 32D, Hager
- 1 Lockset, Entrance Function L9453-03N, 26D, Schlage.
- 1 Closer, SOH; Stop/Hold Open 4116, LCN
- 1 Perimeter Seal, 110SA, National Grd Prod.
- 1 Threshold, 426, Reese
- 1 Door Sweep, 201NA, National Grd Prod.

SET #3

- 3 Hinges, BB1199 4-1/2" X 4-1/2", 32D, Hager
- 1 Lockset, Privacy Function L9410-03N, 26D, Schlage
- 1 Closer, SOH; Stop/Hold Open 4116, LCN
- 1 Perimeter Seal, 110SA, National Grd Prod.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

**SECTION 08 80 00
GLAZING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants.
- B. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- C. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.
- F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.
- G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- H. GANA (GM) - GANA Glazing Manual; 2008.
- I. GANA (SM) - GANA Sealant Manual; 2008.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods. Maintain one copy on site.

1.06 FIELD CONDITIONS

- A. Do not install glazing compounds when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass:
 - 1. AGC Glass North America, Inc: www.agc-yourglass.com/#sle.
 - 2. Cardinal Glass Industries: www.cardinalcorp.com.
 - 3. Guardian Glass, LLC: www.guardianglass.com.
 - 4. Pilkington North America Inc: www.pilkington.com/na.
 - 5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.
- B. Insulating Glass Units:
 - 1. Any of the manufacturers specified for float glass and the following:
 - a. Cardinal Glass Industries: www.cardinalcorp.com.
 - b. Oldcastle Building Envelope: www.oldcastlebe.com.
 - c. Viracon, Apogee Enterprises, Inc: www.viracon.com.
 - d. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with ASCE 7.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 4. Glass thicknesses listed are minimum.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.04 INSULATING GLASS UNITS

- A. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 - 4. Spacer Color: Aluminum.
 - 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone or polyurethane sealant as secondary seal applied around perimeter.
 - b. Color: Black.
 - 6. Purge interpane space with dry air, hermetically sealed.
- B. Type G-1.1 - Insulating Glass Units: Vision glass, double glazed, with Low-E coating.
 - 1. Applications: Exterior glazing, locations where indicated on drawings.
 - 2. Space between lites filled with air.
 - 3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.

- a. Tint: Clear.
 - b. Coating: None.
- 4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type) on #3 surface.
 - 1) Basis of Design Product: PPG Solarban 60.
- 5. Total Thickness: 1 inch.
- 6. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.30, maximum.
- 7. Solar Heat Gain Coefficient (SHGC): 0.65 percent, maximum.
- 8. Glazing Method: Dry glazing method, gasket glazing.

2.05 ACCESSORIES

- A. Setting Blocks: Neoprene, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air barrier and vapor retarder seal; width and thickness as appropriate for application.
- E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- F. Carefully trim protruding tape with knife.

3.06 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- E. Place glazing tape on free perimeter of glazing in same manner described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Carefully trim protruding tape with knife.

3.07 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.08 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

**SECTION 09 91 13
EXTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior surfaces exposed to view and/or weather, unless fully factory-finished.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 06 20 00 - Finish Carpentry.
- B. Section 08 11 13 - Hollow Metal Doors and Frames.
- C. Section 09 91 23 - Interior Painting.
- D. Division 22 - Plumbing.
- E. Division 23 - Heating, Ventilating, and Air Conditioning.
- F. Division 26 - Electrical.

1.03 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.
- B. Sheen (Gloss Level): Designations for values when measured in accordance with ASTM D523.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- C. ASTM D523 - Standard Test Method for Specular Gloss; 2014.
- D. SSPC-SP 1 - Solvent Cleaning; 2015.
- E. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 3. Manufacturer's installation instructions.

- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
 - 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com.
 - 2. Benjamin Moore & Co: www.benjaminmoore.com.
 - 3. PPG Paints: www.ppgpaints.com/#sle.
 - 4. Valspar Corporation: www.valsparpaint.com/#sle.

- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors: To be selected from manufacturer's full range of available colors.
 - 1. Selection to be made by Architect after award of contract.
 - 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Exterior Latex: Sherwin-Williams A-100 Exterior Latex; A8 Series.
- B. Latex, High Performance Acrylic: Sherwin-Williams; Protective & Marine Coatings, SHER-CRYL HPA; B66-350 Series.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Primer, Rust-Inhibitive: Sherwin-Williams; Pro Industrial, Pro-Cryl Universal Primer; B66-310 Series.

PART 3 EXECUTION

3.01 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.

- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- G. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.02 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.03 SCHEDULE - PAINT SYSTEMS

- A. Shop-Primed Metal Items: Finish surfaces exposed to view.
 - 1. Finish the following items: Fabrications, doors, frames, and similar metals having factory primer: Finish surfaces exposed to view.
 - 2. Primer: Touch up shop applied primer with compatible material. Unprimed surfaces shall be coated with one coat of Primer, Rust-Inhibitive at not less than 2.0 mils DFT.
 - 3. Finish: Latex, High Performance Acrylic. Two coats not less than 6.0 mils wft per coat.
- B. Piping, Vents or Conduit: Exposed to weather or view.
 - 1. Metal:
 - a. Primer: Rust-Inhibitive Primer at not less than 5.0 mils wft.
 - b. Finish: Latex, High Performance Acrylic. Two coats not less than 6.0 mils wft per coat
 - 2. PVC:
 - a. Primer: As recommended by paint manufacturer. Prepare/clean surface as recommended by paint manufacturer.
 - b. Finish: Exterior Latex. Two coats not less than 4.0 mils wft per coat.

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 20 00 - Finish Carpentry.
- C. Section 08 11 13 - Hollow Metal Doors and Frames.
- D. Section 09 91 13 - Exterior Painting.
- E. Division 22 - Plumbing.
- F. Division 23 - Heating, Ventilating, and Air Conditioning.
- G. Division 26 - Electrical.

1.03 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.
- B. Designations for sheen (gloss level) values are in accordance with ASTM D523.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- D. ASTM D523 - Standard Test Method for Specular Gloss; 2014.
- E. SSPC-SP 1 - Solvent Cleaning; 2015.
- F. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 3. Manufacturer's installation instructions.
- C. Samples, Opaque Paint: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including Interior Finish Plan showing where each product/color/finish was used, product technical data sheets, care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of not less than 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

- B. Paints:
 - 1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com.
 - 2. Benjamin Moore & Co: www.benjaminmoore.com.
 - 3. Diamond Vogel Paints: www.diamondvogel.com/#sle.
 - 4. Pittsburgh Paints: www.ppgpaints.com/#sle.
 - 5. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 6. Valspar Corporation: www.valsparpaint.com/#sle.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 60 00 - Product Requirements for substitution procedures.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Furnish each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of the State in which the Project is located.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors: To be selected from manufacturer's full range of available colors.
 - 1. Selection to be made by Architect after award of contract.
 - 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - INTERIOR

- A. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.
- B. Interior Latex Acrylic Enamel: Sherwin-Williams; ProClassic, Waterborne Interior Acrylic.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 - 1. Block Filler, Acrylic: Sherwin-Williams Loxon Block Surfacer.
 - 2. Primer, Rust-Inhibitive: Sherwin-Williams; Pro Industrial, Pro-Cryl Universal Primer.
 - 3. Primer, Latex, Interior Wood: Sherwin-Williams PrepRite ProBlock Interior/Exterior Latex Primer-Sealer.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
 - 1. If substrate installation is the responsibility of another installer, notify Architect of unsatisfactory conditions.
 - a. Unsatisfactory substrate conditions shall be made satisfactory by the substrate installer.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. 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. Concrete Masonry Units: 12 percent.
 - 2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove registers, grilles or diffusers, covers, and access panels on mechanical components not having factory applied color matching adjacent surface.
- D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
 - 3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.
- G. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- H. Wood Surfaces to Receive Opaque Top Coat: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- I. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions.
 - 1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
 - 2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
 - 3. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.
 - a. Brush Application: Use brushes best suited for the type of material applied; use brush of appropriate size for the surface or item being painted; produce results free of visible brush marks.
 - b. Roller Application: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 - c. Spray Application: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
 - 4. Do not apply finishes over dirt, rust, scale, grease, moisture, scuffed surfaces, or other conditions detrimental to formation of a durable coating film.
 - 5. Apply finishes no thinner than manufacturer's recommended spreading rate; provide total dry film thickness for entire system as recommended by manufacturer.
 - a. Number of coats and film thickness required are the same regardless of application method.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied and is fully cured.
 - 1. Do not bridge paint over sealant; paint sealant separately.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.04 FIELD QUALITY CONTROL

- A. Painted surfaces will be considered to lack uniformity and soundness if any of the following defects are apparent to the inspector:
 - 1. Brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 - 2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 - 3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - 4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - 5. Damage and/or contamination of paint due to blown contaminants, such as dust, spray paint, and alike.
- B. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source, including daylight, for interior surfaces:
 - 1. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.

2. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
 3. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
 4. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.
- C. Painted surfaces not acceptable to the inspector shall be made good at the expense of the Contractor. Small affected areas may be touched up. Large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.07 SCHEDULE - PAINT SYSTEMS

- A. Concrete Masonry Units (CMU): Finish surfaces exposed to view where Interior Finish Plan indicates walls to be painted.
1. Epoxy; Where indicated in Finish Schedule on drawings:
 - a. Primer: Acrylic Block Filler.
 - b. Finish: Pre-Catalyzed Epoxy-Modified Latex. Two coats not less than 4.0 mils wft per coat.
 - 1) Sheen: G5, Semi-Gloss.
- B. Wood: Finish surfaces exposed to view in rooms that Finish Schedule indicates to be painted.
1. Casings, Moldings (Standing and Running Trim) and Other Items:
 - a. Opaque Finish:
 - 1) Primer: Primer, Latex, Interior Wood. One coat not less than 4.0 mils wft.
 - 2) Finish: Interior Latex. Two coats not less than 4.0 mils wft per coat..
 - (a) Sheen: G5, Semi-Gloss.
- C. Hollow Metal Doors and Frames for Doors and Borrow Lites:
1. General Use; Other Type Not Specified:
 - a. Primer: Touch up shop applied primer with compatible material. Unprimed surfaces shall be covered with one coat of Primer, Rust-Inhibitive at not less than 5.0 mils wft.
 - b. Finish: Interior Latex Acrylic Enamel. Two coats not less than 4.0 mils wft per coat.
 - 1) Sheen: G5, Semi-Gloss.

END OF SECTION

**SECTION 10 28 00
TOILET AND BATH ACCESSORIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Employee use restroom accessories.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 06 10 00 - Rough Carpentry.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of concealed wood blocking.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Maintenance Data: For accessories having stainless steel finish, submit manufacturer's instructions for maintenance and renewal of finish.

1.05 MANUFACTURERS

- A. Employee Restroom Room Accessories:
 - 1. ASI - American Specialties, Inc: www.americanspecialties.com/#sle.
 - 2. Bobrick Washroom Equipment, Inc.: www.bobrick.com/#sle.
 - 3. Bradley Corporation: www.bradleycorp.com/#sle.
 - 4. Substitutions: Section 01 60 00 - Product Requirements.
- B. Provide products of each category type by single manufacturer.

1.06 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide 4 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- G. Hollow Wall Anchors: Expanding metal sleeve or conical plastic plug as recommended by manufacturer of component and is appropriate for substrate.
 - 1. Fiber, lead, or rubber plugs are not acceptable.

1.07 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.

1.08 EMPLOYEE RESTROOM ACCESSORIES

- A. Toilet Paper Dispenser, Surface Mounted: Double roll, stainless steel satin finish unit with pivot hinge, tumbler lock.
 - 1. Basis of Design Product: Bobrick; B-4288.
- B. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.

1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
 2. Size: As indicated on drawings.
 3. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
 - a. Hanging system shall not require access to locking screws from bottom of mirror.
 4. Basis of Design Product: Bobrick; B-290 Series.
- C. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Basis of Design Product: Bobrick; B-5806 series.

PART 3 EXECUTION

2.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

2.02 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
 1. Where accessories have one end secured through tile and the other end in contact with wall substrate (gypsum board), provide shims to plumb the accessory.
- C. Mounting Heights: As required by ADA Standards, unless otherwise indicated.

2.03 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

SECTION 22 05 00

COMMON WORK REQUIREMENTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

1.2 REFERENCE

- A. Applicable provisions of Division 1 govern this section.

1.3 RELATED REQUIREMENTS

- A. Division 1 – General Requirements
- B. Division 31 - Earthwork
- C. Section 07 84 00 – Fire Stopping

1.4 REFERENCE STANDARDS

- A. Abbreviations:
 - 1. ABMA American Boiler Manufacturers Association
 - 2. AGA American Gas Association
 - 3. AMCA Air Movement and Control Association
 - 4. ANSI American National Standards Association
 - 5. ASPE American Society of Plumbing Engineers
 - 6. ASME American Society of Mechanical Engineers
 - 7. ASSE American Society of Sanitary Engineering
 - 8. ASTM American Society for Testing and Materials
 - 9. AWWA American Water Works Association
 - 10. AWS American Welding Society
 - 11. CGA Compressed Gas Association
 - 12. EPA Environmental Protection Agency
 - 13. GAMA Gas Appliance Manufacturers Association
 - 14. IAPMO International Association of Plumbing & Mechanical Officials
 - 15. IEEE Institute of Electrical and Electronics Engineers
 - 16. ISA Instrument Society of America
 - 17. MCA Mechanical Contractors Association
 - 18. MICA Midwest Insulation Contractors Association
 - 19. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry
 - 20. NBS National Bureau of Standards
 - 21. NEBB National Environmental Balancing Bureau
 - 22. NEC National Electric Code
 - 23. NEMA National Electrical Manufacturers Association
 - 24. NFPA National Fire Protection Association
 - 25. UL Underwriters Laboratories Inc.

B. Standards referenced in this section:

1.	ACI 614	Recommended Practice for Measuring, Mixing and Placing of Concrete
2.	ASTM D1557	Standard Test Method for Moisture-Density Relations of Soils
3.	ASTM E814	Standard Test Method for Fire Tests of Through-Penetration Fire Stops
4.	ASTM E84	Standard Test Method for Surface Burning Characteristics of Materials
5.	D.O.T.	State of Wisconsin, Dept. of Transportation
6.	UL1479	Fire Tests of Through-Penetration Firestops
7.	UL723	Surface Burning Characteristics of Building Materials

1.5 QUALITY ASSURANCE

- A. Refer to Division 1, General Conditions, Equals and Substitutions.
- B. All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.
- C. 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 for obtaining the performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

1.6 ABBREVIATIONS AND SYMBOLS

- A. Key to abbreviations and symbols shall be on the Drawings.
- B. The following are additional abbreviations used in the Specifications:
- | | | |
|----|-----|---|
| 1. | A/E | Architect/Engineer |
| 2. | GC | General Contractor |
| 3. | PC | Plumbing Contractor |
| 4. | HC | Heating Ventilating and Air Conditioning Contractor |
| 5. | EC | Electrical Contractor |

1.7 DEFINITIONS

- A. Furnish: Supply and deliver to Project site ready for unpacking, assembly, and installation.
- B. Install: Operations at Site including unpacking, assembling, erecting, placing, anchoring, applying, finishing, cleaning, and connecting related devices required for product fully functional for intended use after installation.
- C. Provide: Furnish and install, such that product is fully functional for intended use.

1.8 COORDINATION

- A. The Drawings show the general arrangement of piping and equipment and shall be followed as closely as actual building construction and the work of other trades permits. Architectural and Structural Drawings shall take precedence. Because of the scale of the Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate conditions affecting the Work and arrange accordingly, providing offsets, fittings and accessories as may be required to meet conditions.

1.9 PROTECTION OF FINISHED SURFACES

- A. Refer to Division 1, General Requirements, Protection of Finished Surfaces.
- B. Furnish one can of touch-up paint for each different color factory finish which is to be the final finished surface of the product. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.10 SLEEVES AND OPENINGS

- A. This contractor shall be responsible for all sleeves and openings unless specifically noted on the drawings that openings will be provided by others.
- B. Furnish all sleeves required for penetrations. Contractors furnishing sleeves to others for installation shall do this in a timely manner so as not to impede the project schedule.
- C. Coordinate location of all sleeves with work of other trades.
- D. Provide a layout drawing of all such required sleeves and/or openings to the General Contractor for coordination and the A/E for review and approval. Sleeve and opening sizes and locations shall be dimensioned from column lines and floor elevations.

1.11 SEALING AND FIRESTOPPING

- A. Sealing and fire stopping of sleeves/openings between ductwork, piping, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

1.12 EQUIPMENT AND MATERIAL SUBMITTALS

- A. Refer to Division 1, General Conditions, Submittals.
- B. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. 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.

- C. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a statement on the shop drawing transmittal to the architect/engineer that the equipment submitted, and the motor starter schedules are in agreement or indicate any discrepancies. See related comments in Section 22 05 13 in Part 1 under Electrical Coordination.
- D. Include wiring diagrams of electrically powered equipment.
- E. Submit electronic (PDF) copy of all submittals for review by A/E, Architect, Owner, Owners Representative and Building Operator.

1.13 OFF-SITE STORAGE

- A. Any required offsite storage of material is the responsibility of the contractor. Materials or equipment damaged while stored offsite, or while transported to or from offset storage will not be allowed to be installed.

1.14 PERMITS, CERTIFICATES, AND INSPECTIONS

- A. Obtain and pay for all required local and State construction permits.
- B. Obtain and pay for all required local, State and Federal installation inspections. Include copies of the certificates in the Operating and Maintenance Instructions.

1.15 OPERATION AND MAINTENANCE MANUAL

- A. Provide operation and maintenance manuals at the completion of the project and prior to owner training. Operation and Maintenance Manuals shall contain the following information:
 - 1. Table of Contents.
 - 2. Summary sheet that includes Contractor name, Contractors contact information and name of Contractors Project Manager for the project.
 - 3. Warranty letter.
 - 4. Certificates of inspections by regulatory agencies.
 - 5. Record of tests performed to comply with system and contract documents.
 - 6. Copies of all approved submittals.
 - 7. Lubrication instructions, including list and frequency of lubrication.
 - 8. Manufacturer's wiring diagrams for electrically powered equipment.
 - 9. Parts list for manufactured equipment.
 - 10. Valve schedule.
 - 11. Additional items as indicated in technical specification sections.
- B. Provide three (3) hardcopies of the Operation and Maintenance Manual. Manuals shall be organized in three ring binders with dividers and reference tabs. Manuals shall be delivered as follows:
 - 1. One copy to the building engineer.
 - 2. One copy to the tenant (to be kept on site).
 - 3. One copy to the Owners Representative.

- C. Provide (3) electronic (Adobe PDF) copies of the Operation and Maintenance Manual.
 - 1. Provide each copy on a separate portable USB flash drive.
 - 2. Deliver each portable USB flash drive with hard copy manuals to parties listed above.

1.16 TRAINING OF OWNER PERSONNEL

- A. Instruct Owner or Owners facility staff in the proper operation and maintenance of systems and equipment provided as part of this project. The Operation and Maintenance manuals shall be used and referenced during training. Provide multiple training sessions if needed due to project size and seasonal operating constraints.
- B. All training times shall be coordinated with the Owner and Owners facility staff a minimum of 2 weeks prior to training.
- C. Include not less than 1 hour of training instruction.
- D. All training sessions shall be recorded on digital video. The contractor shall provide the recording equipment and equipment operator. Deliver (3) copies of the training video, each to be on separate flash drives to the Owner or Owners facility staff.

1.17 RECORD DRAWINGS

- A. Refer to Division 1, General Requirements, Record Drawings.
- B. Maintain accurate as-built or record drawings throughout the duration of the project. As-built drawings shall be available on site at all times for review by the A/E, owner or owner's representative.
- C. If, during project closeout, the A/E or owner observes installations that are not accurately recorded on the as-built or record drawings, the record drawings will not be accepted and the contractor will be required, at their own expense, to provide updated and accurate record drawings.
- D. In addition to the data indicated in the General Requirements, maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

1.18 CLEANING

- A. Keep the premises broom clean and free of surplus materials, rubbish and debris.
- B. After fixtures and equipment have been installed, remove stickers, rust stains, labels, and temporary covers.
- C. Foreign matter shall be blown out, or flushed out, of pipes, tanks, pumps, strainers, motors, devices, switches, fixtures, and panels.
- D. Boilers and water heaters shall be cleaned, drained, flushed and recleaned until free of oil and debris.

- E. Identification plates on equipment shall be free of paint and dirt.
- F. Leave the work in a condition ready for operation.
- G. Clean all equipment, piping, strainers, filters, etc. prior to building turnover to owner. All systems shall be turned over to owner in condition ready for operation.

1.19 WARRANTY

- A. Warrant that work shall function for one year immediately following the acceptance of the system(s). The date of acceptance shall be an agreed upon date by all parties, including Division 22 contractor, General Contractor, Owner, Owners Representative, Tenant, and A/E.
- B. Keep the system in good working order at no expense, unless defects are clearly the result of improper usage.
- C. Warranty calls shall be at no cost to the owner.
- D. Submit for acceptance of the work, written certification that the entire system has been installed and adjusted for operation in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCESS PANELS AND DOORS

- A. Provide access panels at locations requiring access to mechanical equipment. Locations include, but are not limited to areas above drywall ceilings, shaft enclosures and other furred-in spaces concealing valves, ducts, or equipment. Provide UL listed, fire rated access panels when penetrating fire rated chase or shaft areas.
- B. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12 inch by 12 inch for hand access and 24 inch by 24 inch for body access.
- C. Panels shall be Milcor brand or equivalent.
- D. Panels shall include concealed hinges, cam type locking devices, and have frame/border type necessary for particular wall or ceiling construction they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, able to accept field painting for general applications and stainless steel for use in toilet rooms, shower rooms and similar wet areas.
- E. Refer to Architectural Room Finish Schedule for wall and ceiling surfaces and finishes.
- F. For non-security applications, panel construction shall utilize 16 gauge frame with not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.
- G. Lay-In Ceilings

H. Plaster Walls and Ceilings

2.2 IDENTIFICATION

A. Stencils

1. Not less than 1 inch high letters/numbers for marking pipe and equipment.

B. Snap-On Pipe Markers

1. Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in place without the use of adhesive, tape or straps. Not less than 1 inch high letters/numbers and flow direction arrows for piping marking. W. H. Brady, Seton, Marking Services, or equal.

C. Engraved Name Plates

1. White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite- Style EIP by EMED Co., or equal by Marking Services, or W. H. Brady.

D. Valve Tags

1. Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co., Seton Name Plate Company, Marking Services, or W. H. Brady.

2.3 SEALING AND FIRESTOPPING

A. Fire and/or Smoke Rated Partitions

1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with Section 07 84 00 "Fire Stopping".

2.4 NON-RATED PARTITIONS

A. Pipe Penetrations Thru 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 pipe and the cored opening or a water-stop type wall sleeve.

B. Pipe Penetrations

1. At pipe penetrations of non-rated interior walls, floors and exterior walls above grade, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood walls where sleeve is not required use urethane caulk in annular space between pipe insulation and wall material.

PART 3 - EXECUTION

- A. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. All piping specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the user agency. All designated equipment is to be turned over to the user agency for their use at a place and time so designated. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began.

3.2 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated mechanical systems installation in accordance with Division 31 - Earthwork. Blasting will not be allowed without written permission of the Architect/Engineer.
- B. Install lines passing under foundations with minimum of 1-1/2 inch clearance to concrete and insure there is no disturbance of bearing soil.

3.3 CONCRETE WORK

- A. All cast-in-place concrete will be performed by the PC per Division 3 requirements.

3.4 BUILDING ACCESS

- A. 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.

3.5 EQUIPMENT ACCESS

- A. Install all piping and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Mechanical Contractor and installed by the General Contractor.

3.6 COORDINATION

- A. Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, diffusers, register, grilles, and recessed or semi-recessed heating and/or cooling terminal units installed in/on architectural surfaces.
- B. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

3.7 IDENTIFICATION

- A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment such as cabinet heaters and ceiling fans in occupied spaces.
- B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.
- C. Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background.
- D. Identify all exterior buried piping for entire length with underground warning tape except for sewer piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.
- E. Identify valves with brass tags bearing a system identification and a valve sequence number. Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color coded engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

3.8 LUBRICATION

- A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by the owner. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

3.9 SLEEVES AND OPENINGS

- A. Pipe penetrations in new poured concrete horizontal construction requiring F and T rating: Form opening using hole form or core drill opening. Alternatively provide cast in place fire stopping devices/sleeves.
- B. Pipe penetrations in new poured concrete horizontal construction requiring F rating but no T rating: Same as pipe penetrations in new poured concrete construction requiring F and T ratings except that schedule 40 steel sleeves may also be used.

- C. Pipe penetrations in new poured concrete horizontal construction that do not require F or T ratings: Provide schedule 40 steel pipe sleeve, form opening using hole form or core drill opening.
- D. Where penetrating pipe or conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.

3.10 SEALING AND FIRE STOPPING

- A. Fire and/or Smoke Rated Partitions
 - 1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

END OF SECTION

SECTION 22 05 13

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.

1.2 SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. Manufacturers: BrassCraft Manufacturing Co.; a Masco Company, Dearborn Brass, Keeney Manufacturing Company, ProFlo; a Ferguson Enterprises, Inc. brand.
- B. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
- C. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
- D. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
 - b. Chrome-Plated Piping: One-piece steel with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece steel with polished, chrome-plated finish.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
 - f. Insulated Piping: Split-plate, stamped steel with concealed hinge with polished, chrome-plated finish

3.2 FIELD QUALITY CONTROL

- A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 05 19

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Liquid-in-glass thermometers.
- 2. Thermowells.
- 3. Dial-type pressure gages.
- 4. Gage attachments.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Certificates: For each type of meter and gage.
- C. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

- A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

- 1. American, Taylor, Terice, U.S. Gauge, Weiss, or Winters Instruments. Standard: ASME B40.200.
- 2. Case: Cast aluminum ; 9-inch nominal size unless otherwise indicated.
- 3. Case Form: Adjustable angle unless otherwise indicated.
- 4. Tube: Glass with magnifying lens and blue or red organic liquid.
- 5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
- 6. Window: Glass.
- 7. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
- 8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
- 9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

- A. Thermowells:

- 1. Standard: ASME B40.200.

2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. American, Taylor, Terice, U.S. Gauge, Weiss, or Winters Instruments. Standard: ASME B40.100.
2. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass.
9. Ring: Brass.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.

- D. Fill thermowells with heat-transfer medium.
 - E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
 - F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
 - G. Install valve and snubber in piping for each pressure gage for fluids.
 - H. Install thermometers in the following locations:
 - 1. Outlet of each water heater.
 - I. Install pressure gages in the following locations:
 - 1. Building water service entrance into building.
 - J. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
 - K. Adjust faces of meters and gages to proper angle for best visibility.
- 3.2 THERMOMETER SCALE-RANGE SCHEDULE
- A. Scale Range for Domestic Hot-Water Piping: 30 to 240 deg F.
- 3.3 PRESSURE-GAGE SCALE-RANGE SCHEDULE
- A. Scale Range for Water Service Piping: 0 to 100 psi.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 05 23

VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Check valves.

1.2 SUBMITTALS

A. Product Data: For each type of valve.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic water valves intended to convey or dispense water for human consumption must comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or must be certified to be in compliance with NSF 61 and NSF 372 (by an ANSI-accredited third-party certification body) that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
3. ASME B16.18 for cast copper solder-joint connections.
4. ASME B16.22 for wrought copper and copper alloy solder-joint connections.
5. ASME B16.34 for flanged and threaded end connections
6. ASME B31.9 for building services piping valves.

C. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valve Actuator Type:

1. Hand Lever: For quarter-turn valves.

G. Valves in Insulated Piping:

1. Provide 2-inch extended neck stems.
2. Extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

A. Bronze Ball Valves, Two Piece with Full Port, and Bronze or Brass Trim, Threaded or Soldered Ends:

1. Apollo Valves, Nibco, Milwaukee Valve, or approved equal.
2. Standard: MSS SP-110; MSS SP-145.
3. CWP Rating: 600 psig.
4. Body Design: Two piece.
5. Body Material: Bronze.
6. Ends: Threaded or soldered.
7. Seats: PTFE.
8. Stem: Bronze or brass.
9. Ball: Chrome-plated brass.
10. Port: Full.

2.3 BRONZE SWING CHECK VALVES

A. Bronze, Swing Check Valves with Bronze Disc, Class 125:

1. Apollo Valves, Nibco, Milwaukee Valve, or approved equal.
2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B62, bronze, lead free.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Do not attempt to repair defective valves; replace with new valves. Remove defective valves from site.

3.2 INSTALLATION OF VALVES

- A. Install valves with unions or flanges at each piece of equipment arranged to allow space for service, maintenance, and equipment removal without system shutdown.
- B. Provide support to piping adjacent to valves such that no force is imposed upon valves.
- C. Locate valves for easy access.
- D. For valves in horizontal piping, install valves with stem at or above center of pipe.
- E. Install valves in position to allow full valve actuation movement.
- F. Valve Tags: Comply with requirements in Section 22 05 00 "Common Work Requirements for Plumbing" for valve tags and schedules.
- G. Adhere to manufacturer's written installation instructions. When soldering or brazing valves, do not heat valves above maximum permitted temperature. Do not use solder with melting point temperature above valve manufacturer's recommended maximum.
- H. Adjust or replace valve packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves exhibiting leakage.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, provide the same types of valves with higher CWP ratings.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze ball valves, two piece with full port, and bronze or brass trim. Provide with solder-joint ends.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal hanger-shield inserts.
4. Fastener systems.
5. Pipe-positioning systems.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details and include calculations.
- C. Welding certificates.

1.3 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Pipe Welding Qualifications: Qualify procedures and operators according to "2015 ASME Boiler and Pressure Vessel Code, Section IX."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of corrosive-resistant coated carbon steel.

B. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL HANGER-SHIELD INSERTS

- A. Buckaroos, CADDY, Pipe Shields, Rilco Manufacturing, or equal.
- B. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Hilti, ITW/Read Head, or equal.
 2. Indoor Applications: Zinc-coated or stainless steel.
 3. Outdoor Applications: Stainless steel.

2.6 PIPE-POSITIONING SYSTEMS

- A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 MATERIALS

- A. Aluminum: ASTM B 221.
- B. Carbon Steel: ASTM A 1011/A 1011M.
- C. Structural Steel: ASTM A 36/A 36M carbon-steel plates, shapes, and bars; black and galvanized.
- D. Stainless Steel: ASTM A 240/A 240M.
- E. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- B. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use corrosion-resistant coated carbon-steel pipe hangers and supports and corrosion-resistant coated metal trapeze pipe hangers and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal hanger-shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 4. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 5. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 6. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
 3. C-Clamps (MSS Type 23): For structural shapes.
 4. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 5. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.
- M. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- O. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 05 93

TESTING, ADJUSTING, AND BALANCING FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. TAB of domestic water system.
 - 2. TAB of plumbing equipment:
 - a. Domestic hot-water in-line circulation pumps.
 - 3. Pipe-leakage test verification.

1.2 DEFINITIONS

- A. NEBB: National Environmental Balancing Bureau.
- B. TAB: Testing, adjusting, and balancing.
- C. TABB: Testing, Adjusting, and Balancing Bureau.
- D. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- E. TDH: Total dynamic head.

1.3 QUALITY ASSURANCE

- A. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, and balancing valves and fittings. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine approved submittals for plumbing systems and equipment.
- D. Examine design data, including plumbing system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about plumbing system and equipment controls.
- E. Examine equipment performance data, including pump curves.

1. Relate performance data to Project conditions and requirements, including pump system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 2. Calculate pump system-effect factors to reduce performance ratings of plumbing equipment when installed under conditions different from the conditions used to rate equipment performance. Compare results with the design data and installed conditions.
- F. Examine system and equipment installations, and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine plumbing equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- H. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.
- I. Examine system pumps to ensure absence of entrained air in the suction piping.
- J. Examine operating safety interlocks and controls on plumbing equipment.
- K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Perform system-readiness checks of plumbing systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
1. Domestic Water System:
 - a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed in accordance with applicable code and authority having jurisdiction.
 - b. Water heaters are installed and functioning.
 - c. Piping is complete and all points of outlet are installed.
 - d. Water treatment is complete.
 - e. Systems are flushed, filled, and air purged.
 - f. Strainers are clean.
 - g. Control valves are functioning in accordance with the sequence of operation.
 - h. Shutoff and balance valves are 100 percent open.
 - i. Hot-water circulating pumps are operational and proper rotation is verified.
 - j. Variable-frequency controllers' startup is complete and safeties are verified.
 - k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system in accordance with the procedures contained in this Section.

- B. Cut insulation, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. Where holes for probes are required in piping or equipment, install pressure and temperature test plugs to seal systems.
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish in accordance with Section 22 07 19 "Plumbing Piping Insulation."
- C. Mark equipment and balancing devices, including valve position indicators and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR PLUMBING EQUIPMENT

- A. Test, adjust, and balance plumbing equipment indicated on Drawings, including, but not limited to, the following:
 - 1. Domestic water in-line pumps.

3.5 PROCEDURES FOR DOMESTIC HOT-WATER CIRCULATING INLINE PUMP

- A. Balance system with manual or automatic balancing valves by setting at design flow.
 - 1. Measure flow in main and branch pipes.
 - 2. Adjust main and branch balance valves for design flow.
 - 3. Re-measure each main and branch after all have been adjusted.
- B. Adjust pump to deliver total design flow.
 - 1. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gauge heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - 2. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
 - 3. Mark final settings and verify that all memory stops have been set.
 - 4. Verify final system conditions as follows:
 - a. Re-measure and confirm that total flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
 - c. Mark final settings.

3.6 ADDITIONAL TESTS

- A. Within 5 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
3. Detail removable insulation at piping specialties, equipment connections, and access panels.
4. Detail application of field-applied jackets.
5. Detail application at linkages of control devices.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.4 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.5 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
 - 1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.
- D. Glass-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F in accordance with ASTM C411. Comply with ASTM C547.
 - 1. Armstrong, Childers, Dow, Halstead, Johns-Mansville, or approved equal.
 - 2. Preformed Pipe Insulation: Type I, Grade A with factory-applied ASJ-SSL.
 - 3. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
 - 4. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. ASJ Adhesive and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.
 - 1. Armstrong, Childers, Dow, Halstead, Johns-Mansville, or approved equal.
- C. PVC Jacket Adhesive: Compatible with PVC jacket.
 - 1. Armstrong, Childers, Dow, Halstead, Johns-Mansville, or approved equal.

2.4 MASTICS AND COATINGS

- A. Materials shall be compatible with insulation materials, jackets, and substrates.
- B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.
 - 1. Armstrong, Childers, Dow, Halstead, Johns-Mansville, or approved equal.
 - 2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
 - 3. Service Temperature Range: 0 to plus 180 deg F.
 - 4. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 - 1. Water-Vapor Permeance: ASTM E96/E96M, greater than 1.0 perm at manufacturer's recommended dry film thickness.
 - 2. Service Temperature Range: 0 to plus 180 deg F.
 - 3. Color: White.

2.5 SEALANTS

- A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.
- B. Joint Sealants:
 - 1. Permanently flexible, elastomeric sealant.
 - 2. Service Temperature Range: Minus 58 to plus 176 deg F.
 - 3. Color: White or gray.
- C. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:
 - 1. Fire- and water-resistant, flexible, elastomeric sealant.
 - 2. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 3. Color: White.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.

2.7 SECUREMENTS

- A. Bands:
 - 1. Stainless Steel: ASTM A240/A240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
 - 2. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless steel.

2.8 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
 - 1. Brocar, EBC, McGuire, Plumberex, or Truebro. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with the contract documents, unless otherwise approved by the engineer-of-record.

- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
 - 3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.

4. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered or routed fittings made from same material and density as that of adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 - 6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

3.5 INSTALLATION OF GLASS-FIBER

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
 4. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Fittings and Elbows:
1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
 2. When prefabricated insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- C. Insulation Installation on Valves and Pipe Specialties:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 1. Drainage piping located in crawl spaces.
 2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.7 INDOOR PIPING INSULATION SCHEDULE

- A. Provide insulation on new remodeled piping as indicated in the following schedule. Provide jacketing as schedule unless specified otherwise herein.

SERVICE	INSULATION	JACKET	INSULATION THICKNESS BY PIPE SIZE			
			< 1"	1-1/4" to 2"	2-1/2" to 4"	5" and Larger
Domestic Cold Water	Glass Fiber	ASJ-SSL	0.5"	0.5"	1"	1"
Domestic Hot Water	Glass Fiber	ASJ-SSL	1"	1"	1.5"	1.5"
Domestic Hot Water Recirculation	Glass Fiber	ASJ-SSL	1"	1"	1.5"	1.5"
Tempered Water	Glass Fiber	ASJ-SSL	0.5"	0.5"	1"	1"

END OF SECTION

SECTION 22 11 16
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Piping joining materials.
3. Transition fittings.
4. Dielectric fittings.

B. Related Requirements:

1. Section 22 11 13 "Facility Water Distribution Piping" for water-service piping outside the building from source to the point where water-service piping enters the building.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. System purging and disinfecting activities report.
- C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tube: ASTM B88, Type K and ASTM B88, Type L.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- E. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
- F. Wrought Copper Unions: ASME B16.22.

2.3 PIPING JOINING MATERIALS

- A. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- B. Solder Filler Metals: ASTM B32, lead-free alloys.
- C. Flux: ASTM B813, water flushable.
- D. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Standard: ASSE 1079.
 - 2. Pressure Rating: 175 psig minimum at 180 deg F.
 - 3. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be of the following:
 - 1. Soft copper tube, ASTM B88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- D. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

3.2 EARTHWORK

- A. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

3.3 INSTALLATION OF PIPING

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install valves according to the following:
 1. Section 22 05 23 "Valves for Plumbing Piping."
- D. Install domestic water piping level without pitch and plumb.
- E. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- H. Install piping to permit valve servicing.
- I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- M. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 22 11 23.21 "Inline, Domestic Water Pumps."
- N. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 22 05 19 "Meters and Gages for Plumbing Piping."

- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B828 or CDA's "Copper Tube Handbook."
- F. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.5 INSTALLATION OF TRANSITION FITTINGS

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.6 INSTALLATION OF DIELECTRIC FITTINGS

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

3.7 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for hangers, supports, and anchor devices in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

- B. Install hangers for copper tubing and piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping within 12 inches of each fitting.
- D. Support vertical runs of copper tubing and piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.8 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 00 "Common Work Requirements for Plumbing."

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

- B. Domestic water piping will be considered defective if it does not pass tests and inspections.

- C. Prepare test and inspection reports at the request of the engineer.

3.12 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

- a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 11 19

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Balancing valves.
3. Temperature-actuated, water mixing valves.
4. Strainers for domestic water piping.
5. Hose bibbs.
6. Drain valves.

B. Related Requirements:

1. Section 22 05 19 "Meters and Gauges for Plumbing Piping" for thermometers, pressure gauges, and flow meters in domestic water piping.
2. Section 22 11 16 "Domestic Water Piping" for water meters.
3. Section 22 45 00 "Emergency Plumbing Fixtures" for water tempering equipment.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- ###### A.
- Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

- ###### A.
- Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:

1. Manufacturers: Apollo Valves, Watts, Zurn, or approved equal.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.

5. Refer to schedule on drawings.

2.4 BALANCING VALVES

A. Bronze, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Bell & Gossett Circuit Setter Plus, or approved equal.
2. Body: Bronze, lead free, ball, or plug type with calibrated orifice or venturi.
3. Ball: Stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gauge Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 200 psig.
10. Maximum Operating Temperature: 250 deg F.

2.5 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Thermostatic, Water Mixing Valves:

1. Manufacturers: Apollo Valves, Bradley, Leonard, Powers, Watts, or approved equal.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 85 deg F.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Manufacturers: Apollo Valves, Watts, Zurn, or approved equal.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated for NPS 2-1/2 and larger.
4. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
5. Screen: Stainless steel with round perforations unless otherwise indicated.

2.7 HOSE BIBBS

A. Hose Bibbs:

1. Manufacturers: Watts, Woodford, Zurn, or approved equal.
2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.

5. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Refer to schedules on drawings.

2.8 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

- A. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.
- B. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

3.2 PIPING CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

- A. Connect wiring in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment in accordance with Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3.4 CONTROL CONNECTIONS

- A. Connect control wiring in accordance with Section 26 05 23 "Control-Voltage Electrical Power Cables."

3.5 ADJUSTING

- A. Set field-adjustable flow set points of balancing valves.
- B. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 22 11 23.21

INLINE, DOMESTIC-WATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. In-line, sealless centrifugal pumps.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: UL 778 for motor-operated water pumps.
- C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

2.2 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

- A. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.
- B. Armstrong, Bell & Gossett, Grundfos, or Taco.
- C. Refer to schedules on drawings.
- D. Pump Construction:
 - 1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
 - 2. Casing: Bronze or stainless steel, with threaded or companion-flange connections.
 - 3. Impeller: Plastic or stainless steel.
 - 4. Motor: Single speed.

2.3 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 22 05 13 "Common Motor Requirements for Plumbing Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 CONTROLS

- A. Thermostats: Electric; adjustable for control of hot-water circulation pump.
 - 1. Type: Water-immersion temperature sensor, for installation in piping.
 - 2. Range: 65 to 200 deg F.
 - 3. Enclosure: NEMA 250.
 - 4. Operation of Pump: On or off.
 - 5. Transformer: Provide if required.
 - 6. Settings: Start pump at 110 deg F and stop pump at 120 deg F.
- B. Timers: Electric, for control of hot-water circulation pump.
 - 1. Type: Programmable, seven-day clock with manual override on-off switch.
 - 2. Enclosure: NEMA 250, suitable for wall mounting.
 - 3. Operation of Pump: On or off.
 - 4. Transformer: Provide if required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with HI 1.4.
- B. Mount pumps in orientation complying with manufacturer's written instructions.
- C. Install continuous-thread hanger rods and vibration isolation of size required to support pump weight.
 - 1. Comply with requirements for hangers and supports specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
- D. Install thermostats in hot-water return piping.
- E. Install timers adjacent to pump.
- F. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Check piping connections for tightness.
 - 3. Clean strainers on suction piping.
 - 4. Set thermostats and timers for automatic starting and stopping operation of pumps.

5. Perform the following startup checks for each pump before starting:
 - a. Verify bearing lubrication.
 - b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
 - c. Verify that pump is rotating in the correct direction.
6. Prime pump by opening suction valves and closing drains and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

3.2 PIPING CONNECTIONS

- A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to inline, domestic-water pumps, allow space for service and maintenance.
- C. Connect domestic-water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.
 1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:
 - a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
 - b. Comply with requirements for flexible connectors specified in Section 22 11 16 "Domestic Water Piping."
- D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for strainers specified in Section 22 11 19 "Domestic Water Piping Specialties." Comply with requirements for valves specified in the following:
 1. Section 22 05 23 "Valves for Plumbing Piping."
 2. Install pressure gauge and snubber at suction of each pump and pressure gauge and snubber at discharge of each pump. Install at integral pressure-gauge tapings where provided or install pressure-gauge connectors in suction and discharge piping around pumps. Comply with requirements for pressure gauges and snubbers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

3.3 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring between temperature controllers and devices.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Inline, domestic-water pump will be considered defective if it does not pass tests and inspections.

3.5 ADJUSTING

- A. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust initial temperature set points.
- C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Hubless cast-iron soil pipe and fittings.
 - 2. Copper tube and fittings.
 - 3. PVC pipe and fittings.
 - 4. Specialty pipe fittings.

1.2 SUBMITTALS

- A. Product Data: For each type of product.

1.3 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

2.2 PIPING MATERIALS

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. AB&I, Charlotte Pipe, or Tyler Pipe.
- B. Pipe and Fittings:
 - 1. Marked with CISPI collective trademark and NSF certification mark.
 - 2. Standard: ASTM A 888 or CISPI 301.
- C. CISPI, Hubless-Piping Couplings:
 - 1. Couplings shall bear CISPI collective trademark.
 - 2. Standards: ASTM C 1277 and CISPI 310.

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

- A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- C. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- D. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

2.6 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 2. Unshielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1173.
 - b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - c. End Connections: Same size as and compatible with pipes to be joined.
 - d. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
 3. Shielded, Nonpressure Transition Couplings:
 - a. Anaco, Proflex, MIFAB, PipeConx
 - b. Standard: ASTM C 1460.

- c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- d. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 - 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 - 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 - 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 - 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
 - a. Straight tees, elbows, and crosses may be used on vent lines.
 - 3. Do not change direction of flow more than 90 degrees.
 - 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

- a. Reducing size of waste piping in direction of flow is prohibited.
- K. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste and Horizontal Waste Piping: 1/4-inch per foot slope in downward in direction of flow for piping NPS 2 and smaller; 1/8-inch per foot slope in downward in direction of flow for piping NPS 3 and larger.
 - 2. Vent Piping: Slope down toward vertical fixture vent or toward vent stack.
- M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- N. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- O. Install aboveground PVC piping according to ASTM D 2665.
- P. Install underground PVC piping according to ASTM D 2321.
- Q. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - a. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
- R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- S. Install sleeves for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 - 1. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- C. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in ODs.
 - 2. In Waste Drainage Piping: Shielded, nonpressure transition couplings.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 6. Install individual, straight, horizontal piping runs: MSS Type 1, adjustable, steel clevis hangers.
 - 7. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install hangers for cast-iron and copper soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Install hangers for PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- D. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- E. Support vertical runs of cast iron and copper soil piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

- F. Support vertical runs of PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 - 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 22 05 00 "Common Work Requirements for Plumbing."

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections, and arrange for reinspection.

- C. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
 - c. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
 - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.10 PIPING SCHEDULE

- A. Aboveground, soil, waste, and vent piping shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Copper Type DWV tube, copper drainage fittings, and soldered joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- B. Underground, soil, waste, and vent piping shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION

SECTION 22 13 19

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. Miscellaneous sanitary drainage piping specialties.

B. Related Requirements:

1. Section 07 72 00 "Roof Accessories" for preformed flashings.
2. Section 07 84 13 "Penetration Firestopping" for through-penetration firestop assemblies.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

A. Cast Iron Floor Cleanouts:

1. J.R.Smith, Josam, MIFAB, Sioux Chief, Wade, Watts, or Zurn.
2. See schedule on drawings.

2.3 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. J.R.Smith, Josam, MIFAB, Sioux Chief, Wade, Watts, or Zurn.
2. Standard: ASME A112.6.3.
3. See schedule on drawings.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
 - a. NPS 2: 4-inch- minimum water seal.
 - b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

B. Floor-Drain, Inline Trap Seal:

1. ProSet, or equal.
2. Description: Inline floor drain trap seal, forming a physical barrier to slow trap evaporation while not impeding flow from drain.
3. Material: Polymer.
4. Standard: Tested and certified in accordance with ASSE 1072.
5. Listing: ICC-ES listed.
6. Size: Same as floor drain outlet or strainer throat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 3 and smaller and 75 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- B. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- C. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- D. Install wood-blocking reinforcement for wall-mounting-type specialties.
- E. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.
 2. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.
 - a. Maintain integrity of waterproof membranes where penetrated.
 3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 PIPING CONNECTIONS

- A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
 - 1. Nameplates and signs are specified in Section 22 05 00 "Common Work Requirements for Plumbing."

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 34 00

FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial, high-efficiency, gas-fired, storage, domestic-water heaters.
2. Domestic-water heater accessories.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include diagrams for power, signal, and control wiring.

C. Product Certificates: For each type of commercial, gas-fired, domestic-water heater.

D. Sample warranty.

E. Operation and maintenance data.

1.3 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of fuel-fired, domestic- water heaters that fail in materials or workmanship within specified warranty period.

1. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

- 1) Storage Tank: Three years.
- 2) Controls and Other Components: One year.
- 3)

PART 2 - PRODUCTS

3.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. ASHRAE/IES Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IES 90.1.

C. NSF Compliance: Fabricate and label equipment components that will be in contact

with potable water to comply with NSF 61 and NSF 372.

3.2 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

A. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:

1. Heat Transfer Products, Rheem, Voyager, or equal.
2. Standard: ANSI Z21.10.3/CSA 4.3.
3. Description: Manufacturer's proprietary design to provide at least 95 percent combustion efficiency at optimum operating conditions.
4. Storage-Tank Construction: 316L stainless-steel with 150-psig minimum working-pressure rating.
 - a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.
 - 1) NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.
 - 2) NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.
 - b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable- water tank linings, including extending finish into and through tank fittings and outlets.
5. Factory-Installed, Storage-Tank Appurtenances:
 - a. Dip Tube: Required unless cold-water inlet is near bottom of tank.
 - b. Drain Valve: Corrosion-resistant metal with hose-end connection.
 - c. Insulation: Comply with ASHRAE/IES 90.1. Surround entire storage tank except connections and controls.
 - d. Jacket: Steel with enameled finish.
 - e. Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for gas-fired, high-efficiency, domestic-water heaters and natural-gas fuel.
 - f. Temperature Control: Adjustable thermostat.
 - g. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
 - h. Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

B. Capacity and Characteristics:

1. Refer to schedule on drawings.
2. Temperature Setting: 120 deg F.
3. Electrical Characteristics:
 - a. Volts: 120 V.
 - b. Phase: Single.
 - c. Hertz: 60 Hz.
4. Minimum Vent Diameter: 3 inches.

3.3 DOMESTIC-WATER HEATER ACCESSORIES

- A. Piping-Type Heat Traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1.

- B. Comply with requirements for ball-type shutoff valves specified in Section 22 05 00 "Valves for Plumbing Piping."
 - 1. Comply with requirements for balancing valves specified in Section 22 11 19 "Domestic Water Piping Specialties."
- C. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic- water heater. Select relief valves with sensing element that extends into storage tank.
 - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete."
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 6. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 7. Anchor domestic-water heaters to substrate.
- B. Install domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 22 05 23 " Valves for Plumbing Piping."
- C. Install gas-fired, domestic-water heaters in accordance with NFPA 54.
 - 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
 - 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
 - 3. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 23 11 23 "Facility Natural-Gas Piping."
- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-

water-heater relief- valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

- E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 22 11 19 "Domestic Water Piping Specialties."
- F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."
- G. Install piping-type heat traps on inlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
- H. Fill domestic-water heaters with water.
- I. Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water shall contain less than 0.25 percent of lead by weight.

3.2 PIPING CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 22 11 16 "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Section 23 11 23 "Facility Natural-Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections with the assistance of a factory-authorized service representative.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Domestic-water heaters will be considered defective if they do not pass tests and inspections.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters. Training shall be a minimum of one hour.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 42 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Lavatory faucets.
3. Service sinks.
4. Sink faucets.
5. Water closets.
6. Toilet seats.
7. Supply fittings.
8. Waste fittings.
9. Grout.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. ASME A112.19.1/CSA B45.2 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures.
- B. ASME A112.19.5/CSA B45.15 - Flush Valves and Spuds For Water Closets, Urinals, and Tanks.
- C. ASSE 1037/ASME A112.1037/CSA B125.37 - Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures.
- D. IAMPO/ANSI Z124.5 – Plastic Toilet Seats.
- E. ASME A112.6.1M – Floor Affixed Supports for Off-The-Floor Plumbing Fixtures for Public Use.
- F. ICC A117.1 – Accessible and Usable Buildings and Facilities.
- G. ASTM A1045 - Flexible PVC Gaskets Used In Connection of Vitreous China Plumbing Fixtures To Sanitary Drainage Systems.
- H. ASME A112.4.3 - Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System.
- I. ASME A112.18.2/CSA B125.2 – Plumbing Waste Fittings.

J. ASME A112.18.1/CSA B125.1 - Plumbing Supply Fittings.

2.2 GENERAL REQUIREMENTS

2.3 LAVATORIES

A. Refer to schedules on drawings for fixture information not listed in specification.

B. Lavatories Countertop-Mounted Bowl:

1. Fixture:
 - a. General: Countertop lavatory bowl for mounting on base unit.
2. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
3. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

2.4 LAVATORY FAUCETS

A. Refer to schedules on drawings for fixture information not listed in specification.

B. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.

C. Lavatory Faucets Valve:

1. Description: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
2. Standard: ASME A112.18.1/CSA B125.1.
3. Body Material: General duty, solid brass.
4. Finish: Polished chrome plate.
5. Inlet(s): NPS 3/8 tubing, plain end.
6. Drain: Grid.

2.5 SERVICE SINKS

A. Refer to schedules on drawings for fixture information not listed in specification.

B. Service Sinks - Enameled Cast Iron, Trap Standard Mounted:

1. Fixture:
 - a. Refer to schedules on drawings for fixture information not listed in specification.
 - b. Standard: ASME A112.19.1/CSA B45.2.
 - c. Type: Service sink with back.
 - d. Back: Two faucet holes.
 - e. Color: White.
 - f. Mounting: NPS 2 P-trap standard with grid strainer inlet, cleanout, and floor flange.
 - g. Rim Guard: On front and sides.
2. Faucet: Comply with requirements in "Manually Operated Sink Faucets" Article.
3. Support: Comply with "sink carrier" requirements in "Supports" article.

2.6 MANUALLY OPERATED SINK FAUCETS

- A. Refer to schedules on drawings for fixture information not listed in specification.
- B. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.
- C. Commercial Sink Faucets - Manual Type:
 - 1. Description: Single-control nonmixing
 - 2. Standard: ASME A112.18.1/CSA B125.1.
 - 3. General: Coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
 - 4. Body Material: Commercial, solid brass, or die-cast housing with brazed copper and brass waterway.

2.7 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

- A. Refer to schedules on drawings for fixture information not listed in specification.
- B. Water Closets - Floor Mounted, Bottom Outlet, Tank Type:
 - 1. Material: Vitreous china.
 - 2. Type: Siphon jet.
 - 3. Style: Tank type.
 - 4. Height: Refer to drawings.
 - 5. Rim Contour: Elongated.
 - 6. Water Consumption: Refer to drawings.
 - 7. Color: White.

2.8 TOILET SEATS

- A. Refer to schedules on drawings for fixture information not listed in specification.
- B. Toilet Seats:
 - 1. Standard: IAPMO Z124.5/ANSI Z124.5.
 - 2. Material: Plastic.
 - 3. Type: Commercial (Standard).
 - 4. Shape: Elongated rim (Open front).
 - 5. Configuration: Open front without cover.
 - 6. Hinge Type: Self-sustaining, check.
 - 7. Hinge Material: Noncorroding metal.
 - 8. Color: White.

2.9 SUPPLY FITTINGS

- A. Refer to schedules on drawings for fixture information not listed in specification.
- B. NSF Standard: Comply with NSF 61 and NSF 372 for faucet materials that will be in contact with potable water.
- C. Standard: ASME A112.18.1/CSA B125.1.

D. Lavatory and Sink Supply Fittings:

1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
 - a. Operation: Loose key.
3. Risers:
 - a. Size:
 - 1) NPS 3/8 for lavatories.
 - 2) NPS 1/2 for sinks.
 - b. Material: Chrome-plated, soft-copper flexible tube riser.

2.10 WASTE FITTINGS

- A. Refer to schedules on drawings for fixture information not listed in specification.
- B. Standard: ASME A112.18.2/CSA B125.2.
- C. Drain: Grid type with NPS 1-1/4 offset tailpiece for accessible lavatories.
- D. Trap:
 1. Size:
 - a. NPS 1-1/2 by NPS 1-1/4 for lavatories.
 - b. Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated-brass or -steel wall flange.

2.11 GROUT

- A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000 psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install plumbing fixtures level and plumb in accordance with roughing-in drawings.
- B. Water Closets
 1. Examination:
 - a. Examine roughing-in for water-supply piping and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
 - b. Examine walls and floors for suitable conditions where water closets will be installed.

- c. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 2. Installation, General:
 - a. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
 - b. Install accessible, wall-mounted water closets at mounting height in accordance with ICC A117.
 - 3. Support Installation:
 - a. Install supports, affixed to building substrate, for floor-mounted.
 - b. Install floor-mounted water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
- C. Install toilet seats on water closets.
- D. Install counter-mounting fixtures in and attached to casework.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Use ball valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 22 05 23 "Valves for Plumbing Piping".
- F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- G. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- H. Install traps on fixture outlets.
 - 1. Omit trap on fixtures with integral traps.
 - 2. Omit trap on indirect wastes unless otherwise indicated.
- I. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."
- J. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- K. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.2 PIPING CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."
- E. Where installing piping adjacent to plumbing fixtures, allow space for service and maintenance.

3.3 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 22 45 00

EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Combination units.
 - 2. Water-tempering equipment.

1.2 DEFINITIONS

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Tepid: Between 60 and 100 deg F.

1.3 SUBMITTALS

- A. Product data.
- B. Shop Drawings:
 - 1. Plans, elevations, sections, and mounting details.
- C. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ANSI/ISEA Z358.1 for emergency plumbing fixtures including third-party certification of fixtures.
- B. Comply with ASSE 1071 for temperature-actuated mixing valves for plumbed emergency fixtures.
- C. Comply with ASME A112.18.1/CSA B125.1 for water-supply fittings.
- D. Comply with ASME A112.18.2/CSA B125.2 for plumbing waste fittings.
- E. Comply with NSF 61 and NSF 372 for fixture materials that will be in contact with potable water.
- F. Comply with requirements in ICC A117.1 for plumbing fixtures for people with disabilities.

2.2 COMBINATION UNITS

- A. Refer to schedules on drawings for fixture information not listed in specification.

B. Combination Units - Emergency Shower with Eyewash, Standard, Plumbed:

1. Bradley, Guardian, Haws, or equal.
2. Piping:
 - a. Material: Galvanized steel.
 - b. Unit Supply: NPS 1-1/2.
 - c. Unit Drain: Outlet at back or side near bottom.
3. Shower:
 - a. Capacity: Not less than 20 gpm for at least 15 minutes.
 - b. Supply Piping: NPS 1 with flow regulator and stay-open control valve.
 - c. Control-Valve Actuator: Pull rod.
 - d. Mounting: Pedestal.
4. Eyewash Unit:
 - a. Capacity: Not less than 0.4 gpm for at least 15 minutes.
 - b. Supply Piping: NPS 1/2 with flow regulator and stay-open control valve.
 - c. Control-Valve Actuator: Paddle.
 - d. Spray-Head Assembly: Two receptor-mounted spray heads.
 - e. Mounting: Attached shower pedestal.
5. Accessories:
 - a. Thermostatic mixing valve assembly including ball valve shutoffs and outlet temperature gauge.
 - b. 60-inch pull rod.
 - c. Stainless steel ball valve.

2.3 WATER-TEMPERING EQUIPMENT

A. Water-Tempering Equipment - Hot and Cold Water:

1. Bradley, Guardian, Leonard, Powers, or equal.
2. Description: Factory-fabricated equipment with thermostatic mixing valve.
 - a. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.
 - b. Supply Connections: For hot and cold water.

PART 3 - EXECUTION

3.1 INSTALLATION OF EMERGENCY PLUMBING FIXTURE

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.
- B. Install fixtures level and plumb.
- C. Fasten fixtures to substrate.
- D. Install shutoff valves in water-supply piping to fixtures, to facilitate maintenance of equipment. Use ball or gate valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Comply with requirements for valves specified in Section 22 05 23 "Valves for Plumbing Piping."
- E. Install dielectric fitting in supply piping to emergency equipment if piping and

equipment connections are made of different metals. Comply with requirements for dielectric fittings specified in Section 22 11 16 "Domestic Water Piping."

- F. Install thermometers in supply and outlet piping connections to water-tempering equipment. Comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."
- G. Install indirect waste piping on drain outlet of emergency equipment receptors that are indicated to be indirectly connected to drainage system. Comply with requirements for waste piping specified in Section 22 13 16 "Sanitary Waste and Vent Piping."
- H. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.2 PIPING CONNECTIONS

- A. Connect hot- and cold-water-supply piping to hot- and cold-water, water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures. Comply with requirements for hot- and cold-water piping specified in Section 22 11 16 "Domestic Water Piping."
- B. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.

3.3 FIELD QUALITY CONTROL

- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 5. Emergency plumbing fixtures and water-tempering equipment will be considered defective if they do not pass tests and inspections.

3.4 ADJUSTING

- A. Operate and adjust emergency plumbing fixtures and controls. Replace damaged and malfunctioning fixtures and controls.
- B. Adjust or replace fixture flow regulators for proper flow.
- C. Adjust equipment temperature settings.

3.5 CLEANING AND PROTECTION

- A. Clean emergency plumbing fixtures with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed emergency plumbing fixtures and fittings.
- C. Do not allow use of emergency plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 26 05 00

COMMON WORK REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Related Requirements
2. Project Overview
3. Scope
4. Related Work
5. Reference Standards
6. Regulatory Requirements
7. Quality Assurance
8. Continuity of Existing Services and Systems
9. Protection of Finished Surfaces
10. Approved Electrical Testing Laboratories
11. Sleeves and Openings
12. Sealing and Fire Stopping
13. Owner Furnished Equipment
14. Work by Owner
15. Provisions for Future Work
16. Intent
17. Omissions
18. Submittals
19. Project/Site Conditions
20. Work Sequence and Scheduling
21. Work by Other Trades
22. Offsite Storage
23. Salvage Materials
24. Certificates and Inspections
25. Operating and Maintenance Data
26. Record Drawings
27. Products:
 - a. Access Panels and Doors
 - b. Sealing and Fire Stopping
28. Work By Others
 - a. Excavation and Backfill
 - b. Concrete Work
 - c. Cutting and Patching
 - d. Building Access
 - e. Equipment Access
 - f. Coordination
 - g. Sleeves and Openings
 - h. Agency Training

1.2 RELATED REQUIREMENTS

- ###### A. Applicable provisions of Division 1 govern work under this Section.

- B. Section 01 91 01 or 01 91 02 – Commissioning Process
- C. Section 07 84 00 – Fire Stopping

1.3 REFERENCE STANDARDS

- A. Abbreviations of standards organizations referenced in this, and other sections are as follows:
 - 1. ANSI American National Standards Institute
 - 2. ASTM American Society for Testing and Materials
 - 3. EPA Environmental Protection Agency
 - 4. ETL Electrical Testing Laboratories, Inc.
 - 5. IEEE Institute of Electrical and Electronics Engineers
 - 6. IES Illuminating Engineering Society
 - 7. ISA Instrument Society of America
 - 8. NBS National Bureau of Standards
 - 9. NEC National Electric Code
 - 10. NEMA National Electrical Manufacturers Association
 - 11. NESC National Electrical Safety Code
 - 12. NFPA National Fire Protection Association
 - 13. NRTL Nationally Recognized Testing Laboratory
 - 14. UL Underwriters Laboratories Inc.
 - 15. DSPS Wisconsin Department of Safety and Professional Services

1.4 REGULATORY REQUIREMENTS

- A. All work and materials are to conform in every detail to applicable rules and requirements of the Wisconsin State Electrical Code (SPS 316), the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, the National Electrical Safety Code, and present manufacturing standards (including NEMA).
- B. All Division 26 work shall be done under the direction of a currently licensed State of Wisconsin Master Electrician.
- C. All Division 26 work shall comply with SPS 101.862 and SPS 305.40 for electrical wiring integral with pre-manufactured structures.

1.5 QUALITY ASSURANCE

- A. 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 performance from the system into which these items are placed.
- B. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.
- C. All materials, shall be listed by and shall bear the label of an approved Nationally Recognized Testing Laboratory (NRTL) as identified by the United States Occupational Safety and Health Administration (OSHA), per the OSHA Nationally Recognized Testing

Laboratory Program. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system, shall be so labeled.

1.6 CONTINUITY OF EXISTING SERVICES AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by the owner. The institution may require written approval. Any outage must be scheduled when the interruption causes the least interference with normal institutional schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- B. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible. Note that institutional operations are on a seven-day week schedule.

1.7 PROTECTION OF FINISHED SURFACES

- A. Furnish one can of touch-up paint for each different color factory finish furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.8 APPROVED ELECTRICAL TESTING LABORATORIES

- A. The following laboratories are approved for providing electrical product safety testing, listing, and labeling services as required in these specifications:
- B. A Nationally Recognized Testing Laboratory (NRTL) as identified by the United States Occupational Safety and Health Administration (OSHA), per the OSHA Nationally Recognized Testing Laboratory Program.

1.9 SLEEVES AND OPENINGS

- A. Refer to Division 1, General Requirements, Sleeves and Openings.

1.10 SEALING AND FIRE STOPPING

- A. Sealing and fire stopping of sleeves/openings between conduits, cable trays, wireways, troughs, cable bus, busduct, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.

1.11 OWNER FURNISHED EQUIPMENT

- A. None

1.12 PROVISIONS FOR FUTURE WORK

- A. None

1.13 INTENT

- A. 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.
- B. 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 exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the owner's requirement (as determined by the Architect/Owner/Engineer). Refer to the General Conditions of the Contract for further clarification.
- C. It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
- D. All sizes as given are minimum except as noted.
- E. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the Owner's and/or A/E's inspections, tests, and approval from the commencement until the acceptance of the completed work.
- F. Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.

1.14 OMISSIONS

- A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the A/E to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted.

1.15 SUBMITTALS

- A. Submit for all equipment and systems as indicated in the respective specification sections, marking each submittal with that specification section number. 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. Failure to do this may result in the submittal(s) being returned to the Contractor for correction and resubmission. Failing to follow these instructions does not relieve the Contractor from the requirement of meeting the project schedule.
- B. On request from the A/E, the successful bidder shall furnish additional drawings, illustrations, catalog data, performance characteristics, etc.
- C. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.
- D. The submittals must be approved before fabrication is authorized.

1.16 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on drawings, unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of A/E before proceeding.
- C. Tools, materials, and equipment shall be confined to areas designated by the A/E and Owner.

1.17 WORK SEQUENCE AND SCHEDULING

- A. Install work in phases to accommodate user agency's occupancy requirements. During the construction period coordinate electrical schedule and operations with Owner's Construction Representative.

1.18 WORK BY OTHER TRADES

- A. Every attempt has been made to indicate in this trade's specifications and drawings all work required of this Contractor. However, there may be additional specific paragraphs in other trade specifications and addenda, and additional notes on drawings for other trades which pertain to this trade's work, and thus those additional requirements are hereby made a part of these specifications and drawings.
- B. Electrical details on drawings for equipment to be provided by others are based on preliminary design data only. This Contractor shall lay out the electrical work and shall be responsible for its correctness to match equipment actually provided by others.

1.19 OFFSITE STORAGE

- A. Prior approval by the A/E will be needed. In general, building wire, conduit, fittings, and similar rough-in material will not be accepted for off-site storage. No material will be accepted for off-site storage unless shop drawings for the material have been approved.

1.20 SALVAGE MATERIALS

- A. No materials removed from this project shall be reused unless specifically noted otherwise. All materials removed shall become the property of and shall be disposed of by the Contractor.
- B. [The following material shall be removed from service and turned over to the owner or user agency, at a site selected by the owner, in the same condition as when it was removed.]

1.21 CERTIFICATES AND INSPECTIONS

- A. Obtain and pay for all required installation inspections, except those provided by the Owner, in accordance with the Wisconsin Administrative Code. Deliver originals of these certificates to the A/E.
- B. The Electrical Contractor is responsible for coordination of electrical inspections.

1.22 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.
- B. In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:
 - 1. Manufacturer's wiring diagrams for electrically powered equipment.

1.23 RECORD DRAWINGS

- A. The Contractor shall maintain at least one copy each of the specifications and drawings on the job site at all times.
- B. The Contractor shall maintain at least one set of contract drawings on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.
- C. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.
- D. At completion of the project, the Contractor shall submit the marked-up record drawings to the Architect/Engineer prior to final payment.

PART 2 - PRODUCTS

2.1 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 provided under other divisions are sufficient; no additional access provisions are required unless specifically indicated.
- B. Plaster Walls and Ceilings, Concealed Cavities:
 - 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 needing service; minimum size 20" x 30".

2.2 IDENTIFICATION

- A. See Electrical section 26 05 53 – Identification for Electrical Systems.

2.3 SEALING AND FIRE STOPPING

A. Fire and/or Smoke Rated Penetrations:

1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 "Fire Stopping".

B. Non-Rated Penetrations:

1. Conduit Penetrations Below Grade:
 - a. 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 water-stop type wall sleeve.
2. Conduit and Cable Tray Penetrations Above Grade:
 - a. At through-wall conduit and cable tray penetrations of non-rated interior and exterior walls, and floors, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated electrical systems installation unless noted otherwise.

3.2 CONCRETE WORK

- A. The Division 3 Contractor will perform all cast-in-place concrete unless noted otherwise elsewhere. 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.

3.3 CUTTING AND PATCHING

- A. Refer to Division 1, General Requirements, Cutting and Patching.

3.4 BUILDING ACCESS

- A. 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.

3.5 EQUIPMENT ACCESS

- A. 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 with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access doors.

3.6 COORDINATION

- A. The Contractor shall 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 project, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.
- B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.
- C. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

3.7 SLEEVES AND OPENINGS

- A. Conduit penetrations in new poured concrete horizontal construction requiring F and T rating: Form opening using hole form or core drill opening. Alternatively provide cast in place fire stopping devices/sleeves.
- B. Conduit penetrations in new poured concrete horizontal construction requiring F rating but no T rating: Same as conduit penetrations in new poured concrete construction requiring F and T ratings except that schedule 40 steel pipe sleeves may also be used.
- C. Conduit penetrations in new poured concrete horizontal construction that do not require F or T ratings: Provide schedule 40 steel pipe sleeve, form opening using hole form or core drill opening.
- D. Conduit penetrations in existing concrete floors: Core drill openings.
- E. Conduit penetrations through existing floors located in food service areas that do not require a T rating: Core drill sleeve opening large enough to insert schedule 40 sleeve, extend sleeve 2 inches above the floor and grout area around sleeve with hydraulic setting, non-shrink grout.
- F. Where penetrating conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.

3.8 SEALING AND FIRE STOPPING

- A. FIRE AND/OR SMOKE RATED PENETRATIONS:
 - 1. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 00 Fire Stopping.
- B. NON-RATED PENETRATIONS:
 - 1. 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. Install so that the bolts used to tighten the seal are accessible from the interior of the building or vault.

2. At all interior and exterior walls, through-wall conduit penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the sleeve or cored opening and the conduit is completely blocked.

C. PENETRATIONS SUBJECT TO WATER INTRUSION:

1. For penetrations (both rated and non-rated) in floors subject to water intrusion or in rooms housing electrical equipment (but not within walls) provide one of the following:
 - a. Conduit penetration where steel pipe sleeve is used extend steel sleeve 2" above the floor.
 - b. Conduit penetration where cast in place fire stopping device/sleeve is used, extend device/sleeve 2" above the floor (provided it meets the device's UL listing).
 - c. Conduit penetration where there is no steel sleeve or cast in place fire stopping device/sleeve, provide 2"x 2" x 1/8" galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8" on center. Seal corners water tight with urethane caulk.
2. Floors subject to water intrusion or rooms housing electrical equipment include the following locations:
 - a. Restrooms
 - b. Janitor Rooms w/ Sinks
 - c. Mechanical/Plumbing Equipment Rooms
 - d. Chemical/Hazardous Waste Storage
 - e. Electrical Equipment Rooms
3. Provide waterproof caulk sealant top coating on fire stopping system (or other approved means to protect the fire stopping system from water) in areas subject to wash down such as Food Service and Dish Washing Areas.

3.9 HOUSEKEEPING AND CLEAN UP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.10 AGENCY TRAINING

- A. All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01 or 01 91 02.
- B. Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 8 hours.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 26 05 23 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
3. Section 27 15 00 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden; brand of Belden, Inc.
2. Cerro Wire LLC.
3. General Cable; Prysmian Group North America.
4. Southwire Company, LLC.
5. Or approved equal.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden; brand of Belden, Inc.
2. General Cable; Prysmian Group North America.
3. Southwire Company, LLC.
4. Or approved equal.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors .

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Steel , interlocked.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M Electrical Products.
 - 2. ABB, Electrification Business.
 - 3. AFC Cable Systems; Atkore International.
 - 4. Hubbell Utility Solutions; Hubbell Incorporated.
 - 5. NSi Industries LLC.
 - 6. Service Wire Co.
 - 7. Or approved equal.
- C. Jacketed Cable Connectors: For steel jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: Copper.
 - 2. Type: One hole with standard barrels.
 - 3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders:
 - 1. Copper; stranded for No. 12 AWG and larger.
- B. Branch Circuits:
 - 1. Copper, stranded for No. 12 AWG and larger.
- C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway .
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway Metal-clad cable, Type MC.
- E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07 84 13 "Penetration Firestopping."

SECTION 26 05 23

CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Category 5e balanced twisted pair cable.
2. Balanced twisted pair cabling hardware.
3. Control cabling.
4. Control-circuit conductors.

B. Related Requirements:

1. 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
 1. Flame Travel Distance: 60 inch or less.
 2. Peak Optical Smoke Density: 0.5 or less.
 3. Average Optical Smoke Density: 0.15 or less.
- C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.2 CATEGORY 5e BALANCED TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMP NETCONNECT; a TE Connectivity Ltd. company.
 2. Belden Inc.
 3. Berk-Tek Leviton; a Nexans/Leviton alliance.
 4. CommScope, Inc.
 5. General Cable; Prysmian Group North America.
 6. Mohawk Cable; brand of Belden, Inc.
 7. Or Approved Equal
- C. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.
- D. Conductors: 100-ohm, No. 24 AWG solid copper.
- E. Shielding/Screening: Unshielded twisted pairs (UTP) .
- F. Cable Rating: Plenum.
- G. Jacket: White thermoplastic.
- 2.3 CONTROL CABLE
- A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with NFPA 262.
- 2.4 CONTROL-CIRCUIT CONDUCTORS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Encore Wire Corporation.
 2. General Cable; Prysmian Group North America.
 3. Southwire Company, LLC.
 4. Or approved equal
- B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 - 1. Outlet boxes must be no smaller than 4-inch square by 2-1/8 inch deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
 - 2. Flexible metal conduit must not be used.
- B. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
 - 1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
 - 2. Install cable trays to route cables if conduits cannot be located in these positions.
 - 3. Secure conduits to backboard if entering the room from overhead.
 - 4. Extend conduits 3 inch above finished floor.
 - 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
 - 1. Comply with TIA-568-C Series of standards.
 - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
 - 3. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 4. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
 - 5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
 - 6. Secure and support cables at intervals not exceeding 30 inch and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
 - 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
 - 9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.

10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
11. Support: Do not allow cables to lay on removable ceiling tiles.
12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
13. Provide strain relief.
14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
15. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.

C. Balanced Twisted Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Install termination hardware as specified in Section 27 15 13 "Communications Copper Horizontal Cabling" unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inch above ceilings by cable supports not more than 30 inches apart.
3. Cable must not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG .

3.5 FIRESTOPPING

- A. Comply with requirements in Section 07 84 13 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.6 GROUNDING

- A. For control-voltage wiring and cabling, comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers must use label stocks, laminating adhesives, and inks complying with UL 969.
- C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Intersystem bonding bridge grounding connector.
7. Grounding and bonding busbars.
8. Grounding (earthing) electrodes.

B. Related Requirements:

1. 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, THHN/THWN-2, copper wire or cable, green color, in accordance with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ERICO; brand of nVent Electrical plc.
 - b. Harger Lightning & Grounding; business of Harger, Inc.
 - c. Or approved equal
2. Referenced Standards: Complying with one or more of the following:
 - a. Soft or Annealed Copper Wire: ASTM B3
 - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
 - c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
 - d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

2.2 GROUNDING AND BONDING CLAMPS

- A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications; see Section 27 05 26 "Grounding and Bonding for Communications Systems," for selection and installation guidelines.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- C. UL KDER and KDSH - Hex-Fitting-Type Pipe and Rod Grounding and Bonding Clamp :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. ERICO; brand of nVent Electrical plc.
 - e. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - f. Panduit Corp.
 - g. Or approved equal
 - 2. General Characteristics:
 - a. Two pieces with zinc-plated bolts.
 - b. Clamp Material: Corrosion-resistant copper alloy.
 - c. Listed for outdoor use.
- D. UL KDER and KDSH - U-Bolt-Type Pipe and Rod Grounding and Bonding Clamp :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. ERICO; brand of nVent Electrical plc.
 - e. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - f. Panduit Corp.
 - g. Or approved equal
 - 2. General Characteristics:
 - a. Clamp Material: Bronze.
 - b. Listed for outdoor use.
- E. UL KDER - Beam Grounding and Bonding Clamp :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Anderson; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - c. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - d. Panduit Corp.
 - e. Penn-Union Corp.; subsidiary of Nesco, Inc.
 - f. Or approved equal
2. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.

F. UL KDER - Exothermically Welded Connection :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. ERICO; brand of nVent Electrical plc.
 - e. Or approved equal
2. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

B. Performance Criteria:

1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Grounding Bushing :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Arlington Industries, Inc.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. Or approved equal
2. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.4 GROUNDING AND BONDING HUBS

- A. Description: Hubs with certified grounding or bonding locknut.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- C. UL KDER - Grounding and Bonding Hub :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Arlington Industries, Inc.
 - c. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - d. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - e. Penn-Union Corp.; subsidiary of Nesco, Inc.
 - f. Or approved equal
 - 2. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.5 GROUNDING AND BONDING CONNECTORS

- A. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- B. UL KDER - Lay-In Lug Mechanical-Type Grounding and Bonding Busbar Terminal :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Or approved equal
 - 2. General Characteristics: Mechanical-type, copper rated for direct burial terminal with set screw.

2.6 INTERSYSTEM BONDING BRIDGE GROUNDING CONNECTORS

- A. Description: Devices that provide means for connecting communications systems grounding and bonding conductors at service equipment or at disconnecting means for buildings or structures.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
- C. UL KDSH - One-Piece Intersystem Bonding Bridge Grounding Connector:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - b. Madison Electric Products; business of Southwire Company, LLC.
 - c. Or approved equal
 - 2. General Characteristics: Zinc-alloy one-piece construction; six terminating points; gangable.

2.7 GROUNDING AND BONDING BUSBARS

- A. Description: Miscellaneous grounding and bonding device that serves as common connection for multiple grounding and bonding conductors.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- C. UL KDER - Equipment Room Grounding and Bonding Busbar:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - b. Chatsworth Products, Inc.
 - c. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - d. Cooper B-line; brand of Eaton, Electrical Sector.
 - e. ERICO; brand of nVent Electrical plc.
 - f. Harger Lightning & Grounding; business of Harger, Inc.
 - g. Hoffman; brand of nVent Electrical plc.
 - h. ILSCO.

- i. Panduit Corp.
 - j. Or approved equal
- 2. General Characteristics:
 - a. Bus: Rectangular bar of annealed copper.
 - b. Mounting Stand-Off Insulators: Lexan or PVC.
 - 1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.
- 3. Options:
 - a. Predrilled Hole Pattern: Suitable for installing specified grounding and bonding connectors.
 - b. Mounting Hardware: Stand-off brackets that provide 2 inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

2.8 GROUNDING (EARTHING) ELECTRODES

- A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.
- B. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Listing Criteria:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
- C. UL KDER - Rod Electrode :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. allG Fabrication; business of Advanced Lightning Technology, Ltd.
 - c. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - d. ERICO; brand of nVent Electrical plc.
 - e. Galvan Industries, Inc.; Electrical Products Division, LLC.
 - f. Harger Lightning & Grounding; business of Harger, Inc.
 - g. Or approved equal
 - 2. General Characteristics: Copper-clad steel; 3/4 inch by 10 ft .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of electrical service equipment connection.

- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING CONDUCTORS

- A. Conductors: Install solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.
- B. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
- C. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.
- D. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
- E. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
- F. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
- G. Underground Grounding Conductors: Install bare copper conductor, 2/0 AWG minimum.
 - 1. Bury at least 30 inch below grade.

3.3 SELECTION OF CONNECTORS

- A. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.4 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
 - 1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
 - 2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:

1. Conductors:
 - a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
2. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - b. Make connections with clean, bare metal at points of contact.
 - c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
 - d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - f. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1) Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
 - 2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.
 - g. Grounding and Bonding for Piping:
 - 1) Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with bolted connector.
3. Electrodes:
 - a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.
 - 1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2) Use exothermic welds for below-grade connections.
 - b. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.
 - c. Concrete-Encased Electrode (Ufer Ground):
 - 1) Fabricate in accordance with NFPA 70; use minimum of 20 ft of bare copper conductor not smaller than 4 AWG .

- a) If concrete foundation is less than 20 ft long, coil excess conductor within base of foundation.
 - b) Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- 2) Fabricate in accordance with NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 ft long. If reinforcing is in multiple pieces, connect together by usual steel tie wires or exothermic welding to create required length.
- 4. Grounding at Service:
 - a. Equipment grounding conductors and grounding electrode conductors must be connected to ground bus. Install main bonding jumper between neutral and ground buses.
- 5. Grounding Underground Distribution System Components:
 - a. Comply with IEEE C2 grounding requirements.
- 6. Equipment Grounding:
 - a. Install insulated equipment grounding conductors with feeders and branch circuits.
 - b. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
 - c. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
 - d. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.5 PROTECTION

- A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Structural steel for fabricated supports and restraints.
4. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
5. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Allied Tube & Conduit; Atkore International.
 - c. Cooper B-line; brand of Eaton, Electrical Sector.
 - d. Unistrut; Atkore International.
 - e. Or approved equal.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 3. Material for Channel, Fittings, and Accessories: Plain steel .
 4. Channel Width: 1-5/8 inch .
 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
- B. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-line; brand of Eaton, Electrical Sector.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) MKT Fastening, LLC.
 - 5) Or approved equal
 2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
 5. Toggle Bolts: All steel springhead type.
 6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 05 50 00 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 SELECTION

- A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:
1. NECA NEIS 101

- B. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceway and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERM as required by NFPA 70. Minimum rod size must be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps .
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF SUPPORTS

- A. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT may be supported by openings through structure members, in accordance with NFPA 70.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69 .
 - 5. To Light Steel: Sheet metal screws.
 - 6. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT-S raceways and elbows.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type IMC raceways.
4. Type LFMC raceways.
5. Type PVC raceways and fittings.
6. Fittings for conduit, tubing, and cable.
7. Solvent cements.
8. Surface metal raceways and fittings.
9. Wireways and auxiliary gutters.
10. Metallic outlet boxes, device boxes, rings, and covers.
11. Nonmetallic outlet boxes, device boxes, rings, and covers.
12. Termination boxes.
13. Cabinets, cutout boxes, junction boxes, and pull boxes.
14. Cover plates for device boxes.

B. Related Requirements:

1. 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Wireways and auxiliary gutters.
2. Surface metal raceways.
3. Cabinets and cutout boxes.

B. Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details. Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

PART 2 - PRODUCTS

2.1 TYPE EMT-S RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 797 and UL Category Control Number FJMX.

B. Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit; Atkore International.
 - b. Calconduit; Atkore International.
 - c. Emerson Electric Co.
 - d. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
 - e. Topaz Lighting & Electric.
 - f. Western Tube; Zekelman Industries.
 - g. Wheatland Tube; Zekelman Industries.
 - h. ABB, Electrification Business.
 - i. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - j. Erickson Electrical Equipment Company.
 - k. Hoffman; brand of nVent Electrical plc.
 - l. Or approved equal
2. Material: Steel.
3. Options:
 - a. Exterior Coating: Zinc .
 - b. Interior Coating: Zinc with organic top coating .
 - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - d. Colors: As indicated on Drawings.

2.2 TYPE ERM-C-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 6 and UL Category Control Number DYIX.

B. Galvanized-Steel Electrical Rigid Metal Conduit (ERM-C-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit; Atkore International.
 - b. Calconduit; Atkore International.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
 - e. Topaz Lighting & Electric.
 - f. Western Tube; Zekelman Industries.
 - g. Wheatland Tube; Zekelman Industries.
 - h. Or approved equal
2. Exterior Coating: Zinc.
3. Options:
 - a. Interior Coating: Zinc with organic top coating.
 - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - c. Colors: As indicated on Drawings.

2.3 TYPE IMC RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 1242 and UL Category Control Number DYBY.

B. Steel Electrical Intermediate Metal Conduit (IMC):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Allied Tube & Conduit; Atkore International.
 - c. Calconduit; Atkore International.
 - d. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
 - e. Topaz Lighting & Electric.
 - f. Western Tube; Zekelman Industries.
 - g. Wheatland Tube; Zekelman Industries.
 - h. Or approved equal
2. Options:
 - a. Exterior Coating: Zinc .
 - b. Interior Coating: Zinc with organic top coating .
 - c. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - d. Colors: As indicated on Drawings.

2.4 TYPE LFMC RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 360 and UL Category Control Number DXHR.

B. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Anaconda Sealtite; Anamet Electrical, Inc.
 - c. Electri-Flex Company.
 - d. International Metal Hose Co.
 - e. Or approved equal
2. Material: Steel.
3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Colors: As indicated on Drawings.

2.5 TYPE PVC RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 651 and UL Category Control Number DZYR.

B. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Calconduit; Atkore International.
 - c. JM Eagle; J-M Manufacturing Co., Inc.
 - d. NAPCO; Westlake Chemical Corp.
 - e. Opti-Com Manufacturing Network, Inc (OMNI).
 - f. Topaz Lighting & Electric.
 - g. Or approved equal
2. Dimensional Specifications: Schedule 40.
3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Markings: For use with maximum 90 deg C wire.

C. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Calconduit; Atkore International.
 - c. JM Eagle; J-M Manufacturing Co., Inc.
 - d. Opti-Com Manufacturing Network, Inc (OMNI).
 - e. Topaz Lighting & Electric.
 - f. Or approved equal
2. Dimensional Specifications: Schedule 80.
3. Options:
 - a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
 - b. Markings: For use with maximum 90 deg C wire.

2.6 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

B. Fittings for Type ERM, Type IMC, and Type PVC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - e. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - f. Southwire Company, LLC.
 - g. Topaz Lighting & Electric.
 - h. Or approved equal
2. General Characteristics: UL 514B and UL Category Control Number DWTT.
3. Options:
 - a. Material: Steel .

- b. Coupling Method: Raintight compression coupling with distinctive color gland nut .
- c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
- d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

C. Fittings for Type EMT Raceways:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Allied Tube & Conduit; Atkore International.
 - c. Calconduit; Atkore International.
 - d. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - e. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - f. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - g. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - h. Southwire Company, LLC.
 - i. Topaz Lighting & Electric.
 - j. Or approved equal
- 2. General Characteristics: UL 514B and UL Category Control Number FKAV.
- 3. Options:
 - a. Material: Steel .
 - b. Coupling Method: Compression coupling .
 - c. Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
 - d. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

D. Fittings for Type LFMC Raceways:

- 1. Manufacturers: Subject to compliance with requirements, undefined:
 - a. Liquid Tight Connector Co.
 - b. Or approved equal
- 2. General Characteristics: UL 514B and UL Category Control Number DXAS.

2.7 SOLVENT CEMENTS

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL Category Control Number DWTT.

2.8 SURFACE METAL RACEWAYS AND FITTINGS

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics: UL 5 and UL Category Control Number RJBT.

B. Surface Metal Raceways and Fittings with Metal Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - b. MonoSystems, Inc.
 - c. Wiremold; Legrand North America, LLC.
 - d. Or approved equal
2. Options:
 - a. Galvanized steel base with snap-on covers.
 - b. Manufacturer's standard enamel finish in color selected by Architect .
 - c. Wiring Channels: Dual . Multiple channels must be capable of housing a standard 20 to 30 A NEMA device flush within the raceway.

2.9 WIREWAYS AND AUXILIARY GUTTERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 870 and UL Category Control Number ZOYX.

B. Metal Wireways and Auxiliary Gutters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Cooper B-line; brand of Eaton, Electrical Sector.
 - c. Hoffman; brand of nVent Electrical plc.
 - d. MonoSystems, Inc.
 - e. Square D; Schneider Electric USA.
 - f. Wiegmann; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - g. Or approved equal
2. Additional Characteristics:
 - a. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
 - b. Finish: Manufacturer's standard enamel finish.
3. Options:
 - a. Degree of Protection: Type 1 unless otherwise indicated.
 - b. Wireway Covers: Screw-cover type unless otherwise indicated.

2.10 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 514A and UL Category Control Number QCIT.

B. Metallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - e. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - f. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - g. Pass & Seymour; Legrand North America, LLC.
 - h. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - i. Topaz Lighting & Electric.
 - j. Wiremold; Legrand North America, LLC.
 - k. Or approved equal
3. Options:
 - a. Material: Sheet steel .
 - b. Sheet Metal Depth: Minimum 2.5 inch.
 - c. Cast-Metal Depth: Minimum 2.4 inch.
 - d. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing more than 50 lb and marked with maximum allowable weight.
 - e. Paddle Fan Outlet Boxes and Covers: Nonadjustable, designed for attachment of paddle fan weighing up to 70 lb.

C. Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - e. Pass & Seymour; Legrand North America, LLC.
 - f. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - g. Topaz Lighting & Electric.
 - h. Or approved equal

D. Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - e. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - f. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - g. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - h. Topaz Lighting & Electric.
 - i. Or approved equal
3. Options:
 - a. Material: Sheet steel.
 - b. Sheet Metal Depth: minimum 2.5 inch.
 - c. Cast-Metal Depth: minimum 2.4 inch.

2.11 NONMETALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 514C and UL Category Control Number QCMZ.

B. Nonmetallic Floor Boxes and Floor Box Covers:

1. Description: Box mounted in floor with floor box cover and other components to complete floor box enclosure.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Allied Tube & Conduit; Atkore International.
 - c. Arlington Industries, Inc.
 - d. Cantex Inc.
 - e. JM Eagle; J-M Manufacturing Co., Inc.
 - f. Pass & Seymour; Legrand North America, LLC.
 - g. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - h. Wiremold; Legrand North America, LLC.
 - i. Or approved equal

2.12 CABINETS, CUTOFF BOXES, JUNCTION BOXES, AND PULL BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:
 - a. Non-Environmental Characteristics: UL 50.

- b. Environmental Characteristics: UL 50E.

B. Indoor Sheet Metal Cabinets:

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Adalet.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. Erickson Electrical Equipment Company.
 - e. FSR Inc.
 - f. Hoffman; brand of nVent Electrical plc.
 - g. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - h. Robroy Enclosures; Robroy Industries.
 - i. Or approved equal
3. Additional Characteristics: UL Category Control Number CYIV.
4. Options:
 - a. Degree of Protection: Type 1.

C. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adalet.
 - b. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - c. FSR Inc.
 - d. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - f. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - g. Or approved equal
3. Additional Characteristics: UL Category Control Number BGUZ.
4. Options:
 - a. Degree of Protection: Type 1.

D. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adalet.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.

- d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - e. Or approved equal
- 3. Additional Characteristics: UL Category Control Number BGUZ.
- 4. Options:
 - a. Degree of Protection: Type 1.

E. Outdoor Sheet Metal Cabinets:

- 1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
- 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Adalet.
 - c. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - d. Erickson Electrical Equipment Company.
 - e. FSR Inc.
 - f. Hoffman; brand of nVent Electrical plc.
 - g. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - h. Robroy Enclosures; Robroy Industries.
 - i. Or approved equal
- 3. Additional Characteristics: UL Category Control Number CYIV.
 - a. Options:
 - b. Degree of Protection: Type 3R.

F. Outdoor Cast-Metal Junction and Pull Boxes:

- 1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adalet.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - e. Or approved equal
- 3. Additional Characteristics: UL Category Control Number BGUZ.
- 4. Options:
 - a. Degree of Protection: Type 3R.

G. Outdoor Polymeric Junction and Pull Boxes:

- 1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
- 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Allied Tube & Conduit; Atkore International.

- c. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
- d. JM Eagle; J-M Manufacturing Co., Inc.
- e. Robroy Enclosures; Robroy Industries.
- f. Topaz Lighting & Electric.
- g. Or approved equal
- 3. Additional Characteristics: UL Category Control Number BGUZ.
- 4. Options:
 - a. Degree of Protection: Type 3R.

2.13 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

- 1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- 2. General Characteristics:
 - a. Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
 - b. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Metallic Cover Plates for Device Boxes:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABB, Electrification Business.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. EGS; Emerson Electric Co., Automation Solutions, Appleton Group.
 - d. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - e. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - f. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - g. Panduit Corp.
 - h. Pass & Seymour; Legrand North America, LLC.
 - i. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - j. Topaz Lighting & Electric.
 - k. Wiremold; Legrand North America, LLC.
 - l. Or approved equal
- 2. Options:
 - a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.

PART 3 - EXECUTION

3.1 SELECTION OF RACEWAYS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.

B. Outdoors:

1. Exposed and Subject to Physical Damage: ERM C IMC .
 - a. Locations less than 2.5 m above finished floor.
2. Exposed and Not Subject to Physical Damage: ERM C IMC PVC-80.
3. Concealed Aboveground: ERM C IMC EMT .
4. Direct Buried: PVC-80 PVC-40.

C. Indoors:

1. Exposed and Subject to Physical Damage: ERM C IMC . Subject to physical damage includes the following locations:
 - a. Locations less than 2.5 m above finished floor.
 - b. Stub-ups to above suspended ceilings.
2. Exposed and Not Subject to Physical Damage: ERM C IMC EMT .
3. Concealed in Ceilings and Interior Walls and Partitions: ERM C IMC EMT .
4. Damp or Wet Locations: ERM C IMC Corrosion-resistant EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC .

D. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERM C and IMC: Provide threaded type fittings unless otherwise indicated.

3.2 SELECTION OF BOXES AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:
 - a. Type 3R unless otherwise indicated.
 - b. Locations Exposed to Hosedown: Type 4.
2. Indoors:
 - a. Type 1 unless otherwise indicated.

C. Exposed Boxes Installed Less Than 2.5 m Above Floor:

1. Boxes with knockouts or unprotected openings are prohibited.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF RACEWAYS

A. Installation Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

3. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
4. Comply with NECA NEIS 101 for installation of steel raceways.
5. Comply with NECA NEIS 102 for installation of aluminum raceways.
6. Comply with NECA NEIS 111 for installation of nonmetallic raceways.
7. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
8. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
9. Raceway Terminations at Locations Subject to Moisture or Vibration:
 - a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG. Install insulated throat metal grounding bushings on service conduits.

B. General Requirements for Installation of Raceways:

1. Complete raceway installation before starting conductor installation.
2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
3. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch of changes in direction.
4. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
6. Support conduit within 12 inches of enclosures to which attached.
7. Install raceway sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings in accordance with NFPA 70.
8. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:
 - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - b. Where an underground service raceway enters a building or structure.
 - c. Conduit extending from interior to exterior of building.
 - d. Conduit extending into pressurized duct and equipment.
 - e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - f. Where otherwise required by NFPA 70.
9. Do not install conduits within 2 inches of the bottom side of a metal deck roof.
10. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

11. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
12. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inches of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types ERM and IMC:
 - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
2. Type ERM-S-PVC:
 - a. Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.
 - b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERM-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERM-S-PVC raceway.
 - c. Coat field-cut threads on PVC-coated raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.
3. Types FMC and LFM:
 - a. Comply with NEMA RV 3. Provide a maximum of 72 inches of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement, and for transformers and motors.
4. Type PVC:
 - a. Do not install Type PVC conduit where ambient temperature exceeds 122 deg F . Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
 - b. Comply with manufacturer's written instructions for solvent welding and fittings.

D. Stub-ups to Above Recessed Ceilings:

1. Provide EMT, IMC, or ERM for raceways.
2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

E. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

1. ERM-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
2. EMT: Provide compression, fittings. Comply with NEMA FB 2.10.

3. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

F. Expansion-Joint Fittings:

1. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground ERM and EMT conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.
2. Install type and quantity of fittings that accommodate temperature change listed for the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
5. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

G. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

3.4 INSTALLATION OF SURFACE RACEWAYS

- A. Install surface raceways only where indicated on Drawings.
- B. Install surface raceway with a minimum 2-inch radius control at bend points.
- C. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inch and with no less than two supports per straight raceway section. Support surface raceway in accordance with manufacturer's written instructions. Tape and glue are unacceptable support methods.

3.5 INSTALLATION OF BOXES AND ENCLOSURES

- A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.

- B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- C. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
- D. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.
- E. Locate boxes so that cover or plate will not span different building finishes.
- F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
- G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
- H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
- I. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
- J. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
 - 1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
 - 2. Provide gaskets for wallplates and covers.

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

3.8 CLEANING

- A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Tapes and stencils.
3. Signs.

B. Related Requirements:

1. 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 1000 V or Less:

1. Black letters on orange field .
2. Legend: Indicate voltage.

B. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

1. Color must be factory applied or field applied for sizes larger than 8 AWG if authorities having jurisdiction permit.
2. Colors for 208Y/120 V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
3. Color for Neutral: White or gray.
4. Color for Equipment Grounds: Green .
5. Colors for Isolated Grounds: Green with two or more yellow stripes.

C. Warning Label Colors:

1. Identify system voltage with black letters on orange background.

D. Warning labels and signs must include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."

E. Equipment Identification Labels:

1. Black letters on white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Champion America.
 - c. HellermannTyton.
 - d. Marking Services, Inc.
 - e. Panduit Corp.
 - f. Seton Identification Products; a Brady Corporation company.
 - g. Or approved equal

B. Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. Ideal Industries, Inc.
 - e. Marking Services, Inc.
 - f. Panduit Corp.
 - g. Seton Identification Products; a Brady Corporation company.

- h. Or approved equal
 - 2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over legend. Labels sized such that clear shield overlaps entire printed legend.
 - 3. Marker for Labels:
 - a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- C. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A'n D Cable Products.
 - b. Brady Corporation.
 - c. Brother International Corporation.
 - d. HellermannTyton.
 - e. Ideal Industries, Inc.
 - f. Marking Services, Inc.
 - g. Panduit Corp.
 - h. Seton Identification Products; a Brady Corporation company.
 - i. Or approved equal
 - 2. Minimum Nominal Size:
 - a. 1-1/2 by 6 inch for raceway and conductors.
 - b. 3-1/2 by 5 inch for equipment.
 - c. As required by authorities having jurisdiction.

2.4 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. Champion America.
 - c. HellermannTyton.
 - d. Ideal Industries, Inc.
 - e. Marking Services, Inc.
 - f. Panduit Corp.
 - g. Or approved equal
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. Marking Services, Inc.

- d. Or approved equal

C. Underground-Line Warning Tape:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Ideal Industries, Inc.
 - c. Marking Services, Inc.
 - d. Seton Identification Products; a Brady Corporation company.
 - e. Or approved equal
2. Tape:
 - a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape must be permanent and may not be damaged by burial operations.
 - c. Tape material and ink must be chemically inert and not be subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
3. Color and Printing:
 - a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
 - b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".
 - c. Inscriptions for Orange Tapes: "CAUTION BURIED COMMUNICATION LINE BELOW".
4. Tape Properties :
 - a. Detectable three-layer laminate, consisting of printed pigmented polyolefin film, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright colored, continuous-printed on one side with inscription of utility, compounded for direct-burial service.
 - b. Width: 3 inch.
 - c. Overall Thickness: 5 mil.
 - d. Foil Core Thickness: 0.35 mil.
 - e. Weight: 28 lb/1000 sq. ft.
 - f. Tensile in accordance with ASTM D882: 70 lbf and 4600 psi.

2.5 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. Marking Services, Inc.
 - d. Seton Identification Products; a Brady Corporation company.
 - e. Or approved equal
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. inch, 1/8 inch thick.
 - c. Engraved legend with black letters on white face.

- d. Self-adhesive.
- e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- I. Emergency Operating Instruction Signs: Install instruction signs with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer.
- J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.
- K. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
 - 1. "EMERGENCY POWER."
 - 2. "POWER."

3. "UPS."

L. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

M. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

N. Self-Adhesive Labels:

1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.

O. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

P. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

Q. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inch below finished grade. Use multiple tapes where width of multiple lines installed in common trench or concrete envelope exceeds 16 inch overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

R. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

- C. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels .
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
- D. Power-Circuit Conductor Identification, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels self-adhesive wraparound labels self-adhesive vinyl tape to identify phase.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
- E. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels .
 - 1. Apply to exterior of door, cover, or other access.
 - 2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.
- G. Equipment Identification Labels:
 - 1. Indoor Equipment: Self-adhesive label Laminated acrylic or melamine plastic sign.
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign .

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.

A. Related Requirements:

1. 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Configuration diagram of panel and breakers.
6. Include evidence of NRTL listing for SPD as installed in panelboard.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

- 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.
- D. Enclosures: Flush and Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1 .
 - b. Outdoor Locations: NEMA 250, Type 3R .
 - 2. Height: 84 inches maximum.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- E. Incoming Mains Location: Convertible between top and bottom.
- F. Phase, Neutral, and Ground Buses: Tin-plated aluminum .
- G. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Tin-plated aluminum .
 - 2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- H. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

- J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 PERFORMANCE REQUIREMENTS

2.3 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Business.
 - 2. Eaton.
 - 3. Mersen USA.
 - 4. Siemens Industry, Inc., Energy Management Division.
 - 5. Square D; Schneider Electric USA.
 - 6. Or approved equal.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: Circuit breaker or Lugs only, as indicated on drawings.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers .

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, undefined:
 - 1. ABB, Electrification Business.
 - 2. Eaton.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; Schneider Electric USA.
 - 5. –Or approved equal.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
 - 4. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).

5. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 6. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
- 2.5 Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
- IDENTIFICATION
- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
 - B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
 - C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.
- 2.6 ACCESSORY COMPONENTS AND FEATURES

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NEMA PB 1.1.
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box.
- E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
 1. Set field-adjustable, circuit-breaker trip ranges.
- G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- H. Install filler plates in unused spaces.
- I. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection for low-voltage air circuit breakers
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 24 19

MOTOR CONTROL CENTER SALVAGE & REUSE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removing, salvaging, refurbishing, and installing the existing Well No. 2 Motor Control Center (MCC) into the proposed Well No. 5 Pumphouse.
- B. Related Sections:
 - 1. Section 33 09 10 – Supervisory Control and Data Acquisition (SCADA) System Update
 - 2. Division 26 - Electrical

1.2 PRICE AND PAYMENT PROCEDURES

- A. Section 01 20 00 - Price and Payment Procedures Contract Sum/Price
- B. Well No. 2 MCC Relocation:
 - 1. Basis of Measurement: By lump sum.
 - 2. Basis of Payment: Includes full compensation for the removal, refurbishing, and installation of the existing Well No. 2 MCC into the proposed Well No. 5 Pumphouse including rewiring, resetting trip settings of circuit breakers to remain, furnishing and installing new VFD & transformer circuit breakers, new VFD, new transformer, new lighting panel, and installation of the new SCADA RTU. Also includes full compensation for testing, and Owner training services, operation and maintenance manuals, and furnishing all materials, tools, equipment, labor and incidentals necessary to complete the work in accordance with the Contract Documents.

1.3 REFERENCE STANDARDS

- A. REQUIREMENTS OF REGULATORY AGENCIES
 - 1. National Fire Protection Association (NFPA). NFPA-70 - National Electrical Code (NEC) and Wisconsin amendments thereto.
 - 2. Underwriters' Laboratories, Inc. (UL). UL-845.
 - 3. Local Codes and Ordinances.
- B. REFERENCE STANDARDS
 - 1. National Electrical Manufacturers Association (NEMA), NEMA ICS-2-322.

1.4 SUBMITTALS

- A. Opening size and layout in slab for MCC. Submit information prior to slab pour.
- B. Elementary schematics diagrams.
- C. Wiring and interconnection diagram.
- D. Frontal elevation and dimension drawings.

- E. Bill of material listing components.
- F. Manufacturer's product data sheets.

PART 2 PRODUCTS

2.1 ACCEPTABLE SUPPLIERS AND COMPONENT MANUFACTURERS

- A. Supplier: Altronex
- B. Component Manufactures: Square D, Cutler-Hammer/Westinghouse/Eaton, General Electric, Allen-Bradley, and Siemens.

2.2 MATERIAL AND EQUIPMENT

- A. GENERAL
 - 1. Provide motor control centers where shown on drawings and as described by frontal elevation drawings, one-line diagrams, and equipment schedules.
- B. ELECTRICAL RATINGS
 - 1. 480/277 VAC.
 - 2. 3 phase, 4 wire.
 - 3. 60 Hz.
 - 4. 300-amp vertical bus minimum.
 - 5. Bus bracing – as indicated on the drawings.
 - 6. Unit IC ratings as shown on drawings.
- C. WIRING
 - 1. NEMA Class 2, Type B wiring.
 - 2. Track mounted, pull apart terminals in unit.
- D. STRUCTURE
 - 1. Motor control centers shall consist of one or more enclosed vertical sections minimum 20" wide joined together to form a rigid, free standing assembly.
 - 2. Sectionalize construction in minimum 20" wide basic sections. Other widths for special sections as specified on drawings. Provisions for future add-on of sections at either end.
 - 3. Engraved MCC tag number identification nameplate:
 - a. Laminated plastic.
 - b. Letters 1/4" high.
 - c. White letters on black background.
 - d. On each MCC.
 - 4. Provide six space factors per section.
 - 5. Prepaint treatment to resist corrosion. Baked enamel finish.
 - 6. Removable one piece top plate. Open bottom for conduit entry.
 - 7. NEMA type 1 enclosure.
- E. BUS BARS
 - 1. Tin-plated copper.
 - 2. Bus bar material plated.

3. Main lug compartment.
4. 600 amp minimum horizontal bus or as specified on drawings.
5. Glass reinforced alkyd bus insulators.
6. Plated vertical bus.
7. Bus joints made with bolts, self-clinching nuts and Belleville washers.
8. Bus shall be front accessible.

F. BUS BARRIERS

1. Bus barrier opening at $\frac{1}{2}$ space factor intervals for convenient plug-in.
2. Snap-in closing plates for unused openings.
3. Bottom covers over bus to prevent accidental contact with fish tapes are required.

G. HORIZONTAL BUS

1. Continuous over length of MCC.
2. Minimum of 28% of main horizontal bus cross sectional area.

H. WIREWAYS

1. Provide vertical wireway in each section.
2. Provide horizontal wireway, top and bottom, throughout entire length.
3. Means shall be provided for releasing the interlock for intentional access and/or application of power. Padlocking arrangements shall permit locking the disconnect device off with at least three padlocks with the door closed or open. Means shall be provided to padlock the unit in a partially withdrawn position with the stabs free to the vertical bus.

I. VARIABLE FREQUENCY DRIVE

1. Provide variable frequency drive in motor control center indicated in one-line diagram and as specified below.
 - a. Provide adjustable frequency, drive control system capable of converting the specified 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. Each drive shall have an individual 3% input line reactor.
 - 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, 1992.
 - 4. If harmonic filters are needed to meet these requirements, then the manufacturer shall provide and be responsible for the design and manufacture of the filters.
- c. Environmental
 - 1. Altitude: 3,300 feet without de-rating.
 - 2. Humidity: 5 to 95 percent, noncondensing.
 - 3. Temperature: 32 to 104 degrees Fahrenheit, in NEMA 1 enclosure.
- d. Electrical
 - 1. Input voltage tolerance: 10 percent of rated voltage.
 - 2. Rated voltage: as shown on drawings and scheduled.
 - 3. Input frequency: 48 to 62 Hertz.
 - 4. Displacement power factor: 0.95, provide inductor on units 5 hp and smaller.
 - 5. Efficiency at rated current and nominal voltage: 97.5 percent.
 - 6. Maximum short circuit current: 5000 A rms at 600 volts.
- e. Control
 - 1. Method: Sine coded PWM with programmable carrier frequency.
 - a. 0.5 to 5 hp: 2 to 12 kHz carrier frequency.
 - b. 7.5 to 30 hp: 2-8 kHz carrier frequency.
 - 2. Output voltage: 0 to rated voltage.
 - 3. Output frequency: 0 to 400 Hz.
 - 4. Volts per Hertz ratio: fully programmable.
 - 5. Frequency regulation:
 - a. Analog input: 0.4 percent of maximum.
 - b. Digital input: 0.01 percent of maximum.
 - 6. DC Boost:
 - a. Fan mode: two selectable.
 - b. Auto mode: eight selectable with independent.
 - c. Fixed mode: selectable with independent acceleration and run boosts.
 - 7. Acceleration/deceleration: two independently programmable times, adjustable from 0 to 600 seconds in 0.1-second increments.
 - 8. Intermittent overload capability.
 - a. Constant torque: 150 percent of output for one minute.
 - b. Variable torque: 115 percent of output for one minute.
 - 9. Proactive current limit:
 - a. Constant torque: 20 to 160 percent of rated

- output.
 - b. Variable torque: 20 to 115 percent of rated output.
 - c. Inverse time overload: Class 20 protection with speed sensitive response, adjustable from 20 to 115 percent of rated current in 3 speed ranges.
- f. Protective features
 - 1. Detection and trip:
 - a. Undervoltage
 - b. Overvoltage
 - c. Overcurrent
 - d. Overtemperature
 - e. External signal
 - f. Output short circuit
 - g. Ground fault
 - 2. Overcurrent stall
 - 3. Overvoltage stall
 - 4. Six alarms
- g. Signal interface:
 - 1. Drive fault contact
 - 2. Drive run contact.
 - 3. Drive alarm contact.
 - 4. Programmable output contact.
 - 5. Potentiometer input.
 - 6. 0-10 VDC analog input.
 - 2. 4-20 mA analog input.
 - 8. 4-20 mA signal loss response.
 - 9. Analog output, selectable.
 - 10. Analog input conversion.
 - 11. Pulse train input.
 - 12. Encoder feedback closed loop speed control.
- h. Programmable Parameters:
 - 1. Dual acceleration/deceleration profiles.
 - 2. Three skip frequencies.
 - 3. DC injection braking.
 - 4. Dynamic braking.
 - 5. Slip compensation.
 - 6. Negative slip compensation.
 - 7. Selectable fault reset tries and time.
 - 8. Electronic thermal overload.
 - 9. S-curve acceleration/deceleration profile.
 - 10. Standard and custom volts-per-hertz curves.
 - 11. Traverse function.
 - 12. Proactive current limit.
 - 13. Four event fault memory.
 - 14. Flying start.
 - 15. Automatic DC boost.
 - 16. Seven preset speeds.
 - 17. Phase lock loop
- i. Human Interface Module
 - 1. Display faults in English language:

- a. Power fault.
 - b. Control fault.
 - c. Logic fault.
 - d. Software fault.
 - e. Protective fault.
- 2. Allow control of drive with start-stop function keys and digital speed potentiometers.
- 3. Allow programming of all programmable parameters.
- 4. Door mounted on front of enclosure. Provide required interface cable.
- j. Additional Features
 - 1. Agency approvals.
 - a. UL listed.
 - b. CSA certified.
 - c. IEC classified.
 - 2. IGBT Technology.
 - 3. Constant or variable torque rated as required by motor/equipment manufacture.
- k. Overcurrent Protection
 - 1. Provide thermal magnetic main circuit breaker of proper ampacity.
 - 2. UL short circuit withstand rating shall be 65,000A.
 - 3. Provide through door circuit breaker operator which is interlocked with door mechanism and is lockable in the off position. Provide an interlock defeat mechanism which allows authorized personnel to enter the enclosure while circuit breaker is in the on position.
- l. Contactors
 - 1. Provide full voltage input isolation contactor to disconnect adjustable frequency drive from line power when not required to run.
- m. Overload Protection
 - 1. Provide electronic, self-powered, overload protector of the heaterless design. Unit shall be sized for the actual motor and shall provide a three-second trip on single phase condition.
- n. Pilot Devices On Each Drive
 - 1. Provide the following front of panel mounted pilot devices:
 - a. HAND-OFF-AUTO selector switch or as specified.
 - b. Human interface Module.
 - c. Run and Fail indicator lights.
- o. Enclosure
 - 1. Mount all equipment in single NEMA 1, free-standing, MCCtype enclosure sized as needed. Where multiple units are provided for similar service it shall be acceptable to mount multiple units in single MCC structure with multiple compartments, size permitting.
- p. Motor Connections
 - 1. Provide NEMA 4 terminator modular mounted at unit where length of motor feeder exceeds recommendations

of manufacturer.

- q. Misc.
 - 1. Adjust overload devices.
 - 2. Adjust all programmable drive features, including but not limited to auto restart parameters. The drive system must automatically restart after a power fail condition.
 - 3. Provide typed label inside each unit identifying motors served, nameplate horsepower, full load current, codeletter, service factor, voltage/phase rating, and overload setting.
 - 4. Provide typed label inside each unit identifying configured values for all programmable drive parameters.
 - 5. When requested by engineer, submit system hydraulic analysis including graphs and tabular information for the following:
 - a. Input horsepower versus flow (minimum design flow to maximum design flow) taking into account pump, AFD and motor efficiencies.
 - b. System curve versus pump curve at 100 percent speed and in 10 percent increments until minimum pump speed at which pump does not generate enough head to overcome static head is reached. Plots must also show curves of constant hydraulic horsepower to verify non-overloading.
 - c. Tabulated data shall be calculated at 2 percent speed increments.
 - d. 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:
 - e. Calculate percent voltage distortion, with respect to fundamental voltage, for all harmonics up to the 99th.
 - f. Comparison with IEEE 519 standards for acceptable voltage distortions on such systems.

J. EXTERNAL DISCONNECT OPERATOR

- 1. Operator handle engaged with disconnect at all times.
- 2. Up and down hand motion.
- 3. Down as OFF.
- 4. Handle interlocked with unit door.
- 5. Capable of opening to 112° minimum.

K. DOORS

- 1. Pan type ¼ turn latches or captive knurled thumb screws engaging with cage nuts.
- 2. Concealed hinges.
- 3. Padlock provision to lock unit with plugs disengaged from bus.
- 4. Unit supported and guided by unit support pan.

5. Pan easily relocated without tools.
6. Unit identification tag fastened to unit saddle.
7. Unit compartments enclosed and isolated from adjacent units, busses and wireways except for openings for conductors entrance into units.

L. STARTERS

1. All full voltage starter units through NEMA Size 5 shall be of the draw out type. Draw out provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. All draw out units shall be secured by a spring loaded quarter turn indicating type fastening device, located at the top front of the unit.
2. All starters shall be furnished with individual control transformers and all starters shall have individual adjustable timers to start units in a timed sequence after a power failure. Starter heater size will be determined by actual verification of motor furnished at the jobsite
3. Each starter will be provided with a phase failure/phase reversal relay, with automatic reset.

M. TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

1. Unit shall provide all-mode protection in any surge environment against any type of transient and provide full spectrum protection from both surges and noise for the MCC. Include the following:
 - a. 80K Amp per phase surge protection
 - b. 50/60 HZ operating frequency
 - c. 50db EMI/RFI attenuation
 - d. UL 1449 safety approval
 - e. 200,000 AIC fault current rating
 - f. 5 year warranty
 - g. 480 VAC, 3 phase, 4 wire unit

N. MAGNETIC FLOW METER

1. A ten (10) inch diameter magnetic flow meter shall be furnished and installed in the well discharge piping by the Contractor. See Subsection 2.11 of Section 40 23 25 of these Specifications for specifications.
2. The meter signal converter will be mounted on the meter.
3. Furnish and install conduit(s) in the floor slab required for power supply and signal wire for the meter.
4. Furnish and install signal wiring in conduits from meter converter to SCADA system RTU to be located in MCC. Flow rate indicated by meter shall be transmitted to RTU. Provide control components in MCC and wiring such that chlorine booster pump will not be energized unless flow meter detects flow and well pump motor starter is energized.

O. SELECTOR SWITCHES AND PUSHBUTTONS

1. Selector switches and pushbuttons shall be full size Allen-Bradley 800T or equal respectively, and shall be heavy duty, oil-tight and shall be rated at not less than 10 amps at 110 volts.

P. LIGHTS

1. All status and alarm indicating lights shall be full size Allen-Bradley 800T push-to-test oil-tight transformer type or equal.

- Q. ELAPSED TIME METERS
1. Elapsed time meters shall be provided for all motors. They shall record the running time of the motors from 0 to 99,999 hours in tenths of hours. Meters shall be General Time 96005300 or equal
- R. PANELBOARD
1. Provide panelboard in motor control center as indicated in one- line diagram, panel schedule, and as specified in Specification Section 26 24 16.
- S. TRANSFORMER
1. 45 KVA 480V primary: 240Y/120 secondary with primary circuit breaker.
 2. Provide in motor control center as indicated in one-line diagram and as specified in specification Section 26 22 00.
- T. SCADA RTU:
1. Provide SCADA RTU in motor control center as indicated in one-line diagram and as specified in Specification Section 33 09 10.

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which motor control centers are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work.
- B. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 IDENTIFICATION

- A. Provide nameplate on feeder termination compartment indicating MCC designation and voltage.
- B. Provide nameplates on motor starter compartments indicating load served. Nameplates shall identify loads by HVAC or plumbing designations. Do not use motor numbers indicated on the electrical plans.

3.03 INSTALLATION

- A. Install and wire where shown in accordance with NEC, manufacturer's written instructions, and with recognized industry practices.
- B. Install on 3-1/2" concrete housekeeping pad. Coordinate size and location with General Contractor.
- C. Secure to concrete pad with steel bolts.
- D. Tighten bus connections and mechanical fasteners.
- E. Touch up scratched or marred surfaces to match original finish.

- F. Close openings in floor and concrete pad with concrete or other approved fire rated materials.

3.04 ADJUSTMENT AND CLEANING

- A. Clean MCC equipment and enclosures of dirt and debris.

3.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handle equipment carefully to prevent internal components damage, breakage and denting and scoring the enclosure finish. Do not install damaged equipment.
- B. Store equipment in a clean, dry space and protect from dirt, fumes, water, construction debris and physical damage.
- C. After installation, protect from damage by work of other trades.

END OF SECTION

SECTION 26 27 02
EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Misc. Equipment
2. HVAC and Plumbing motors, VFDs, and panels

B. RELATED WORK

1. Applicable provisions of Division 1 govern work under this Section.
2. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
3. Section 26 05 33 – Raceway and Boxes for Electrical Systems

C. SUBMITTALS

1. Product Data: Provide data for cord and wiring devices.

D. COORDINATION

1. Coordinate all equipment requirements with the various contractors and the Owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required.
2. Coordinate the available fault current at equipment including control panels and internal components. Equipment shall be listed to interrupt the available fault current at point of connection.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

- A. Straight-blade Attachment Plug: NEMA WD 1.
- B. Locking-blade Attachment Plug: NEMA WD 5.
- C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.
- D. Cord Construction: Oil-resistant thermoset insulated multi-conductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.
- E. Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

2.2 OTHER PRODUCTS

- A. Refer to related sections for other product requirements.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Verify that equipment is ready for electrical connection, wiring, and energizing.
- B. Working space for equipment shall be provided that is likely to require examination, adjustment, servicing or maintenance per NEC 110.26(A)(1) table.

3.2 PREPARATION

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

- A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.
- B. Provide a green equipment ground conductor for all installed equipment wiring.
- C. Make conduit connections to equipment using flexible PVC-coated metal conduit.
- D. Requirements of NEC Article 300.22 shall apply for boxes, conduit, conduit connections to equipment, devices and luminaire located in Mechanical Plenum spaces.
- E. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.
- F. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.
- G. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.
- H. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.
- I. All 120V single phase motor operated equipment such as fan coil units, unit heaters, door operators, shall be provided with a SSY, 2 gang combination plug fuse holder/ switch mounted adjacent to equipment.

3.4 MISCELLANEOUS CONNECTIONS

3.5 HVAC AND PLUMBING CONNECTIONS

- A. Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), controller overcurrent protection and disconnects to motors or to packaged control motor protection panels.

- B. Packaged control motor protection panels may include disconnects and starters and overcurrent protection. Provide all wiring between source and packaged control motor protection panel and motors. Install panel on exterior wall or adjacent to AHU's.
- C. Contractor shall verify with mechanical contractor the electrical requirements including voltages, horsepower, disconnecting means, starters and variable frequency drives for motors and equipment prior to ordering circuit breakers, disconnects, controller overcurrent protection devices and starters.
- D. Provide 120 volts to each temperature control panel. Coordinate quantity and exact locations with HVAC/DDC contractors.
- E. Unless otherwise specified, all electrical control devices such as aqua-stats, float and pressure switches, fan powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired by the Contractor supplying the devices.
- F. Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. When connections are located in Mechanical Plenum spaces located within Mechanical equipment, flexible metal conduit shall be utilized. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.
- G. All wiring shall be routed in conduit and a minimum of 12 AWG wire shall be used for all luminaires, switches and convenience outlets. All lighting, switches and convenience outlet circuits shall be a minimum of 20 amperes.
- H. Check for proper rotation of each motor.
- I. All heating, air conditioning and refrigeration equipment installed on the exterior of the building or rooftop shall have a 120V, single phase, 20 ampere rated outlet at an accessible location within 25 feet of the equipment.

3.6 EQUIPMENT CONNECTION SCHEDULE

- A. As indicated on the drawings.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches.
2. General-grade single straight-blade receptacles.
3. General-grade duplex straight-blade receptacles.
4. Receptacles with ground-fault protective devices.

B. Related Requirements:

1. 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section. for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
2. Section 01 31 00 "Project Management and Coordination" for preinstallation conference procedures.
3. Section 26 09 23 "Lighting Control Devices" for occupancy sensors, timers, control-voltage switches, and control-voltage dimmers.

1.2 SUBMITTALS

A. Product Data:

1. Toggle switches.
2. Single straight-blade receptacles
3. Duplex straight-blade receptacles.
4. Receptacles with GFCI device.

B. Shop Drawings:

1. Wiring diagrams for duplex straight-blade receptacles with integral switching means.

1.3 WARRANTY FOR DEVICES

A. Special Manufacturer Extended Warranty: Manufacturer warrants that devices perform in accordance with specified requirements and agrees to provide repair or replacement of devices that fail to perform as specified within extended warranty period.

1. Initial Warranty Period: 1 year from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED CONTROLLER SWITCHES

A. Toggle Switch:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
 - e. Or approved equal.
2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
3. General Characteristics:
 - a. Reference Standards: UL CCN WMUZ and UL 20.
4. Options:
 - a. Device Color: Office White.
 - b. Configuration:
 - 1) General-duty, 120-277 V, 20 A, single pole.
5. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.2 GENERAL-GRADE SINGLE STRAIGHT-BLADE RECEPTACLES

A. Single Straight-Blade Receptacle:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
 - e. Or approved equal.
2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
3. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
4. Options:
 - a. Device Color: Office White.
 - b. Configuration:

- 1) General-duty, NEMA 5-20R.
5. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.
 - c.

2.3 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
 - e. Or approved equal.
2. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
3. General Characteristics:
 - a. Reference Standards: UL CCN RTRT and UL 498.
4. Options:
 - a. Device Color: Office White.
 - b. Configuration:
 - 1) General-duty, NEMA 5-20R.
5. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.4 RECEPTACLES WITH GROUND-FAULT PROTECTIVE DEVICES

A. General-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
 - e. Or approved equal.
2. Regulatory Requirements:

- a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- 3. General Characteristics:
 - a. Reference Standards: UL CCN KCXS, UL 498, and UL 943.
- 4. Options:
 - a. Device Color: Office White.
 - b. Configuration: Heavy-duty, NEMA 5-20R.
- 5. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

- 1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF SWITCHES

A. Comply with manufacturer's instructions.

B. Identification:

- 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 26 05 53 "Identification for Electrical Systems."

3.3 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's instructions.

B. Identification:

- 1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL OF SWITCHES

A. Tests and Inspections:

- 1. Perform tests and inspections in accordance with manufacturers' instructions.

B. Nonconforming Work:

- 1. Unit will be considered defective if it does not pass tests and inspections.
- 2. Remove and replace defective units and retest.

3.5 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

A. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.

B. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

3.6 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Enclosed switches.

1.2 SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bussmann; Eaton, Electrical Sector.
2. Littelfuse, Inc.
3. Or approved equal.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC , time delay.
2. Type J: 600-V, zero- to 600-A rating, 200 kAIC , time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Owner.

3.2 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

B. Related Requirements:

1. Section 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section. for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section. for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

A. GFEP: Ground-fault circuit-interrupter for equipment protection.

B. GFLS: Ground-fault circuit-interrupter for life safety.

1.3 SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Business.
 - 2. Eaton.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; Schneider Electric USA.
 - 5. Or approved equal.
- B. Type HD, Heavy Duty:
 - 1. Single throw.
 - 2. Three pole.
 - 3. 600 V(ac).
 - 4. 1200 A and smaller .
 - 5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
 - 6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Service-Rated Switches: Labeled for use as service equipment.

2.3 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB, Electrification Business.
 - 2. Eaton.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; Schneider Electric USA.

5. Or approved equal.
- B. Type HD, Heavy Duty, Three Pole, Single Throw, 600 V(ac), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.4 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB, Electrification Business.
 2. Eaton.
 3. Siemens Industry, Inc., Energy Management Division.
 4. Square D; Schneider Electric USA.
 5. Or approved equal.
- B. Circuit breakers must be constructed using glass-reinforced insulating material. Current carrying components must be completely isolated from handle and accessory mounting area.
- C. Circuit breakers must have toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. Circuit-breaker handle must be over center, be trip free, and reside in tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon must be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with push-to-trip button, located on face of circuit breaker to mechanically operate circuit-breaker tripping mechanism for maintenance and testing purposes.
- D. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings must be clearly marked on face of circuit breaker. Circuit breakers must be 100 percent rated .
- E. MCCBs must be equipped with device for locking in isolated position.
- F. Lugs must be suitable for 60 deg C rated wire on 100 A circuit breakers and below .
- G. Standard: Comply with UL 489 with required interrupting capacity for available fault currents.
- H. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 200 A and larger.

I. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: Enclosure must be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1) .
- C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: Circuit-breaker operating handle must be externally operable with operating mechanism being integral part of box, not cover . Cover interlock mechanism must have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.
- E. Enclosures designated as UL 50E Type 4, 4X stainless steel, 12, or 12K must have dual cover interlock mechanism to prevent unintentional opening of enclosure cover when circuit breaker is ON and to prevent turning circuit breaker ON when enclosure cover is open.
- F. UL 50E Type 7/9 enclosures must be furnished with breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 SELECTION OF ENCLOSURES

- A. Indoor, Dry and Clean Locations: UL 50E, Type 1 .
- B. Outdoor Locations: UL 50E, Type 3R .
- C. Other Wet or Damp, Indoor Locations: UL 50E, Type 4 .

3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
 1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
 2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

3. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
4. Install fuses in fusible devices.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73.16 "Coordination Studies."

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 29 23

VARIABLE-FREQUENCY DRIVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes separately enclosed, preassembled, combination VFDs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.
- B. Related Requirements:
 - 1. Section 23 05 13 - Common Motor Requirements for HVAC Equipment
 - 2. Division 26 - Electrical Work

1.2 DEFINITIONS

- A. CPT: Control power transformer.
- B. DDC: Direct digital control.
- C. EMI: Electromagnetic interference.
- D. OCPD: Overcurrent protective device.
- E. PID: Control action, proportional plus integral plus derivative.
- F. RFI: Radio-frequency interference.
- G. VFD: Variable-frequency drive.

1.3 SUBMITTALS

- A. Product Data: For each type and rating of VFD indicated.
- B. Shop Drawings: For each VFD indicated.
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

1.6 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace VFDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ABB, Electrification Business.
 2. ABB, Motion Business.
 3. Danfoss, Inc.
 4. Eaton.
 5. Emerson
 6. Reliance
 7. Rockwell Automation, Inc.
 8. Schneider Electric USA, Inc.
 9. Siemens Industry, Inc., Building Technologies Division.
 10. Toshiba
 11. Trane / Danfoss
 12. Yaskawa
 13. Or approved equal

2.2 SYSTEM DESCRIPTION

- A. General Requirements for VFDs:
 1. VFDs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508A .
- B. Application: Constant torque or variable torque .
- C. VFD Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.
 1. Units suitable for operation of NEMA MG 1 motors.
 2. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.
- D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.
- E. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range ; maximum voltage equals input voltage.
- F. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFD input voltage rating.
 2. Input AC Voltage Unbalance: Not exceeding 5 percent.
 3. Input Frequency Tolerance: Plus or minus 3 percent of VFD frequency rating.
 4. Minimum Efficiency: 97 percent at 60 Hz, full load.
 5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
 6. Minimum Short-Circuit Current (Withstand) Rating: 22 kA.
 7. Ambient Temperature Rating: Not less than 32 deg F and not exceeding 104 deg F.
 8. Humidity Rating: Less than 95 percent (noncondensing).
 9. Altitude Rating: Not exceeding 3300 feet.
 10. Vibration Withstand: Comply with NEMA ICS 61800-2.
 11. Overload Capability: 1.1 (for variable torque) or 1.5 (for constant torque) times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
 12. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
 13. Speed Regulation: Plus or minus 5 percent.
 14. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
 15. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.
- G. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.
- H. Isolated Control Interface: Allows VFDs to follow remote-control signal over a minimum 40:1 speed range.
1. Signal: Electrical.
- I. Internal Adjustability Capabilities:
1. Minimum Speed: 5 to 25 percent of maximum rpm.
 2. Maximum Speed: 80 to 100 percent of maximum rpm.
 3. Acceleration: 0.1 to 999.9 seconds.
 4. Deceleration: 0.1 to 999.9 seconds.
 5. Current Limit: 30 to minimum of 150 percent of maximum rating.
- J. Self-Protection and Reliability Features:
1. Surge Suppression: Factory installed as an integral part of the VFD, complying with UL 1449 SPD, Type 1 or Type 2.
 2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
 3. Under- and overvoltage trips.
 4. Inverter overcurrent trips.
 5. VFD and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFDs and motor thermal characteristics, and for providing VFD overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
 6. Instantaneous line-to-line and line-to-ground overcurrent trips.
 7. Loss-of-phase protection.
 8. Reverse-phase protection.
 9. Short-circuit protection.

10. Motor-overtemperature fault.
11. Ground fault protection for all 3 phases .

- K. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.
- L. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.
- M. Bidirectional Autospeed Search: Capable of starting VFD into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.
- N. Integral Input Disconnecting Means and OCPD: NEMA KS 1, fusible switch with pad-lockable, door-mounted handle mechanism.
 1. Disconnect Rating: Not less than 115 percent of VFD input current rating.
 2. VFDAuxiliary Contacts: NO or NC, arranged to activate before switch blades open.

2.3 PERFORMANCE REQUIREMENTS

2.4 CONTROLS AND INDICATION

- A. Status Lights: Door-mounted LED indicators displaying the following conditions:
 1. Power on.
 2. Run.
 3. Overvoltage.
 4. Line fault.
 5. Overcurrent.
 6. External fault.
- B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.
 1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
 2. Security Access: Provide electronic security access to controls through identification and password with at least one level of access: View only; view and operate; and view, operate, and service.
 - a. Control Authority: Supports at least four conditions: Off, local manual control at VFD, local automatic control at VFD, and automatic control through a remote source.
- C. Historical Logging Information and Displays:
 1. Running log of total power versus time.
 2. Total run time.
 3. Fault log, maintaining last four faults with time and date stamp for each.

- D. Indicating Devices: Digital display mounted flush in VFD door and connected to display VFD parameters including, but not limited to:
1. Output frequency (Hz).
 2. Motor speed (rpm).
 3. Motor status (running, stop, fault).
 4. Motor current (amperes).
 5. Motor torque (percent).
 6. Fault or alarming status (code).
 7. PID feedback signal (percent).
 8. DC-link voltage (V dc).
 9. Set point frequency (Hz).
 10. Motor output voltage (V ac).
- E. Control Signal Interfaces:
1. Electric Input Signal Interface:
 - a. A minimum of two programmable analog inputs: 0- to 10-V dc or 4- to 20-mA dc .
 - b. A minimum of six multifunction programmable digital inputs.
 2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the DDC system for HVAC or other control systems:
 - a. 0- to 10-V dc.
 - b. 4- to 20-mA dc.
 - c. Potentiometer using up/down digital inputs.
 - d. Fixed frequencies using digital inputs.
 3. Output Signal Interface: A minimum of one programmable analog output signal(s) (operator-selectable "x"- to "y"-mA dc), which can be configured for any of the following:
 - a. Output frequency (Hz).
 - b. Output current (load).
 - c. DC-link voltage (V dc).
 - d. Motor torque (percent).
 - e. Motor speed (rpm).
 - f. Set point frequency (Hz).
- F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.
1. Number of Loops: One .

2.5 BYPASS SYSTEMS

- A. Bypass Operation: Manually transfers motor between power converter output and bypass circuit. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.
- B. Bypass Mode: Manual operation only; requires local operator selection at VFD. Transfer between power converter and bypass contactor, and retransfer shall only be allowed with the motor at zero speed.

- C. Bypass Controller: Two-contactor-style bypass allows motor operation via the power converter or the bypass controller ; with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.
 - 1. Bypass Contactor: Load-break, NEMA-rated contactor.
 - 2. Output Isolating Contactor: Non-load-break, NEMA-rated contactor.
 - 3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.
- D. Bypass Contactor Configuration: Reduced-voltage (autotransformer) type.
 - 1. NORMAL/BYPASS selector switch.
 - 2. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFD while the motor is running in the bypass mode.
 - 3. Contactor Coils: Pressure-encapsulated type.
 - a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
 - b. Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
 - 4. Control Circuits: 120 -V ac; obtained from integral CPT, with primary and secondary fuses , with CPT of sufficient capacity to operate all integral devices and remotely located pilot, indicating, and control devices.
 - a. CPT Spare Capacity: 100 VA.
 - 5. Overload Relays: NEMA ICS 2.

2.6 OPTIONAL FEATURES

- A. VFDCommunication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and a notebook computer.
- B. .

2.7 ENCLOSURES

- A. VFD Enclosures: NEMA 250, to comply with environmental conditions at installed location.
 - 1. Dry and Clean Indoor Locations: Type 1 .
 - 2. Outdoor Locations: Type 3R .
 - 3. Other Wet or Damp Indoor Locations: Type 4 .
 - 4. .
- B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFD as "Plenum Rated."

2.8 ACCESSORIES

- A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFD enclosure cover unless otherwise indicated.

1. Push Buttons: Unguarded.
 2. Pilot Lights: Push to test.
 3. Selector Switches: Rotary type.
- B. Control Relays: Auxiliary and adjustable solid-state time-delay relays.
- C. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.
1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.
- D. .

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 26 05 29 "Hangers and Supports for Electrical Systems."
- B. Floor-Mounting Controllers: Controllers serving motors 100 HP and larger shall be floor mounted and installed on a 3-1/2 inch high concrete pad.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in each fusible-switch VFD.
- E. Install fuses in control circuits if not factory installed. Comply with requirements in Section 26 28 13 "Fuses."
- F. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.
- G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- H. Comply with NECA 1.

3.2 CONTROL WIRING INSTALLATION

- A. Install wiring between VFDs and remote devices. Comply with requirements in Section 26 05 23 "Control-Voltage Electrical Power Cables."
- B. Bundle, train, and support wiring in enclosures.

3.3 IDENTIFICATION

- A. Identify VFDs, components, and control wiring. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each VFD with engraved nameplate.
 - 3. Label each enclosure-mounted control and pilot device.

3.4 VFDADJUSTING

- A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- B. Set the taps on reduced-voltage autotransformer controllers.
- C. Set field-adjustable pressure switches.
- D. Controllers shall be set for the following minimum speeds:
 - 1. Pump applications - 20 hertz (30%)
 - 2. Fan applications - 12 hertz (20%)

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFDs.

END OF SECTION

SECTION 26 32 13

GAS-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Engine.
2. Gas fuel system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor generator-set enclosure.

B. Related Requirements:

1. Section 26 36 00 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.3 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in cubic feet per hour (cubic meters per hour) at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
6. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.
 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
 - a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - b. Operating instructions laminated and mounted adjacent to generator location.
 - c. Training plan.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
 2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
 3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
 4. Tools: Each tool listed by part number in operations and maintenance manual.

1.7 QUALITY ASSURANCE

1.8 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: 5 years from date of registered commissioning and start-up.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Blue Star Power Systems

2. Caterpillar, Inc.; Electric Power Division.
3. Cummins Power Generation.
4. Generac.
5. Kohler Power Systems.
6. Or Approved Equal

- B. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. B11 Compliance: Comply with B11.19.
- B. NFPA Compliance:
 1. Comply with NFPA 37. (Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines)
 2. Comply with NFPA 70. (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702)
- C. UL Compliance: Comply with UL 2200.
- D. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.
- E. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
 1. Ambient Temperature: -15 to 104 deg F.
 2. Relative Humidity: Zero to 95 percent.
 3. Altitude: Sea level to 1000 feet.

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

- A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and use.
- C. Power Rating: Standby.
- D. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.
- E. EPSS Class: Engine generator shall be classified as Class 2 according to NFPA 110.
- F. Service Load: Refer to drawings and schedule.
- G. Power Factor: 0.8, lagging.

- H. Frequency: 60 Hz.
- I. Voltage: Refer to drawings and schedule.
- J. Phase: Three-phase, four wire, wye .
- K. Induction Method: Turbocharged.
- L. Governor: Adjustable isochronous, with speed sensing.
- M. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
 - 1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.
- N. Capacities and Characteristics:
 - 1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.
 - 2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.
- O. Engine Generator Performance:
 - 1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
 - 2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
 - 3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
 - 4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
 - 5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
 - 6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
 - 7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
 - 8. Start Time:
 - a. 30 seconds.

2.4 GAS ENGINE

- A. Fuel: Natural gas .
- B. Rated Engine Speed: 1800 rpm.
- C. Lubrication System: Engine or skid-mounted.
 - 1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
 - 2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
 - 3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
- D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.
- E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.
 - 1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
 - 2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
 - 3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
 - 4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
 - 5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
 - a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
 - b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.
- F. Muffler/Silencer:
 - 1. Commercial type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
 - a. Minimum sound attenuation of 12 dB at 500 Hz.
 - b. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 90 dBA or less.
- G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.
- H. Starting System: 24-V electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified.
4. Battery: Nickel cadmium, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least twice without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F regardless of external ambient temperature within range specified in "Performance Requirements" Article. Include accessories required to support and fasten batteries in place. Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
9. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for nickel cadmium batteries. Unit shall comply with UL 1236 and include the following features:
 - a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
 - b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
 - c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
 - d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
 - e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
 - f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 GAS FUEL SYSTEM

- A. Natural Gas Piping: Comply with requirements in Section 23 11 23 "Facility Natural Gas Piping."
- B. Gas Train: Comply with NFPA 37.

- C. Engine Fuel System:
- D. Natural Gas, Vapor-Withdrawal System:
 - 1. Carburetor.
 - 2. Secondary Gas Regulators: One for each fuel type, with atmospheric vents piped to building exterior.
 - 3. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves; one for each fuel source.
 - 4. Fuel Filters: One for each fuel type.
 - 5. Manual Fuel Shutoff Valves: One for each fuel type.
 - 6. Flexible Fuel Connectors: Minimum one for each fuel connection.

2.6 CONTROL AND MONITORING

- A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.
- B. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.
- C. Comply with UL 508A.
- D. Configuration:
 - 1. Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine generator battery.
- E. Control and Monitoring Panel:
 - 1. Digital controller with integrated LCD, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
 - a. Engine lubricating-oil pressure gage.
 - b. Engine-coolant temperature gage.
 - c. DC voltmeter (alternator battery charging).
 - d. Running-time meter.
 - e. AC voltmeter, for each phase.
 - f. AC ammeter, for each phase.
 - g. AC frequency meter.
 - h. Generator-voltage adjusting rheostat.
 - 2. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:
 - a. Cranking control equipment.
 - b. Run-Off-Auto switch.
 - c. Control switch not in automatic position alarm.

- d. Overcrank alarm.
- e. Overcrank shutdown device.
- f. Low water temperature alarm.
- g. High engine temperature prealarm.
- h. High engine temperature.
- i. High engine temperature shutdown device.
- j. Overspeed alarm.
- k. Overspeed shutdown device.
- l. Low fuel main tank.
 - 1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for the duration required for the indicated EPSS class.
- m. Coolant low-level alarm.
- n. Coolant low-level shutdown device.
- o. Coolant high-temperature prealarm.
- p. Coolant high-temperature alarm.
- q. Coolant low-temperature alarm.
- r. Coolant high-temperature shutdown device.
- s. EPS supplying load indicator.
- t. Battery high-voltage alarm.
- u. Low cranking voltage alarm.
- v. Battery-charger malfunction alarm.
- w. Battery low-voltage alarm.
- x. Lamp test.
- y. Contacts for local and remote common alarm.
- z. Low-starting air pressure alarm.
- aa. Low-starting hydraulic pressure alarm.
- bb. Remote manual stop shutdown device.
- cc. Air shutdown damper alarm when used.
- dd. Air shutdown damper shutdown device when used.
- ee. Hours of operation.
- ff. Engine generator metering, including voltage, current, Hz, kW, kVA, and power factor.
- gg. Generator overcurrent protective device not closed alarm.

F. Engine Generator Metering: Comply with Section 26 27 13 "Electricity Metering."

G. Connection to Datalink:

- 1. A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication.
- 2. Provide connections for datalink transmission of indications to remote data terminals via ModBus . Data system connections to terminals are covered in Section 26 09 13 "Electrical Power Monitoring and Control."

H. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

I. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering

visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Coolant low-temperature alarm.
3. High engine temperature prealarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low coolant level alarm.
8. Low cranking voltage alarm.
9. Contacts for local and remote common alarm.
10. Audible-alarm silencing switch.
11. Air shutdown damper when used.
12. Run-Off-Auto switch.
13. Control switch not in automatic position alarm.
14. Lamp test.
15. Low cranking voltage alarm.
16. Generator overcurrent protective device not closed.

J. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

K. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Overcurrent Protective Device:

1. Molded-case circuit breaker, electronic-trip type; 100 percent rated; complying with UL 489:
 - a. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
 - b. Trip Settings: Selected to coordinate with generator thermal damage curve.
 - c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
 - d. Mounting: Adjacent to or integrated with control and monitoring panel.

C. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and

predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
 2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
 3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
 4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.
- D. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.
1. Indicate ground fault with other engine generator alarm indications.
 2. Trip generator protective device on ground fault.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

- A. Comply with NEMA MG 1.
- B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.
- C. Electrical Insulation: Class H.
- D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six lead alternator.
- E. Range: Provide limited range of output voltage by adjusting the excitation level.
- F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.
- G. Enclosure: Dripproof.
- H. Instrument Transformers: Mounted within generator enclosure.
- I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.
1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
 2. Maintain voltage within 15 percent on one step, full load.
 3. Provide anti-hunt provision to stabilize voltage.

- 4. Maintain frequency within 5 percent and stabilize at rated frequency within 5 seconds.
 - J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
 - K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.
 - L. Subtransient Reactance: 12 percent, maximum.
- 2.9 OUTDOOR GENERATOR-SET ENCLOSURE
- A. Description:
 - 1. Vandal-resistant, sound-attenuating, weatherproof steel housing, wind resistant up to 100 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.
 - a. Sound Attenuation Level: 72 to 87 dBA.
 - B. Structural Design and Anchorage: Comply with ASCE/SEI 7 for wind loads up to 100 mph.
 - C. Hinged Doors: With padlocking provisions.
 - D. Space Heater: Thermostatically controlled and sized to prevent condensation.
 - E. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.
 - F. Muffler Location: Within enclosure.
 - G. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.
 - 1. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.
 - 2. Ventilation: Provide temperature-controlled exhaust fan interlocked to prevent operation when engine is running.
- 2.10 FINISHES
- A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer. Color selected by owner from Manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.
- B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

3.3 INSTALLATION

- A. Comply with NECA 1 and NECA 404.
- B. Comply with packaged engine generator manufacturers' written installation and alignment instructions.
- C. Equipment Mounting:
 - 1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
 - 2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
 - 3. Install packaged engine generator with having a minimum deflection of 1 inch on 4-inch- high concrete base. Secure engine generator to anchor bolts installed in concrete bases.
- D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.
- E. Gaseous Fuel Piping:
 - 1. Natural gas piping, valves, and specialties for gas distribution are specified in Section 23 11 23 "Facility Natural Gas Piping."
- F. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.
- B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

C. Gaseous Fuel Connections:

1. Connect fuel piping to engines with a gate valve and union and flexible connector.
2. Install manual shutoff valve in a remote location to isolate gaseous fuel supply to the generator.
3. Vent gas pressure regulators outside building a minimum of 60 inches from building openings.

D. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

3.5 IDENTIFICATION

A. Identify system components according to Section 26 05 53 "Identification for Electrical Systems."

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location.

3.6 FIELD QUALITY CONTROL

A. Testing Agency:

1. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs below as specified in the NETA ATS. Certify compliance with test parameters.

a. Visual and Mechanical Inspection:

- 1) Compare equipment nameplate data with drawings and specifications.
- 2) Inspect physical and mechanical condition.
- 3) Inspect anchorage, alignment, and grounding.
- 4) Verify the unit is clean.

b. Electrical and Mechanical Tests:

- 1) Perform insulation-resistance tests in accordance with IEEE 43.
 - a) Machines larger than 200 hp. Test duration shall be 10 minutes. Calculate polarization index.
 - b) Machines 200 hp or less. Test duration shall be one minute. Calculate the dielectric-absorption ratio.
- 2) Test protective relay devices.
- 3) Verify phase rotation, phasing, and synchronized operation as required by the application.

- 4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
 - 5) Perform vibration test for each main bearing cap.
 - 6) Verify correct functioning of the governor and regulator.
- C. Coordinate tests with tests for transfer switches and run them concurrently.
 - D. Test instruments shall have been calibrated within the last 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
 - E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
 - F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
 - G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - H. Remove and replace malfunctioning units and retest as specified above.
 - I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
 - J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- 3.7 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

SECTION 26 36 00

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes automatic transfer switches rated 600 V and less.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
 - 2. Single-Line Diagram: Show connections between transfer switch, power sources, and load.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA ICS 1.
- C. Comply with UL 1008 unless requirements of these Specifications are stricter.
- D. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.
 - 1. Short-time withstand capability for 6 cycles.
- E. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.
- F. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
- G. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

- H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed markers at terminations. Color-coding and wire and cable markers are specified in Section 26 05 53 "Identification for Electrical Systems."
1. Designated Terminals: Mechanical type, suitable for types and sizes of field wiring indicated.
 2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
 3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
 4. Accessible via rear access.

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ASCO Power Technologies.
 2. Cummins Power Generation.
 3. Eaton.
 4. Generac.
 5. Kohler Power Systems.
 6. Or Approved Equal.
- B. Comply with Level 1 equipment according to NFPA 110.
- C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.
1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
 2. Switch Action: Double throw; mechanically held in both directions.
 3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
 4. Conductor Connectors: Suitable for use with conductor material and sizes.
 5. Material: Tin-plated aluminum .
 6. Main and Neutral Lugs: Mechanical type.
 7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 8. Ground bar.
 9. Connectors shall be marked for conductor size and type according to UL 1008.
 10. .
- D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.
1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
- E. Automatic Transfer-Switch Controller Features:
1. Controller operates through a period of loss of control power.

2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
4. Test Switch: Simulate normal-source failure.
5. Switch-Position Pilot Lights: Indicate source to which load is connected.
6. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
 - a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
 - b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
7. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
8. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
9. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
10. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
11. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:
 - a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
 - b. Push-button programming control with digital display of settings.
 - c. Integral battery operation of time switch when normal control power is unavailable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.
- B. Identify components according to Section 26 05 53 "Identification for Electrical Systems."
- C. Set field-adjustable intervals and delays, relays, and engine exerciser clock.
- D. Comply with NECA 1.

3.2 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, motor controls, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
- B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.
 - 1. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- D. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- E. Connect twisted pair cable according to Section 26 05 23 "Control-Voltage Electrical Power Cables."
- F. Route and brace conductors according to manufacturer's written instructions and Section 26 05 29 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.
- G. Brace and support equipment according to Section 26 05 48.16 "Seismic Controls for Electrical Systems."
- H. Final connections to equipment shall be made with liquidtight, flexible metallic conduit no more than 18 inches in length.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with Drawings and Specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, grounding, and required clearances.
 - d. Verify that the unit is clean.
 - e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
 - f. Verify that manual transfer warnings are attached and visible.
 - g. Verify tightness of all control connections.
 - h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:
 - 1) Use of low-resistance ohmmeter.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.
 - i. Perform manual transfer operation.

- j. Verify positive mechanical interlocking between normal and alternate sources.
- k. Perform visual and mechanical inspection of surge arresters.
- l. Inspect control power transformers.
 - 1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - 2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
 - 3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.
- 2. Electrical Tests:
 - a. Perform insulation-resistance tests on all control wiring with respect to ground.
- B. Coordinate tests with tests of generator and run them concurrently.
- C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.
- D. Transfer switches will be considered defective if they do not pass tests and inspections.
- E. Remove and replace malfunctioning units and retest as specified above.
- F. Prepare test and inspection reports.
- 3.4 DEMONSTRATION
 - A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.
 - B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.
 - C. Coordinate this training with that for generator equipment.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 51 19

LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of LED luminaires:
 - 1. Linear industrial.
 - 2. Strip light.
 - 3. Surface mount, linear.
- B. Related Requirements:
 - 1. Section 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section. for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2

- A. Product Data: For each type of product.
 - 1. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 - 2. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.3 SUBMITTALS

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Provide luminaires from a single manufacturer for each luminaire type.
- B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Altitude: Sea level to 1000 feet .

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.
- D. Electrical Requirements: Refer to electrical plans and light fixture schedule for voltage requirements.

2.3 STRIP LIGHT.

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Lighting Solutions; Signify North America Corp.
 - 2. GE Current, a Daintree company; American Industrial Partners (AIP).
 - 3. Hubbell Lighting.
 - 4. Lighting Science Group.
 - 5. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 6. OSRAM SYLVANIA.
 - 7. Signify North America Corporation (formerly Philips Lighting).
 - 8. Or approved equal
- B. Lamp:
 - 1. Minimum 750 lm.
 - 2. Minimum allowable efficacy of 75 lm/W.
 - 3. CRI of minimum 80 . CCT as indicated on schedule .
 - 4. Rated lamp life of 50,000 hours to L70.

5. Dimmable from 100 percent to one (1) percent of maximum light output.
6. Internal driver.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

C. Housings:

1. Extruded-aluminum housing and heat sink.
2. Color as indicated on light fixture schedule and selected from manufacturer's standard colors.
3. With integral mounting provisions.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping of luminaire without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Prismatic acrylic .
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

F. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.4 SURFACE MOUNT, LINEAR.

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Architectural Lighting Works.
2. Axis Lighting, Inc.
3. Cooper Lighting Solutions; Signify North America Corp.
4. Finelite.
5. GE Current, a Daintree company; American Industrial Partners (AIP).
6. Hubbell Lighting.
7. Lighting Science Group.
8. Lithonia Lighting; Acuity Brands Lighting, Inc.
9. Lumen Pulse.
10. OSRAM SYLVANIA.
11. Signify North America Corporation (formerly Philips Lighting).
12. Tech Lighting.
13. Or approved equal

B. Lamp:

1. Minimum 750 lm.

2. Minimum allowable efficacy of 75 lm/W.
3. CRI of minimum 80 . CCT as indicated on schedule .
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to one (1) zero percent of maximum light output.
6. Internal driver.
7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

C. Housings:

1. Extruded-aluminum housing and heat sink.
2. Color as indicated on light fixture schedule and selected from manufacturer's standard colors.
3. With integral mounting provisions.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Diffusers and Globes:

1. Prismatic acrylic .
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

F. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.5 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for sheet steel.

C. Stainless Steel:

1. 1. Manufacturer's standard grade.
2. 2. Manufacturer's standard type, ASTM A240/240M.

D. Galvanized Steel: ASTM A653/A653M.

- E. Aluminum: ASTM B209.

2.6 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 52 13

EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Emergency lighting.
2. Exit signs.
3. Materials.
4. Luminaire support components.

B. Related Requirements:

1. Section 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section. for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 SUBMITTALS

A. Product Data:

1. For each type of emergency lighting unit, exit sign, and emergency lighting support.
 - a. Include data on features, accessories, and finishes.
 - b. Include physical description of unit and dimensions.
 - c. Battery and charger for light units.
 - d. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
 - e. Include photometric data and adjustment factors based on laboratory tests by, or under supervision of, qualified luminaire photometric testing laboratory, for each luminaire type.

B. Shop Drawings:

1. For nonstandard or custom luminaires.
 - a. Include plans, elevations, sections, and mounting and attachment details.
 - b. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - c. Include diagrams for power, signal, and control wiring.

1.3 WARRANTY

- ###### A. Special Manufacturer Extended Warranty for Batteries for Emergency and Exit Lighting:
- Manufacturer warrants that batteries for emergency luminaires and exit signs perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended warranty period.

1. Extended Warranty Period: Five year(s) from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 and UL 924, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Comply with NFPA 101.
- C. Comply with NEMA LE 4 for recessed luminaires.
- D. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast.
 1. Emergency Connection: Operate one lamp(s) continuously at an output of at least 1100 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
 2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 3. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 4. Battery: Sealed, maintenance-free, nickel-cadmium type.
 5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
- E. External Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, suitable for powering one or more lamps, remote mounted from luminaire.
 1. Emergency Connection: Operate [one] <Insert number> [fluorescent] [incandescent] [LED] lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire[ballast].
 2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 3. Nightlight Connection: Operate lamp in a remote luminaire continuously.
 4. Battery: Sealed, maintenance-free, [nickel-cadmium] [lead-acid] type.
 5. Charger: Fully automatic, solid-state, constant-current type.

6. Housing: Type 1 enclosure listed for installation inside, on top of, or remote from luminaire. Remote assembly must be located no less than half of distance recommended by [ballast] [emergency power unit] manufacturer, whichever is less.
7. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
8. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.2 EMERGENCY LIGHTING

A. General Characteristics: Self-contained units.

B. Emergency Luminaire:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper Lighting Solutions; Signify North America Corp.
 - b. Dual-Lite; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - d. Signify North America Corporation (formerly Philips Lighting).
 - e. Or approved equal.
2. Options:
 - a. Nominal Voltage: Refer to electrical drawings and light fixture schedule.
 - b. Internal emergency power unit.
 - c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
 - d. UL 94 5VA flame rating.

C. Emergency Lighting Unit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper Lighting Solutions; Signify North America Corp.
 - b. Dual-Lite; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - d. Or approved equal.
2. Options:
 - a. Nominal Voltage: Refer to electrical drawings and light fixture schedule.
 - b. Wall with universal junction box adaptor.
 - c. UV stable thermoplastic housing.
 - d. Two LED lamp heads.
 - e. Internal emergency power unit.

2.3 EXIT SIGNS

A. General Characteristics: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Sign:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper Lighting Solutions; Signify North America Corp.
 - b. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - c. Signify North America Corporation (formerly Philips Lighting).
 - d. Or approved equal.
2. Options:
 - a. Nominal Voltage: Refer to electrical drawings and light fixture schedule.
 - b. Lamps for AC Operation:
 - 1) LEDs; 50,000 hours minimum rated lamp life.
 - c. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.

2.4 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components must be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded aluminum housing.
2. White powder coat finish.

E. Conduit: EMT , minimum metric designator 21 (trade size 3/4).

2.5 METAL FINISHES

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Nonconforming Work:
 - 1. Luminaire will be considered defective if it does not pass operation tests and inspections.
 - 2. Remove and replace defective units and retest.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:
 - 1. Inspect luminaires. Replace lamps, emergency power units, batteries, exit signs, and luminaires that are defective.
 - a. Parts and supplies must be manufacturer's authorized replacement parts and supplies.
 - 2. Conduct short-duration tests on all emergency lighting.

3.5 PROTECTION

- A. Remove and replace luminaires and exit signs that are damaged or caused to be unfit for use by construction activities.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 26 56 19
LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.

B. Related Requirements:

1. Section 26 05 00 "Common Work Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section. for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color rendering index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 SUBMITTALS

- A. Product Data: For each type of luminaire.
- B. Shop Drawings: For nonstandard or custom luminaires.
1. Include plans, elevations, sections, and mounting and attachment details.
 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.5 FIELD CONDITIONS

- A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: 5 years (not pro-rated) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. UL Compliance: Comply with UL 1598 and listed for wet location.
- D. Lamp base complying with ANSI C81.61 .
- E. CRI of 80 .
- F. CCT shall not exceed 4100 K .
- G. L70 lamp life of 50,000 hours.
- H. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- I. Nominal Operating Voltage: Refer to light fixture schedule.
- J. In-line Fusing: On the primary for each luminaire .
- K. Lamp Rating: Lamp marked for outdoor use .
- L. Source Limitations:
 1. For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

A. Area, Building and Site:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Architectural Area Lighting; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - b. Atlas Lighting Products.
 - c. Cooper Lighting Solutions; Signify North America Corp.
 - d. Gallium Lighting, LLC.
 - e. GE Current, a Daintree company; American Industrial Partners (AIP).
 - f. H.E. Williams.
 - g. Howard Lighting Products.
 - h. Juno Lighting Group by Schneider Electric.
 - i. Kim Lighting; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - j. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - k. OSRAM SYLVANIA.
 - l. RAB Lighting.
 - m. Selux Corporation.
 - n. Signify North America Corporation (formerly Philips Lighting).
 - o. Or approved equal
2. Product Performance: Refer to light fixture schedule for performance requirements, finish, voltage, and mounting height,
3. Product Performance: Refer to light fixture schedule for performance requirements, finish, voltage, and mounting height,

2.4 MATERIALS

- A. Metal Parts: Free of burrs and sharp corners and edges.
- B. Sheet Metal Components: Corrosion-resistant aluminum . Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- D. Diffusers and Globes:
 1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
 1. White Surfaces: 85 percent.

2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

2.5 FINISHES

- A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color:
 - 1) As selected from manufacturer's standard catalog of colors.

2.6 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Comply with NECA 1.
- B. Fasten luminaire to structural support.
- C. Supports:
 1. Sized and rated for luminaire weight.
 2. Able to maintain luminaire position after cleaning and relamping.
 3. Support luminaires without causing deflection of finished surface.
 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- D. Wall-Mounted Luminaire Support:

1. Attached using through bolts and backing plates on either side of wall .
- E. Wiring Method: Install cables in raceways. Conceal raceways and cables.
- F. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.
- G. Coordinate layout and installation of luminaires with other construction.
- H. Adjust luminaires that require field adjustment or aiming.
- I. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 05 33 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.
- B. Perform the following tests and inspections[with the assistance of a factory-authorized service representative]:
 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 2. Verify operation of photoelectric controls.
- C. Illumination Tests:
 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- D. Luminaire will be considered defective if it does not pass tests and inspections.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 31 05 13
SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Subsoil materials.
 - 2. Topsoil materials.
 - 3. Pipe Bedding Materials.
 - 4. Pipe Cover Materials
- B. Related Sections:
 - 1. Section 31 23 16 – Earthwork
 - 2. Section 31 23 17 – Trenching and Backfilling.
 - 3. Section 32 05 13 - Soils for Exterior Improvements.
 - 4. Section 32 05 16 - Aggregates for Exterior Improvements.
 - 5. Section 32 92 19 - Seeding and Soil Supplements.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International:
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - 3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 4. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 5. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

1.3 QUALITY ASSURANCE

- A. Furnish each subsoil and topsoil material from single source throughout the Work.
- B. Perform Work in accordance of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition.

PART 2 PRODUCTS

2.1 BEDDING AND COVER MATERIALS

- A. Class I - Crushed stone consisting of clean (screened), hard, tough, durable, angular 3/8" to 1 1/2" graded stone crushed from bedrock limestone, dolomite, granite or bank run gravel.
- B. Class II - Coarse sands and gravels with maximum particle size of 1 1/2" including well-graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class, along with coarse-grained soils with less than 12% fines (P200).
- C. Class III - Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures with less than 30% fines (P200). Soil Types GM, GC, SM, and SC are included in this class.

2.2 SUBSOIL MATERIALS

- A. Select Granular Backfill: Conforming to ASTM D2487 standard meeting soil classification groups; GW, GP, SW, SP, SM. Free of rocks larger than 3" in any dimension, debris, waste, frozen material, vegetation and other deleterious matter. Liquid Limit 40 or less and Plasticity Index of 40 or less. Material shall consist of durable particles ranging from fine to coarse in a substantially uniform combination. Some fine clay or loam particles are desirable, but they shall not be present in the form of lumps. Backfill material shall conform to the following grading requirements.

GRADING REQUIREMENTS FOR SELECT GRANULAR BACKFILL

Sieve Sizes	Percentage by Weight Passing
2 inches	95 - 100
No. 4	35 - 60
No. 200	5 - 15

- B. Native Backfill:
 - 1. On-site excavated material to be used as backfill shall consist of ASTM D 2487 soil classification groups GW, GP, SW, SP, and SM, or a combination of these groups, or other materials which, in the judgment of the Engineer, are suitable for backfilling.
 - 2. Free of lumps larger than 3 inches, rocks larger than 2 inches, debris, waste, frozen materials, vegetation, and other deleterious matter.
 - 3. Unsuitable backfill materials include ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these groups, vegetable or other organic matter, all types of refuse, large pieces or fragments of concrete and such other material as in the judgment of the Engineer are unsuitable for backfilling.
 - 4. Frozen material shall not be used for backfilling.

- C. General Fill:
 - 1. Conforming to ASTM D2487 standard meeting soil classification groups; GW, GP, GM, SW, SP, and SM, or a combination of these groups free of lumps larger than 3 inches, rocks larger than 2 inches, debris, waste, frozen materials, vegetation, and other deleterious matter.
 - 2. Unsuitable backfill materials include ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these groups, vegetable or other organic matter, all types of refuse, large pieces or fragments of concrete and such other material as in the judgment of the Engineer are unsuitable for backfilling.
 - 3. Frozen material shall not be used for backfilling.
- D. Structural Fill: Conforming to ASTM D2487 standard meeting soil classification groups; GW, GP, SW. Free of rocks larger than 3" in any dimension, debris, waste, frozen material, vegetation and other deleterious matter. Liquid Limit 40 or less and Plasticity Index of 40 or less. Material shall consist of durable particles ranging from fine to coarse in a substantially uniform combination.

2.3 TOPSOIL MATERIALS

- A. Trucked-In Topsoil:
 - 1. Imported topsoil conforming to State of Wisconsin Department of Transportation standard, section 625.2.
 - 2. Topsoil shall consist of natural loam, sandy loam, silt loam, silty clay loam, or clay loam humus-bearing soils adapted to sustain plant life.
 - 3. Topsoil shall have a pH range of 6.0 to 7.0.
 - 4. Topsoil shall have an organic content of at least 40%.
 - 5. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.
 - 6. Topsoil shall be subject to inspection upon delivery to site. Any unsatisfactory materials, as determined by the Engineer, shall be removed and replaced with materials conforming to these specifications.
- B. Salvaged Topsoil :
 - 1. Excavated and reused material consisting of loam, sandy loam, silt loam, silty clay loam or clay loam humus-bearing soils available from overlying portions of the areas to be disturbed.
 - 2. Graded.
 - 3. Free of roots, rocks, subsoil, debris, large weeds and foreign matter.
 - 4. Conforming to ASTM D2487 Group Symbol OH.

2.4 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services Testing and analysis of soil material.
- B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698. ASTM D1557. (ASTM C136).

- C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698. ASTM D1557. (ASTM C136).
- D. Testing and Analysis of Coarse Aggregate Material: Perform in accordance with ASTM D698, ASTM D1557, ASTM D4318, ASTM C136
- E. When tests indicate materials do not meet specified requirements, change material and retest.
- F. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.
- B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.
- C. Remove excess excavated materials subsoil and topsoil not intended for reuse, from site.
- D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING / PLACING

- A. Stockpile or place materials on site at locations indicated designated by Engineer.
- B. Furnish material in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Stockpile topsoil 8 feet high maximum.
- E. Prevent intermixing of soil types or contamination.
- F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- G. Stockpile unsuitable or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.
- H. Place Engineered Soil with backhoe or end loader being careful not to compact placed material. After placement, protect from compaction by wheeled or tracked equipment.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 31 10 00

SITE CLEARING AND REMOVALS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Site Clearing and Grubbing.
 - 2. Remove Existing Stumps.
 - 3. Remove Existing Asphalt.
 - 4. Remove Curb & Gutter.
 - 5. Remove Existing Concrete.
 - 6. Sawcut Asphalt and Concrete.

- B. Related Sections:
 - 1. Section 31 23 16 - Earthwork.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Site Clearing and Grubbing:
 - 1. Basis of Measurement: By Lump Sum.
 - 2. Basis of Payment: Includes clearing, grubbing, and disposal of trees, brush, stumps, and other vegetation.
 - 3. If no price is stated in the Bid Form, Cleaning and Grubbing will be considered incidental to the other construction.
- B. Remove Existing Asphalt:
 - 1. Basis of Measurement: By Square Yard.
 - 2. Basis of Payment: Removal of existing asphalt shall be full compensation for excavating existing asphalt, disposal of existing asphalt off-site, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.
- C. Remove Existing Curb & Gutter:
 - 1. Basis of Measurement: By Lineal Foot.
 - 2. Basis of Payment: Removal and disposal of curb and gutter off-site, and for labor, tools, equipment, and incidentals necessary to complete the work.
- D. Remove Existing Concrete:
 - 1. Basis of Measurement: By Square Foot or Square Yard.
 - 2. Basis of Payment: Removal and off-site disposal of sidewalk, driveway aprons, and driveways, concrete pavement and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.
- E. Sawcut Asphalt:
 - 1. Basis of Measurement: By lineal foot.
 - 2. Basis of Payment: Includes full compensation for furnishing all labor, tools, equipment, and incidentals necessary to complete the work. Payment will be made

for final sawcut only. The Engineer will not measure overcuts beyond the limits the plans show or as the Engineer directs. There will be no compensation for additional sawcuts due to rolled pavement edges.

F. Sawcut Concrete:

1. Basis of Measurement: By lineal foot.
2. Basis of Payment: Includes full compensation for furnishing all labor, tools, equipment, and incidentals necessary to complete the work. Payment will be made for final sawcut only. The Engineer will not measure overcuts beyond the limits the plans show or as the Engineer directs. There will be no compensation for additional sawcuts due to rolled pavement edges.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Call Local Utility Line Information service at 1 800 242 8511 not less than three working days before performing Work.
 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.2 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain, from damage. Contractor shall coordinate with the Owner/Engineer prior to completing any removals.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.
- D. Confine work to limits indicated on the plans.

3.3 SITE CLEARING AND GRUBBING AND TREE REMOVAL

- A. Remove existing stumps (City shall remove trees indicated prior to start of construction), shrubs, grass, and other vegetation, improvements, or obstructions, as required, for access to the site and execution of Work. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.
 1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 2. Stumps may be removed by grubbing, chipping, or grinding.

- B. Remove stumps and root system to a depth of 12 inches below finished grade.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Apply herbicide to remaining stumps to inhibit growth.
- E. Disposal of Elm Trees shall be in accordance with local regulations.
- F. Prevent the spread of oak wilt by treating all cut surfaces and abrasions sustained between April 1 and September 30 by healthy oak trees and saplings with a thorough application of tree paint immediately upon discovering a wound. Between these dates, also paint the cut surfaces of the stumps of all healthy oak trees and saplings immediately after cutting, whether remaining in place or grubbed.

3.4 REMOVAL OF ASPHALT, CONCRETE, and CURB & GUTTER

- A. All waste and debris shall be disposed of in compliance with State and local regulations, within five days of being cut or removed.
- B. Remove paving, sidewalk, driveway, and curb and gutter as indicated on Drawings or as directed by the Engineer. Neatly saw cut edges at right angle to surface.
- C. Existing asphalt shall be left in place as much as practical during underground utility construction. Pavement shall only be removed as necessary to excavate the trench for each utility line unless otherwise directed by the Engineer. Following completion of all underground utilities, the remaining asphalt shall be removed.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

3.5 SAWING ASPHALT

- A. Make straight, full-depth saw cuts at least 2 inches deep. Saw so the surface remaining is generally vertical over its full depth. Sawcut edges shall be protected. Only final sawcut will be paid for.

3.6 SAWING CONCRETE

- A. Do not extend sawcuts into newly placed concrete pavement or into existing pavements more than 12 inches beyond the limits the engineer designates. Saw full-depth unless the plans indicate otherwise or the engineer directs or allows otherwise.
- B. Removing sawing sludge after completing each saw cut. Minimize sludge on live traffic lanes. Remove sludge from all traffic control devices each day before dark. Dispose of sludge at an acceptable material disposal site or on Engineer-approved areas of the roadway or roadside.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 31 23 16

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

This work consists of the excavation and satisfactory disposal of all materials for the construction of the roadway, roadbed, embankments, earth subgrade and shoulders, intersections, side ditches and dikes, channels and waterways, and shall also include the grading of entrances, approaches, ditches and channels, in accordance with these specifications and in reasonably close conformity with the lines, grades, thicknesses and typical cross-sections shown on the plans or established by the engineer. Except when otherwise provided, this work shall also include the removal and satisfactory disposal of surface and base courses, surplus and unsuitable materials; the replacement of unsuitable material with satisfactory material; the trimming and finishing of the roadway; and maintaining such work in a finished condition until acceptance.

A. Section Includes:

1. Topsoil Excavation.
2. Topsoil Placement.
3. Common Excavation.
4. Borrow Excavation.
5. Excavation Below Subgrade (EBS).
6. Excavating Roadway, and Parking Areas.
7. Excavating for Drainage & Embankments.
8. Filling.
9. Finish Grading.
10. Placing Topsoil.
11. Soil Compaction.

B. Related Sections:

1. Section 31 05 13 - Soils for Earthwork – Pumphouses & Lift Station.
2. Section 31 23 17 - Trenching.
3. Section 31 23 18 - Rock Removal.
4. Section 33 11 16 - Site Water Utility Distribution Piping.
5. Section 33 11 13 - Public Water Utility Distribution Piping.
6. Section 33 31 13 - Public Sanitary Utility Sewerage Piping.
7. Section 33 31 00 - Sanitary Utility Sewerage Piping.
8. Section 33 41 00 - Storm Utility Drainage Piping.
9. Section 41 13 - Public Storm Utility Drainage Piping.
10. Section 31 25 13 - Erosion Controls.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Strip Topsoil:

1. Basis of Measurement: By Cubic Yard or Lump Sum when indicated on the bid form.

2. Basis of Payment: Price shall be full compensation for excavating, loading, hauling, and temporary stockpiling the topsoil as required and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work. Work shall include removal and off-site disposal when required.
 3. When no item is included in the bid form, stripping topsoil will be incidental to Common Excavation.
- B. Topsoil Respread:
1. Basis of Measurement: By Cubic Yard or Lump Sum when indicated on the bid form.
 2. Basis of Payment: Price shall be full compensation for re-spreading the stockpiled topsoil to the required elevations and thicknesses and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.
 3. When no item is included in the bid form, Topsoil Placement will be incidental to Common Excavation.
- C. General Fill:
1. Basis of Measurement: By Cubic Yard or Lump Sum when indicated on the bid form.
 2. Basis of Payment: Price shall be full compensation for supplying fill materials, stockpiling, placing in areas which will not receive concrete slabs, or building foundations, compacting, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.
- D. Structural Fill – Concrete Slabs & Structure Foundations:
1. Basis of Measurement: By Cubic Yard or Lump Sum when indicated on the bid form.
 2. Basis of Payment: Price shall be full compensation for supplying fill materials, stockpiling, placing in areas which will receive concrete slabs and structure foundations, compacting, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.
- E. Excavation for Pumphouse Structure:
1. Basis of Measurement: Incidental to the Pumphouse lump sum bid item.
 2. Basis of Payment: Price shall be full compensation for excavation for footings/foundations, disposal of all excavated materials, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.
- F. Common Excavation:
1. Basis of Measurement: By cubic yard or Lump Sum as indicated on the bid form. When the contract uses a cubic yard measurement, payment of excavation will be in the original position, computed by the method of average end areas, with no correction for curvature, except where this method is not feasible and as hereinafter provided.
 2. Basis of Payment: Prices shall be full compensation for excavation, disposal of all material not otherwise classified, including topsoil, surface, and base courses, and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work. Topsoil Excavation and Topsoil Placement shall also be included in the cost of common excavation when no specific bid item is indicated for those items.
 3. The cost of removing walls, foundations, etc., the satisfactory disposal of material resulting there from, and the backfilling of basements or openings resulting from the removal of walls, foundations, etc., for which no separate unit prices are included in the contract, will be construed to be included in the contract unit price for Common

Excavation items, except as provided above for the removal of concrete structures. No extra or additional compensation will be made for such work, except that payment for furnishing and placing the required Granular Backfill will be made at the contract unit price for that item, and excavation below subgrade performed after completion of rough grading.

G. Borrow Excavation:

1. Basis of Measurement: By cubic yards when indicated on the bid form. The volume will be determined in its original position, computed by the method of average end areas, with no correction for curvature, or if the engineer elects, by the method of truncated prisms. The contractor shall notify the engineer sufficiently in advance of the time when excavation operations will be performed so as to permit accurate measurements of the borrow pit. Sod or other unsuitable material removed, or material salvaged from borrow pits and used for covering surfaces of the excavated areas within such pits, as hereinbefore provided, will not be measured for payment. The engineer may require the contractor to remove topsoil or other unsuitable materials from the surface of the pit area prior to taking original cross-sections of the pit area and, upon completion of the excavation, to smooth or trim the pit, as require, to permit taking accurate final measurements of the area before the topsoil is replaced thereon. Any material excavated prior to the staking out and cross-sectioning of the borrow pit by the engineer, and all excavated material in excess of that required for or not incorporated in the work, will not be included in the quantity measured for payment.
2. Basis of Payment: Prices shall be full compensation for furnishing, clearing, grubbing, excavating, loading, hauling, sloping, shaping, placing, watering and dust abatement unless otherwise provided, compacting, disposing of surplus and unsuitable material; for salvaging, stockpiling, remanding and spreading approved salvaged material for covering surfaces of excavated areas within borrow pits; and for all labor, equipment, tools and incidentals necessary for completion of embankments and other portions of the work when sufficient quantities of satisfactory material for such purposes cannot be obtained from common excavation.

H. Excavation Below Subgrade:

1. Basis of Measurement: By cubic yard when indicated on the bid form.
2. When not indicated on the bid form and excavation below subgrade is performed after the rough grading operations are complete, unit price will be determined by multiplying the contract unit price bid for Common Excavation by three.
3. Basis of Payment: Such price shall be full compensation for excavation and disposal of unsuitable materials off-site, and for furnishing all tools, labor, equipment, and incidentals necessary to complete the work.

I. Finish Grading in Prep of Stone Base:

1. Basis of Measurement: By lineal foot when indicated on the bid form.
2. Basis of Payment: The price shall be full compensation for completing the work as required and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

1.3 REFERENCES

- A. Local utility standards when working in proximity of utility lines.
- B. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- C. ASTM International:
 - 1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - 4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit, in air-tight containers, 10 lb sample of each type to testing laboratory when required or requested by Engineer.
- C. Materials Source: Submit name and location of imported materials suppliers.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish each material from single source though out the work.
- B. Perform Work in accordance with State of Wisconsin Department of Transportation Standard Specifications.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Topsoil: Salvaged topsoil or trucked-In topsoil if indicated on the bid form as specified in Section 31 05 13.
- B. Subsoil Fill: Select Granular Backfill, Native Backfill, General Fill, or Structural Fill as specified in Section 31 05 13.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.
- C. Verify building and trench backfilling have been inspected.
- D. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

- A. Call Diggers Hotline Information service at 1-800-242-8511 not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.
- C. Notify utility company to remove and relocate utilities.
- D. Protect utilities indicated to remain from damage.
- E. Protect plant life, lawns, rock outcropping and other features remaining as portion of final landscaping.
- F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

- A. Strip/Salvage Topsoil:
 - 1. Strip topsoil to whatever depths encountered or to depths necessary to provide sufficient volumes to cover designated areas to the required depths in a manner to prevent intermingling with underlying subsoil or other objectionable material. All areas from which topsoil is obtained shall be cleaned, if necessary, by means of mowing weeds or other vegetation to a height of approximately six inches or less. The area shall be free of any litter such as rocks, brush, or other material of objectional nature.
 - 2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water.
 - 3. Stripped/salvaged topsoil may be stockpiled in areas designated on the plans or as directed by the Engineer so that it may be reclaimed and spread on the areas designated.
 - 4. Stockpile in area designated on site and protect from erosion with silt fence.

3.4 TOPSOIL PLACEMENT

- A. All areas designated to be covered with topsoil shall be undercut or underfilled with approved material to such depth that when covered with the required depth of topsoil, the finished surface will be in accordance with the required lines, grades, slopes, and cross sections.
- B. The finished surface shall contain no dirt clumps, stones, sticks, or other debris larger than one inch in any dimension. Topsoil placed next to fixed surfaces, such as walks, curbs, concrete sidewalks or other borders shall be kept 3/4 inch below such fixed surfaces.
- C. Place topsoil in areas where restoration is required to a nominal depth of 6 inches unless otherwise indicated on the plans.
- D. Place topsoil during dry weather.
 - 1. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
 - 2. Remove roots, weeds, rocks, and foreign material while spreading.
 - 3. Manually spread topsoil close to plant material, building, and concrete or pavement to prevent damage.
 - 4. Lightly compact placed topsoil.
 - 5. Excess topsoil shall be disposed of off-site unless otherwise stated in the plans.
 - 6. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.5 TRUCKED-In TOPSOIL

- A. Use when insufficient quantities of salvaged topsoil exist on site only with approval of Engineer.
- B. Place topsoil according to TOPSOIL PLACEMENT item.

3.6 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
- B. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.8 COMMON EXCAVATION

- A. Common excavation shall consist of removal, satisfactory disposal, and placement of all materials of every description not otherwise classified on the bid form.

- B. Excavate to in accordance to the lines, grades, thicknesses, and typical sections shown on the plans.
- C. Provide temporary drainage and efficient management of surface water runoff to reduce the flow of storm water runoff into site excavations and construction areas.
- D. Correct unauthorized excavation at no cost to Owner.
- E. Any materials tracked on adjacent property or streets will be cleared immediately by the Contractor.
- F. Excess material is to be disposed of off-site unless otherwise indicated.

3.9 PREPARING ROADWAY AND PAVEMENT FOUNDATIONS

- A. Vegetation of a height greater than one foot shall be cut and properly disposed of before ground is broken for excavation or before embankment is placed thereon. Heavy sod and other perishable material underlying proposed embankments within the limits of assumed one-to-one slopes extending outward from the outer limits of the finished shoulder line shall be removed. Muck, peat, and other unstable material shall be removed, disposed of, or otherwise treated as shown on the plans.
- B. All suitable topsoil material from within the roadway limits shall be stripped and stockpiled or otherwise salvaged and stockpiled as shown on the plans or directed by the Engineer.
- C. After suitable topsoil and required sod and other perishable or unsuitable materials have been removed, the ground underlying proposed embankments, within the limits of the assumed one-to-one slopes prescribed above, shall be compacted, or otherwise prepared as required to provide a foundation which will properly support the proposed embankment and which will permit attaining the density specified for the embankment.
- D. All pavements, asphaltic surfaces, or rigid base courses occurring within the area of the roadbed slopes and underlying proposed embankments shall be completely removed to a depth of not less than 24 inches below the proposed finished grade line, or to such other depth as shown on the plans.

3.10 EXCAVATION BELOW SUBGRADE (EBS)

- A. Excavation below subgrade shall consist of removal and satisfactory disposal of frost heave material, unstable soils, water bearing soil, topsoil containing unsatisfactory amounts of vegetation or other undesirable foundation material to such depths below the proposed finished earth grade as shown on the plans or as directed by the engineer. The undercut material shall be replaced with base course. The base course used to replace the undercut material will be paid for under the unit price for base course.
- B. Slope the bottom of the excavation so that water is drained and does not accumulate in excavated area.
- C. The sub-grade shall be proof-rolled with a loaded tri-axle dump truck to determine unsuitable materials.

- D. Verify that the sub-grade is dry and in suitable condition to support paving and imposed loads. Notify Engineer of any unsatisfactory subsoil conditions.
- E. Base course placement and paving shall not occur until these conditions have been corrected.
- F. Remove and dispose of off-site all lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- G. Backfill shall be made from selected materials as called for on the plans or as directed by the Engineer.
- H. Repair or replace items indicated to remain damaged by excavation.

3.11 ROADWAY AND PAVEMENT GRADING

- A. All suitable material removed from excavation shall be used in the construction of the roadway, as far as practicable, and at such other places as shown on the plans.
- B. All excavated slopes or areas and all embankment slopes or areas, designated to be covered with topsoil or salvaged topsoil, shall be undercut or underfilled to the necessary depth to provide for the specified amount of topsoil or salvaged topsoil to be placed and finished to the required grade lines and section.
- C. Excavating shall be so performed as to avoid removing or loosening any material outside the required slopes, and any such material, which may be removed or loosened, shall be replaced and thoroughly compacted to the required cross-section.
- D. All intersecting roads, approaches, entrances, and driveways shall be graded as shown on the plans or as laid out in the field by the engineer. The work of constructing intersections and private entrances, trimming shoulders and slopes, finishing, and blading the earth subgrade and completing the ditches to proper alignment, grade and cross-section shall follow the rough grading closely.
- E. Grading operations shall not be performed to the detriment of the work of trimming and finishing the roadway and blading and maintaining the roadbed and earth subgrade.

3.12 FINISH GRADING IN PREP OF STONE BASE

- A. The grading, trimming, and finishing shall be completed prior to construction of the subbase, base, or surface courses. The Contractor shall regrade after all underground construction activities have ended.
- B. Prepare and construct the foundation to uniform density throughout.
- C. Unless otherwise specified, the foundation shall be compacted to not less than the density for standard compaction of the particular material existing in the foundation.

- D. Excavate and backfill all soft or yielding areas, holes, or other defects that occur due to traffic, hauling, poor drainage, unstable materials, or from any other cause before placing the base as directed by the Engineer.
- E. Construct the foundation by scarifying, blading, leveling, and rolling as required to bring the foundation to the required grade, cross-section, and density.
- F. The foundation for base course shall be constructed using a machine designed specifically for trimming foundations. The machine shall utilize automatic sensors to trim to the required grade and cross-section.
- G. After shaping and compacting, provide a smooth foundation for the full width of the roadbed, to the required lines, grade, cross-section, and density for base course laying operations.
- H. The final street grade, which will be used for a base to install curb and gutter, stone base and bituminous pavement, shall be required to be within 0.05' of elevations given on the grade stakes.
- I. During grading operations and pending acceptance or placement of subbase, base or surface course, the contractor shall provide continuous maintenance of the entire roadbed and perform all blading and repair work necessary to keep the grade smooth and to the required grade and cross section.
- J. Washouts caused by erosion shall be refilled and properly compacted, and payment for such filling shall accrue only from additional volume of material used.
- K. Remove snow or ice, if any, from the foundation before placing the base.

3.13 DRAINAGE AND EMBANKMENTS

A. DRAINAGE

- B. 1. Inlets, outlets, swamps, berm and intercepting ditches, dikes, or intercepting embankments and channels shall be constructed where and as shown on the plans or where and as directed by the engineer and shall be maintained to the required section until acceptance. The work shall be performed in proper sequence with other work to provide adequate drainage and to minimize erosion and siltation.

C. EMBANKMENT

1. Materials:

- a. Materials for embankment shall consist of approved materials and shall contain no logs, stumps, brush, or other perishable material. Humus-bearing soils, in excess of the quantity needed for salvaged topsoil requirements, and other soils not suitable for roadbed construction may be placed in the outside edges of the embankment, beyond the limits of an assumed one-to-one slope extending outward from the outer limits of the finished shoulder line. Frozen lumps of soil shall not be permitted to be placed in embankments inside the above designated assumed slope limits.

- b. Materials to be incorporated in the top 8-inches of earth embankments shall be free from large stone, rock and broken concrete or other materials, which would significantly affect scarifying, compacting and finishing the subgrade.
 - c. Materials placed in those portions of embankments through which it is proposed to bore holes for or to drive piling shall contain no stone or broken concrete retained on a three-inch ring and shall be free from quantities of gravel, stone or broken concrete passing a three-inch ring, or other material which would significantly affect the boring of holes or driving of piling.
- 2. Placing Layers
 - a. Embankment shall be constructed in layers. The construction of an embankment shall begin at the lowest point of the fill below the grade, and shall be constructed in layers by spreading and leveling the material during placement. Individual layers shall be spread evenly to uniform thickness throughout and approximately parallel with the finished grade for the full width of the embankment, unless otherwise directed. The thickness of the layer shall be as necessary to secure the required compaction, generally not exceeding eight-inches.

3.14 FILL PLACEMENT SCHEDULE

- A. Place and compact fill material in layers to required elevations as follows:
- B. Other materials, such as a drainage course or subbase or base courses, may still be required over fill.
 - 1. Under grass and planted areas, use General Fill.
 - 2. Under walks and pavements, use Structural Fill.
 - 3. Under steps and ramps, use Structural Fill.
 - 4. Under building slabs, use Structural Fill.
 - 5. Under footings and foundations, Structural Fill.

3.15 PAVEMENT GRAVEL SHOULDERS

- A. Place shoulders along edges of pavement base course to prevent lateral movement. Construct shoulders and compact simultaneously with each base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.16 COMPACTION

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures, building slabs, steps, and pavements, compact each layer of backfill or fill material at 95 percent.
 - 2. Under walkways, compact each layer of backfill or fill material at 92 percent.

3. Under lawn or unpaved areas, compact each layer of backfill or fill material at 85 percent.

3.17 BORROW EXCAVATION

A. Quality

1. The material furnished shall consist of satisfactory soil or a mixture of satisfactory soil, stone, gravel, or other acceptable materials, which is of a character and quality satisfactory for the purpose intended. The material shall be free from sod, stumps, logs, grubs, and other perishable and deleterious matter.

B. Source

1. Unless otherwise provided in the contract, the contractor shall make his own negotiations with property owners or others from whom he proposes to obtain borrow material.

C. Construction Methods

1. The area from which material for Borrow Excavation is to be obtained shall be cleared and grubbed. All sod or other perishable or unsuitable material shall be removed from the proposed pit area. Borrow pits shall be excavated in a manner to permit accurate measurement of the material excavated and incorporated in the work.
2. All stone, broken rock, boulders, and other materials, which are not satisfactory for use in the work, shall be disposed of by the contractor at his expense.
3. All stumps, trees, logs, brush, tops and other debris resulting from clearing and grubbing work in borrow pit areas shall be disposed of by the contractor.
4. Except in the case of commercial pits, the available topsoil or other soil of a nature conducive to plant growth, overlying such pit, shall be stripped off and placed in stockpiles in sufficient quantities to cover all surfaces of excavated areas within such pit to a depth of from four to six inches. When the depth of topsoil overlying such pit is less than four inches in depth, the topsoil shall be replaced to the original depth. After the pit has been trimmed and finished, such salvaged material shall be uniformly spread over all excavated areas of the borrow pit, except as otherwise authorized by the engineer in writing.
5. After the excavated areas of the pit have been topsoiled the pit, disturbed areas adjacent thereto and associated haul roads shall be fertilized and seeded.

3.18 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Compaction testing will be performed in accordance with ASTM D1557 by Owner.
- C. Owner, at their discretion, to perform in place compaction tests in accordance with the following:
 1. Density Tests: ASTM D2922.
 2. Moisture Tests: ASTM D3017.
 3. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and

approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

4. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: As determined by Owner.

3.19 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

END OF SECTION

SECTION 31 23 17

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating trenches for utilities including services to 5 feet outside building or as indicated on the plans.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.
4. Rock Excavation

B. Related Sections:

1. Section 31 05 13 - Soils for Earthwork: Soils for fill.
2. ~~Section 31 22 13 - Rough Grading: Topsoil and subsoil removal from site surface.~~
3. Section 31 23 16 - Earthwork.
4. Section 33 11 13 - Public Water Utility Distribution Piping.
5. Section 33 31 13 - Public Sanitary Utility Sewerage Piping.
6. Section 33 41 13 - Public Storm Utility Drainage Piping.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Trenching:

1. Basis of Measurement: Trenching will not be paid for separately but is incidental to pipe installation.
2. Basis of Payment: Included in the price of the pipe.

B. Native Backfill:

1. Basis of Measurement: No payment will be made for native backfill. Native backfill shall be included in the per foot unit costs of each item it is installed with.

C. Select Granular Backfill:

1. Basis of Measurement: By cubic yard as measured in the truck. Load tickets will be required.
2. Basis of Payment: Includes full compensation for furnishing all materials, delivery to site hauling and disposing of unsuitable materials off-site, compaction, tools, equipment, labor, and incidentals necessary to complete the work in accordance with the Contract Documents.

Cover material, which is placed around the pipe and brought up to a point at the top or above the pipe barrel as shown in the standard drawings, is an integral part of the pipe section and will not be considered as part of the backfill area. Pay depths for backfill, when ordered as an extra, shall extend from the pavement, or surfacing subgrade down to the top of the cover material or concrete section.

D. Rock Excavation:

1. Basis of Measurement: Rock excavation in ledges and solid masses by the cubic yard or LF acceptably completed when called out on the bid form.
2. Basis of Payment: Includes excavating rock to required elevations, protecting excavation, and stockpiling excavated materials removing excavated materials from site. Over Excavating: Payment is not made for over excavated work nor for replacement materials. Material that can be removed with a 100,000 pound backhoe with ripping teeth shall not be considered rock excavation.

E. Bedding and Cover:

Basis of Measurement: No payment will be made for bedding and cover material. Bedding and cover material shall be included in the per foot unit costs of each item it is installed with.

1.3 REFERENCES

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

1.5 SUBMITTALS

- A. Excavation Protection Plan: When required, describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.
- B. Product Data: Submit data for geotextile fabric indicating fabric and construction.
- C. Materials Source: Submit name of imported fill materials suppliers.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Wisconsin Department of Transportation or Standard Specifications for Sewer and Water Construction in Wisconsin.

- B. Perform Work in accordance of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition.

1.7 QUALIFICATIONS

- A. Prepare excavation protection plan under direct supervision of Competent Person experienced in design of this Work and comply OSHA standard 1926.650 Excavation.

1.8 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

1.9 USE OF EXPLOSIVES

- A. The Contractor shall observe the utmost care in the use of explosives so as not to endanger life and property. The methods of use, storing and handling of explosives and highly inflammable materials shall conform with applicable Federal, State and local laws and regulations including the rules of the Department of Commerce (Wisconsin Administrative Code Comm. 7).
 - 1. When blasting operations are conducted in communities, the shots shall be designed and initiated by a properly licensed Class 4 or 5 blaster.
 - 2. Blasting operations in communities shall comply with all local regulations and Contractor shall obtain necessary permits.
 - 3. Any person conducting blasting operations in a community shall notify the Engineer, Department of Commerce, the local fire department, and the local law enforcement agency of the time and location of the blast.
 - 4. The Contractor is responsible to assure that the works to be accomplished are covered by insurance to an extent ample to cover any and all claims, damage, liabilities, awards or costs which might derive from or be attributable to such works or any adverse effects thereof, including, but not limited to, blasting influences. Any damages caused by blasting shall be repaired by the Contractor at his own expense.

PART 2 PRODUCTS

2.1 BACKFILL MATERIALS

- A. Native backfill and select granular backfill, where required, shall be as specified in Section 31 05 13.

2.2 BEDDING AND COVER MATERIALS

- A. Pipe bedding and cover materials shall be as specified in Section 31 05 13.

PART 3 EXECUTION

3.1 LINES AND GRADES

- A. Lay pipes to lines and grades indicated on Drawings.
 - 1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

- 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect above and below grade utilities indicated to remain.
- F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

- A. Perform trenching as specified in 29 CFR part 1926, OSHA subpart P for excavations and trenches.
- B. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.
- C. Except by permission of the Engineer, not more than 250 feet of trench shall be opened at any one time. Not more than 200 feet of trench may be opened in advance of the completed pipe laying operations; and not more than one street crossing may be obstructed by the same trench at any one time.
- D. Cut trenches to width indicated on Drawings. Sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.
- E. Excavate bottom of trenches wide enough to provide free working space on each side of the pipe, preferably this space shall not exceed $\frac{1}{2}$ the nominal diameter of the pipe of the size of the sewer, and never be less than 6 inches. The working space required shall depend upon the size of the pipe and the character of the material encountered in the excavation. The trench shall always provide sufficient space between the pipe and sides of the trench to allow for preparing the foundation, laying the sewer, and placing and compacting the backfill as specified.

- F. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.
- G. Do not interfere with 45 degree bearing splay of foundations.
- H. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. If utilities and other restraints make sloping or benching of the excavation impractical, employ a shoring system conforming to OSHA Subpart P.
- I. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by notify Engineer, and request instructions.
- J. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Base Aggregate Dense 3" per Section 32 11 23 and compact to density equal to or greater than requirements for subsequent backfill material.
- K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
- L. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.
- M. Remove surplus excavated material not intended for reuse, from site.

3.4 EXCAVATED MATERIAL

- A. The excavated material to be used for trench backfilling must be stored so that it will cause a minimum of inconvenience to public travel, adjacent owners or tenants and other contractors or subcontractors.
- B. The excavated material, which is not to be used for trench backfilling, shall be removed immediately from the site.
- C. No claim for extra payment will be allowed because of the presence of quicksand or other materials tending to increase the excavating costs, unless specifically provided for in the Contract Documents, or as approved by the Engineer.

3.5 SURPLUS EXCAVATED MATERIAL

- A. Surplus excavated material shall be disposed of by the Contractor at his own option and cost unless he is otherwise directed by the Contract Documents, with the exception in both cases as specified in the following paragraph.
- B. The Engineer reserves the right to order up to 10% of the surplus excavated material to be delivered to streets, alleys, public properties, or other locations designated by the Engineer. The cost of delivering such surplus material to any point within a driving distance of two miles from the site of the work shall be included in the unit price bid for the work.
- C. After delivery to any designated location, such material shall be leveled off by the Contractor.

3.6 EXCAVATION IN ROCK

- A. When rock is encountered, it shall be stripped of earth and shale and the Engineer notified in order that he may measure or cross-section the same. In lieu of stripping the earth overburden prior to blasting, the Engineer and the Contractor may mutually agree on a method to define the vertical limits of the rock. Any rock excavated, before such measurement or agreement is made, will not be estimated, or paid for. Rock excavation shall be defined to include all hard solid rock in natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock, and masonry or concrete structures not shown on plans. Shales, hard pan, masonry and concrete rubble, boulders less than one (1) cubic yard which are not a part of or attached to sub-strata of rock, will not be considered rock excavation.
- B. The classification of rock excavation does not apply to crushed aggregate or asphaltic base or surface courses, or to Portland cement base or surface courses.
- C. The trench in rock excavation shall be excavated to a point six (6) inches below the bell of a bell and spigot type pipe and six (6) inches below the outside of the barrel of a tongue and groove type pipe.
- D. The pay width for rock excavation in open cut shall be the actual width of the excavated trench, but not to exceed the outside diameter of the pipe plus twenty-four (24) inches.
- E. Existing utilities damaged during rock excavation or blasting will be replaced at the Contractor's expense.
- F. If excavation methods leave undrained pockets in the rock surface, drain the depressions properly. If the engineer allows, the contractor may fill the depressions with engineer-approved impermeable material, at no expense to the Owner.

3.7 PIPE BEDDING

- A. Bedding and cover material for utilities shall conform to Section 31 05 13. The standard trench section shall be as specified below.
- B. Sanitary Sewer
 - 1. Class C (ASTM C12) shall be used for all gravity sanitary, PVC water main, and PVC force main: The pipe shall be bedded in compacted Class I material placed on a flat trench bottom. The bedding shall have a minimum thickness of 6-inches under the barrel and shall extend one-tenth to one-sixth of the outside diameter up the pipe barrel at the sides. The remainder of the side fills and to minimum depth of 6-inches over the top of the pipe shall be filled with lightly compacted cover material. The cover material shall be Class I.
 - 2. Class I material shall be as specified in Section 31 05 13.
- C. Storm Sewer
 - 1. Class B (ASTM C12) shall be used for all gravity storm sewers: The pipe shall be bedded in compacted Class I material placed on a flat trench bottom. The bedding shall have a minimum thickness of 6 inches under the barrel and shall extend to the

spring line of the pipe. The remainder of the side fills and to minimum depth of 12-inches over the top of the pipe shall be filled with lightly compacted cover material. The cover material shall be Select Granular Backfill per Section 31 05 13.

D. Water Main

1. Type 3 Embedment according to AWWA C600 shall be used for ductile iron pipe: Pipe shall be bedded on 6-inches minimum of loose soil with backfill lightly consolidated to 12-inches above the top of pipe. Loose material shall be select granular backfill or screenings, free of rocks, foreign materials, and frozen earth.
2. Class C (ASTM C12) shall be used PVC water main: The pipe shall be bedded in compacted Class I, II, or III material placed on a flat trench bottom. The bedding shall have a minimum thickness of 6 inches under the barrel and shall extend one-tenth to one-sixth of the outside diameter up the pipe barrel at the sides. The remainder of the side fills and to minimum depth of 6-inches over the top of the pipe shall be filled with lightly compacted cover material. The cover material shall be Class I, II, or III.

- E. Unstable Foundation: If the bottom of the trench is of undesirable material, such as organic soil, or the presence of ground water causes a condition that cannot adequately support the main, the unsuitable material shall be removed and replaced with Class I material. Depth greater than 3" will be considered extra work.

3.8 SHEETING AND SHORING

- A. Open-cut trenches shall be sheathed and braced as required by applicable Federal and State Codes, by the Contract Documents, and as may be necessary to protect life, property, or the work. When close sheathing is required, it shall be driven so as to prevent soil from entering the trench either below or through such sheathing.
- B. For any trench section, the Engineer may allow close sheathing to be set in place rather than be driven, providing that ground conditions are suitable and that the trench is properly spot braced prior to the placing of sheathing. Any voids behind the sheathing shall be immediately filled with backfill gravel.
- C. Lower Limits of Sheathing:
1. The Engineer reserves the right to order the sheathing driven to such additional depths below the pipe as may be required for the protection of the work.
 2. Where the sheathing must be driven below the top of a concrete cradle or envelope, tarpaper or other suitable material shall be used to break the bond between the concrete and the sheathing so as to permit the removal of the sheathing.
- D. Design sheeting and shoring to be removed at completion of excavation work.
- E. Removal of Sheathing and Bracing:
1. Trench sheathing and bracing, including sections, which have been ordered left in place, shall be removed for a distance of three (3) feet below the established street grade or the existing surface grade, whichever is lower.
 2. Trench sheathing and bracing shall be removed before the trenches are flooded, but only when and in such manner as will insure adequate protection of the

completed sewer or water structures and adjacent underground or surface structures, and prevent the disturbance of adjacent ground. Trench bracing, except that which must be left in place, may be removed when the backfilling has reached the respective levels of such bracing. Sheathing, except that which must be left in place, shall be removed after the backfilling has been completed or has been brought up to such elevation as to permit its safe removal.

- F. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.
- G. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.
- H. Cost of Sheathing and Bracing:
 - 1. The cost of furnishing, placing and removing of sheathing and bracing in open-cut trench, and the leaving in place of sheathing and bracing specifically indicated on the plan or in the Contract Documents, shall be included in the unit price bid for the work.
 - 2. Sheathing and bracing shall include all stringers, wales and cross braces deemed necessary by the Engineer to protect the work.
 - 3. The cost of furnishing and placing shoring and bracing in tunnel construction shall be included in the unit price bid for such work in tunnel.
- I. The right of the Engineer to order sheathing and bracing left in place shall not be construed as creating any obligation on his part to issue such orders. His failure to exercise his right to do so shall not relieve the Contractor of any liability for damages to persons or property occurring from or upon the work of constructing the sewer, water main, or appurtenances occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheathing and bracing to prevent the caving or moving of the ground, or disturbance of the completed work or any of the surface or subsurface structures.
- J. Portable Trench Box or Sliding Trench Shield
 - 1. Portable trench boxes or sliding trench shields complying with OSHA regulations may be used. Use of the shield shall not relieve the Contractor of any liability for damages to persons or property occurring from or upon the work of constructing the sewer, water main, or appurtenances occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheathing and bracing to prevent the caving or moving of the ground, or disturbance of the completed work or any of the surface or subsurface structures.
 - 2. Care shall be taken when a trench box or shield is moved ahead so as not to pull the already jointed pipe apart, leave voids around the pipe wall or change the alignment.
 - 3. Where a concrete cradle or envelope is required, tarpaper or other suitable material shall be used to prevent a bond between the spacer and the concrete, so as to permit moving of the shield without disturbing the pipe, cradle, or envelope. A suitable spacer between the concrete and the shield shall be provided.
 - 4. The width of the trench shield or box shall be such that a minimum six (6) inch horizontal clearance is maintained between the pipe and shield at all times.

5. Any voids between the trench box or shield and the undisturbed trench wall within the pipe zone (bottom of trench to top of cover material) shall be filled with crushed stone chips or backfill gravel, immediately after the box or shield is positioned.

3.9 SUPPORT OF UNDERGROUND STRUCTURES

- A. Concrete backfill shall be used to support sewers, building sewers, water mains, and other utilities crossing trenches. With prior written approval of the Engineer, the Contractor may substitute reinforced concrete beams.

3.10 BACKFILLING

A. NATIVE BACKFILL

1. Unless otherwise specified, material excavated from an open trench may be used for backfilling if it meets the requirements of Section 31 05 13 and is approved by the Engineer. Where excavated material is used for backfilling and there is a deficiency due to the rejection of a part thereof, the Contractor, upon the written order of the Engineer, shall furnish an additional quantity of select granular backfill.
2. Vegetable or other organic matter, all types of refuse, large pieces, or fragments of concrete and frozen materials are unsuitable for backfilling.
3. Native backfill material shall be used in streets only where soil is of proper moisture content so that the required compaction can be achieved. Where compaction requirements cannot be achieved, granular backfill shall be used.

B. SELECT GRANULAR BACKFILL

1. Trenches shall be filled with select granular backfill where specifically called for on the plans or if directed by the Engineer when native backfill does not conform to Section 31 05 13.

- C. All pipe or manholes with a rubber gasket or resilient type joint shall be backfilled within 24 hours after installation. Pipe sewers or manholes with cement mortar joints shall not be backfilled until initial set has occurred.
- D. Large stones or hard or frozen lumps of earth will not be allowed in the backfill. Material, which has frozen in the stockpile, shall be replaced with acceptable backfill by the Contractor at his own expense.
- E. After the cover material has been placed, the backfill shall be deposited and consolidated in accordance with this Section. The Contractor will be held responsible for any damage to underground structures.
- F. Unless otherwise specified, native material excavated from an open trench may be used for backfilling if approved by the Engineer. Where excavated material is used for backfilling and there is a deficiency due to the rejection of a part thereof, the Contractor, upon the written order of the Engineer, shall furnish an additional quantity of granular backfill.
- G. In existing pavement and roadways, the trench shall be backfilled to the existing surface, subject to surfacing requirements as indicated on the plans. In streets under construction, in open areas and in easements, the trench shall be backfilled to the existing ground

surface or to the proposed or established grade, whichever is lower, unless otherwise specified.

- H. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- I. Place and compact backfill material above the pipe in layer no more than 12 inches deep, to the top of the trench. Compact to the same degree as the material next to the trench.
- J. Do not walk or work on the completed pipe, except as necessary to tamp or backfill, until backfilling the trench to at least 2 feet above the top of pipe.
- K. Employ placement method that does not disturb or damage utilities in trench, and existing facilities to remain. Tamp or ram each layer thoroughly with proper tools that do not injure or disturb the pipe.
- L. Maintain optimum moisture content of fill materials to attain required compaction density.
- M. Do not leave more than 25 feet of trench open at end of working day.
- N. No sewer or water main shall be backfilled in absence of the engineer's construction representative without the opportunity to observe the installation. In case the Contractor fails to observe this requirement, he shall uncover the pipe where requested and backfill the trench at his own expense.
- O. Contractor shall provide temporary drainage and efficient management of surface water runoff to reduce the flow of storm water runoff into site excavations and construction areas.
- P. Protect open trench to prevent danger to Owner and the public.

3.11 CONSOLIDATION OF BACKFILL

- A. All backfill material shall be consolidated. Fill material shall be placed in lifts such that the required density is achieved throughout the entire lift with the equipment used by the contractor. The contractor shall place smaller lifts if the required compaction cannot be obtained. Fill material beneath paved areas and within five (5) feet of paved areas shall be consolidated as follows; within three (3) feet of the surface 95% of maximum dry density, below three (3) feet from the surface to one (1) foot above the pipe 90% of maximum dry density, backfill material beneath non-paved areas shall be consolidated to a compaction density of a minimum of 90% of maximum dry density, as determined by the Modified Proctor Test (ASTM D1557).
- B. Mechanical Compaction of Earth or Gravel. Unless otherwise directed by the Engineer, mechanical compaction of backfill material shall be used to achieve the results required. All initial required compaction testing will be performed by the Engineer at no cost to the Contractor. The cost of required re-tests due to test failures shall be paid by the Contractor. The Contractor shall fully cooperate and provide whatever assistance, time

and safe access is necessary for the performance of the tests. The trench shall be kept free of visible water during the backfilling and compaction work. The cover material shall be placed over the pipe and care shall be taken not to exert undue stress on the pipe during the compaction operation. The thickness of compacted lifts shall be such that allows the density throughout the entire thickness of the lift to meet the density requirements, with the compaction equipment used by the Contractor. The Contractor shall use smaller lifts if the required compaction cannot be obtained.

- C. Jetting/Flooding of Granular Soils or Gravel. Jetting or flooding of granular soils or gravel for backfill consolidation will only be allowed if approved by the Engineer. Granular soils or gravel backfill shall be settled by jetting or flooding the trench with water after backfill has been placed. Compaction results obtained by jetting or flooding shall conform to this Section. The Contractor shall provide an adequate supply of water.
- D. Contractor shall compact under and along the side of the pipe with a jumping jack or plate compactor.
- E. Special compaction methods around manholes and other appurtenances shall be used to insure proper compaction.
- F. Any backfill found to be deficient in meeting the mechanical compaction specification shall be re-excavated and re-consolidated at the Contractor's expense. The costs of retesting backfill consolidation found to be deficient shall be paid by the Contractor.

3.12 INTERFERENCE OF UNDERGROUND STRUCTURES

- A. When an underground structure interferes with the work to such an extent that an alteration of the plan is required, such alteration shall not be made without the prior approval of the ENGINEER. If the alteration results in a change in the cost to the CONTRACTOR, the ENGINEER will issue a change order for such altered work.
- B. No pipe, conduit, or other underground structure shall be allowed to remain in, penetrate, reduce the cross-sectional area, or abridge the use of any sewer or appurtenance to be constructed under the contract.
- C. Where a previously unknown underground structure is encountered in the trench or tunnel of the proposed sewer, and because of interference, such part of the structure requires relocation, or chipping away of a part of the structure, the CONTRACTOR shall immediately notify the ENGINEER.
- D. Where the line and/or grade of the proposed sewer conflicts with an existing water main, the OWNER will arrange to relocate the water main at no cost to the CONTRACTOR or negotiate with the CONTRACTOR to perform such required relocation as an extra, unless otherwise specified. The CONTRACTOR shall in either case excavate the area around the water main to allow sufficient room to relocate the main.
- E. No extra compensation will be paid for unavoidable delays caused by the interference of existing underground structures.

- F. In the event that the above-mentioned relocation is to be made for the convenience of the CONTRACTOR, the CONTRACTOR shall first notify the ENGINEER and the structure owner of his desire to relocate such structure or to discontinue the service; and receive from the structure owner permission for relocation or discontinuance of service. Replacement to original position and condition shall be made at no cost to the OWNER.
- G. All sewer, building sewers or drains under proposed installation shall, when deemed necessary by the ENGINEER, be enveloped, capped, or bridged with concrete. Such work is considered incidental to the proposed installation.

3.13 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Top Surface of Backfilling Under Paved Areas : Plus or minus 1 inch from required elevations.
- C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.14 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
 - 1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
 - 2. Moisture Tests: ASTM D3017.
- B. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- C. Frequency of Tests: One (1) test per two (2) lift per 200 feet of trench if required by Engineer.

3.15 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.
- B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 25 13
EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silt Fence
 - 2. Inlet Protection
 - 3. Tracking Pad
 - 4. Erosion Mat
- B. Related Sections:
 - 1. Section 31 05 13 - Soils for Earthwork.
 - 2. Section 31 10 00 - Site Clearing.
 - 3. Section 31 23 16 - Excavation.
 - 4. ~~Section 32 91 19 - Landscape Grading.~~
 - 5. Section 32 92 19 - Seeding and Soil Supplements.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Silt Fence:
 - 1. Basis of Measurement: By lineal foot.
 - 2. Basis of Payment: Includes furnishing materials, tools, equipment and incidentals to install, maintain and remove following revegetation as required.
- B. Inlet Protection:
 - 1. Basis of Measurement: By each.
 - 2. Basis of Payment: Includes furnishing materials, labor, tools, equipment, maintaining, cleaning and incidentals required to complete the work and removal of protection following revegetation.
- C. Tracking Pad:
 - 1. Basis of Measurement: By Ton.
Basis of Payment: Includes furnishing materials, labor, tools, equipment and incidentals to complete the work.
- D. Erosion Mat:
 - 1. Basis of Measurement: By square yard.
 - 2. Basis of Payment: Includes furnishing materials, labor, tools, equipment and incidentals to complete the work. Seeding and fertilization prior to placement of mat shall be paid for under the restoration item.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.

2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
- C. ASTM International:
1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- D. Precast/Prestressed Concrete Institute:
1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Product Data: Submit data on geotextile.
- C. Submit proposed mix design of each class of concrete for review prior to commencement of Work.
- D. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements for all materials.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Wisconsin Department of Natural Resources Best Management Practices.

1.7 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

- B. Convene minimum one week prior to commencing work of this section.

1.8 ENVIRONMENTAL AND EROSION CONTROL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. At a minimum, the following erosion and sediment control measures shall be implemented at all construction sites.
 - 1. Sediment from overland flow shall be prevented from leaving the work site by installing straw bales or silt fencing, parallel to the contours, downhill from the work area.
 - 2. During pipeline construction, excavated material shall be placed on the high side of the trench. All trench water shall be discharged into a settling basin or through a filtering device prior to release into a storm sewer or stream. At the end of each day the trench shall be backfilled, compacted, and stabilized.
 - 3. Storm sewer inlets shall be protected from runoff by encircling with straw bales or silt fencing.
 - 4. Stone tracking pads shall be installed at all construction site exits to prevent soil tracking. Tracked soil shall be collected from paved roads located near construction sites on a daily basis.
 - 5. Minimize surface area of bare soil exposed at one time.
 - 6. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.
 - 7. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

PART 2 PRODUCTS

2.1 GEOTEXTILE MATERIALS

- A. Furnish materials in accordance with State of Wisconsin Department of Transportation standards.
- B. Geotextile Fabric: Furnish in accordance with State of Wisconsin Department of Natural Resources Best Management Practices.

2.2 EROSION MAT

- A. Erosion mat shall be listed on the Wisconsin DOT Product Acceptability List (PAL) and be a 100% biodegradable blanket of the class and type indicated on the plans or bid form. Curlex Netfree by American Excelsior or equal.
- B. Staples for anchoring the erosion mat in place shall be U-shaped, biodegradable landscape stakes. Staples to be e-staple by American Excelsior or equal.

2.3 SILT FENCE

- A. Geotextile Fabric.

1. The Geotextile fabric shall consist of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. Nonwoven fabric may be needle punched, heat bonded, resin bonded, or combination thereof. Submit a certificate of compliance certifying that geotextile conforms to the following:

TEST	METHOD	VALUE MINIMUM REQUIREMENTS
Minimum Grab Tensile Strength (cross machine direction) (lb)	ASTM D-4632	100
Minimum Grab Tensile Strength (machine direction) (lb)	ASTM D-4632	120
Maximum Apparent Opening Size (equivalent standard sieve)	ASTM D-4751	No. 30
Minimum Permittivity	ASTM D-4491	0.05 S ⁻¹
Minimum Ultraviolet Stability (strength retained at 500 hours of exposure)	ASTM D-4355	70%

2. The geotextile fabric shall be insect, rodent, mildew and rot resistant.

B. Fence Support System

1. The fence support system shall comply with plan requirements.

2.4 INLET PROTECTION

- A. 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 addition of the WisDOT Product Acceptability List (PAL).

2.5 TRACKING PADS

- A. The aggregate for tracking pads shall be 3 to 6 inch clear or washed stone or as directed by the Engineer. All material to be retained on a 3-inch sieve.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

- B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.
- C. Verify gradients and elevations of base or foundation for other work are correct.

3.2 EROSION CONTROL REQUIREMENTS

- A. Erosion control is the responsibility of the Contractor until acceptance of the project.
- B. The erosion control measures and structures shown on the plans and described in the specifications shall be considered the minimum erosion control requirements. These measures shall be installed prior to start of construction and must be maintained and adjusted as necessary throughout construction.
- C. The Contractor shall be responsible for checking erosion control measures at the end of each week and after a rain event of 0.5" or more throughout the length of construction. Contractor shall complete and maintain a copy of the WDNR erosion control inspection form for each inspection. Contractor shall also provide a copy to Engineer.
- D. Contractor is responsible for implementation and maintenance of erosion control measures until the disturbed area is stabilized. All erosion control measures shall be in working condition at the end of each working day. The site will be considered stable when no soil leaves the site as a result of storm events and the areas served have established permanent vegetative cover. Adjustments shall be made to the erosion control measures as required.
- E. Maintaining a clean job site including sweeping dust and sediment off from the adjacent streets shall be the responsibility of the contractor and shall be incidental to all other construction.

3.3 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Clear only those areas designated for the placement of improvements or earthwork before placement of the final cover. Perform stripping of vegetation, grading, excavation, or other land disturbing activities in a logical sequence and manner that will minimize erosion. If possible, schedule construction for times of the year when erosion hazards are minimal.
- D. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2: 1 or flatter.
- E. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 14 days.
 - 1. During non-germinating periods, apply mulch at recommended rates.

2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19 at percent of permanent application rate with no topsoil.
 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 permanent seeding specifications.
- F. Stabilize diversion channels, sediment traps, and stockpiles immediately.
- G. Do not locate any soil or dirt piles which will remain in existence for more than 7 consecutive days, whether to be worked during that period or not, within 25 feet of any roadway, parking lot, paved area, or drainage structure or channel (unless intended to be used as part of the erosion control measures.)
- H. Do not discharge water in a manner that will cause erosion or sedimentation of the site or receiving facility.

3.4 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.

3.5 EROSION MAT

- A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1052 for Non-Channel Erosion Mat products and Wisconsin DNR Conservation Practice Standard 1053 for Channel Erosion Mat products.
- B. In all cases, lining installation and anchoring must be performed in strict compliance with the manufacturer's recommendations and guidelines.
- C. The erosion mat shall be placed on a specified area immediately after the seeding or sodding operations have been completed. All stones or clods over 1-1/2 inches in diameter and all roots, sticks or other foreign material, which would interfere with the mat bearing completely on the soil or sod, shall be removed prior to placing the mat.
- D. Any small stones or clods, which prevent contact of the mats with the soil, shall be pressed in the soil with a small lawn-type roller or by other effective means. The mat shall have its lateral edges so impressed in the soil as to permit runoff water to flow over it.
- E. In the event methods and details for placing erosion mat are incorporated in the plans, the work shall conform thereto.
- F. Any seeded areas damaged or destroyed during erosion mat placing operations shall be reseeded as specified for the original seeding. All surplus excavation or materials, and all stones, clods or other foreign material removed in the preparation of the seeded soil or sodded surface for placing the mat, shall be disposed of by the contractor.

- G. Following the placing of the mat, water shall be uniformly applied to the area sufficiently to moisten the seedbed to a depth of two inches and in a manner to preclude washing or erosion.
- H. The contractor shall maintain the erosion mat and make satisfactory repairs of any areas damaged by erosion, traffic, fires, or other causes until acceptance of the work.
- I. The matting strips shall be rolled on or laid in the direction of the flow. The mat shall be spread evenly, smoothly, in a natural position without stretching and with all parts bearing on the soil. Wood fiber blanket shall be placed with the netting on top. Adjacent strips shall overlap at least four inches. Strip ends shall overlap at least ten inches. All overlaps shall be made with the upgrade section on top.
- J. The upgrade end of each strip shall be buried at least six inches in a vertical slot cut in the soil and the soil pressed firmly against the embedded blanket.
- K. The mat shall be anchored in place with vertically driven staples, driven until their tops are flush with the soil. Staples shall be spaced at three-foot centers along mat edges and be alternately spaced at three-foot centers through the center. Staples shall be at ten-inch centers at end or junction slots.
- L. Erosion mats 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.

3.6 SILT FENCE

- A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1056.
- B. Installation and Removal

The silt fence shall be erected prior to starting any construction operation, which might cause any sedimentation or siltation at the site of the proposed silt fence.

The silt fence shall, when possible, be constructed in an arc or horseshoe shape with its ends pointing up slope. The silt fence shall be constructed to the dimensions and in accordance with the details shown on the plans. Silt fences shall be removed, as determined by the engineer, after the slopes and ditches have been stabilized and turf developed to the extent that future erosion is unlikely. Materials remaining after removal shall become the property of and shall be disposed of by the contractor.

- C. Inspection and Maintenance

The contractor shall inspect all silt fences weekly and immediately after each rainfall and at least daily during prolonged rainfall. Any deficiencies shall be immediately corrected by the contractor. In addition, the contractor shall make a daily review of the location for silt fences and filter barriers in areas where construction activity changes the earth contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, additional silt fences shall be installed as approved or directed by the engineer.

Sediment deposits shall be removed when the deposit reaches approximately one-half of the volume capacity of the silt fence as determined by the engineer and disposed of as directed by the engineer. Any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade and the area topsoiled, fertilized, and seeded as required.

3.7 INLET PROTECTION

- A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1060.
- B. Inlet protection shall be Type D (Catch-All) unless otherwise called out on the plans or bid form.
- C. Inlet protection shall be provided at all existing inlets prior to construction and proposed inlets following inlet construction. Inlet protection shall be installed in such a manner as to prevent sediment from entering the inlet.
- D. Inlet protection shall be inspected by the Contractor following rain events of 0.5" or greater and at least once per week. Deposited sediment shall be removed and properly disposed of.
- E. The contributing drainage area to the inlet protection device shall be one acre or less. In instances where a larger contributing drainage area exists, runoff shall be routed through a properly designed sediment trapping or settling device upstream of inlet.
- F. Filter Fabric Barrier Criteria (See 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. Inlet protection Type B shall be utilized after the casting and grate are in place.
 - 3. Inlet protection 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 casings are in place on top of the inlet boxes.
 - 4. Type D inlet protection shall conform to the details as shown in the plans. 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 grate to the 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.
- G. 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 detail).
 - a. Type B shall be utilized on inlets without curb box.
 - b. Type C shall be utilized on street inlets with curb heads. A 1 ½" x 3 ½" minimum, piece of wood shall be wrapped and secured in the fabric and placed in front of the curb head as shown on the plans. 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.

- H. Remove inlet protection devices once contributing drainage area is stabilized with appropriate vegetation or impervious area.

3.8 TRACKING PAD

- A. Perform work in accordance with Wisconsin DNR Conservation Practice Standard 1057.
- B. Clear stone tracking pads shall be constructed at each construction site entrance prior to any traffic leaving the site.
- C. Tracking pads shall be 50"L x 25'Wx1'D, unless otherwise specified.
- D. 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.
- E. Tracking pads 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.
- F. The tracking pad performance shall be maintained by scraping or top-dressing with additional aggregate.
- G. Tracking pad stone or crushed aggregate base course shall be used to cover utility trenches to prevent erosion on an as needed basis.

3.9 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. When required, broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- C. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

3.10 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

3.11 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

- B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- C. Field test concrete in accordance with Section 03 30 00.
- D. Compaction Testing: As specified in Section 31 23 23.
- E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- F. Frequency of Compaction Testing: One for each lift.

3.12 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
- C. Do not damage structure or device during cleaning operations.
- D. Do not permit sediment to erode into construction or site areas or natural waterways.
- E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.13 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- C. Do not permit construction traffic over paving for 7 days minimum after finishing until 75 percent design strength of concrete has been achieved.
- D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Base Aggregate Dense.
 - 2. Geotextile Fabric – Street Subgrade.
- B. Related Sections:
 - 1. Section 31 23 17 – Trenching & Backfilling: Compacted fill under base course.
 - 2. Section 32 12 16 - Asphalt Paving: Binder and finish asphalt courses.
 - 3. Section 33 05 14 – Public Manholes and Structures

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Base Aggregate Dense:
 - 1. Basis of Measurement: By the ton of the size specified in the bid form to elevations and thicknesses indicated on Drawings. Load Tickets shall be provided to the Engineer by the end of the work day following the date the Base Aggregate was placed.
 - 2. Basis of Payment: Includes supplying fill material, stockpiling, scarifying substrate surface, placing where required, watering, drying, finishing, and compacting, and incidentals necessary to complete the work.
- B. Geotextile Fabric – Street Subgrade
 - 1. Basis of Measurement: By the square yard of surface area upon which fabric has been placed as indicated on Drawings or as directed by the Engineer.
 - 2. Basis of Payment: Includes furnishing, transporting, and installing the fabric; and for furnishing all labor, tools, and equipment necessary to complete the work.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
 - 2. Wisconsin Department of Transportation Standard Specifications

1.4 SUBMITTALS

- A. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- B. Material sources and gradations shall be submitted to the Engineer for review. A sample of material from each source shall be submitted to the Engineer for testing and approval prior to construction.

1.5 QUALITY ASSURANCE

- A. Aggregates furnished for the work shall conform to quality and gradation requirements hereinafter set forth. Furnish each aggregate material from single source throughout the Work.
- B. Perform Work in accordance with Sections 301 and 305 of the State of Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, latest edition.
- C. The Engineer may prohibit the use of crushed stone from limestone/dolomite deposits that have thinly bedded strata or strata of a shale nature. The Engineer may also prohibit the use of aggregate from deposits or sources known to produce unacceptable material.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

- A. The aggregates shall be well graded between the limits specified and conform to the following gradation requirements:

Percentage by Weight Passing (WDOT 305.2.2.)			
Sieve No.	Base Aggregate Dense, 3-inch	Base Aggregate Dense, 1¼	Base Aggregate Dense, ¾
3 inch	90-100	---	---
1½ inch	60-85	---	---
1¼ inch	---	95-100	---
1 inch	---	---	100
¾ inch	40-65	70-93	95-100
⅝ inch	---	42-80	50-90
No. 4	15-40	25-63	35-70
No. 10	10-30	16-48	15-55
No. 40	5-20	8-28	10-35
No. 200	2.0-12.0	2.1-12.0 ^{1 3*}	5.0-15.0 ²
¹ Limited to a maximum of eight percent in base course placed between old and new pavement. ² 8.0-15.0 percent, if base is ≥50 percent crushed gravel. ³ 4.0-10.0 percent, if base is ≥50 percent crushed gravel.			

- B. Base Aggregate: 5-inch Select. To be placed in areas of EBS undercuts.

Sieve Size	Percent Passing
5 inch	90-100
1-1/2 inch	20 to 50
No. 10	0 to 10

2.2 ACCESSORIES

- A. Geotextile Fabric: Fabric should be Mirafi HP 370.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify compacted substrate is dry and ready to support paving and imposed loads.
1. Contractor shall notify Engineer 24 hours prior to when the proof roll will take place.
 2. Proof roll substrate with fully loaded tri-axle truck to indentify soft spots.
 3. Remove soft substrate and replace with compacted fill or dense graded base – 3 inch or 5 inch select if approved by Engineer.
 4. Engineer will cross-section EBS to determine volume in place.
 5. Engineer's recommendations shall not relieve Contractor of their warranty obligations.
- C. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

- A. Prior to placing crushed aggregate base course, the roadway subgrade shall be compacted. The roadway subgrade shall be fine graded to elevations shown on the plan based on the roadway profiles and typical sections.
- B. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- C. Do not place fill on soft, muddy, or frozen surfaces.
- D. Water and rework or re-compact dry foundations as necessary to ensure proper compaction, or as the engineer directs.

- E. Correct all soft or yielding areas, holes, or other defects that occur due to traffic, hauling, poor drainage, unstable materials, or from any other cause before placing the base.

3.3 AGGREGATE PLACEMENT

- A. Place aggregate equal thickness layers to total compacted thickness and width indicated on Drawings.
- B. Roller compact aggregate to 95 percent maximum density.
- C. All equipment used for hauling and spreading crushed aggregate base course shall be the weight, type, capacity, and method of operation such that no damage will result to the existing subgrade or base course in place. Equipment used for spreading shall be designed and operated to spread the material in uniform layers without significant segregation.
- D. Equipment used for densification or compaction shall be of the static type, vibratory type, or a combination of both types.
- E. If using a pneumatic roller, do not exceed a compacted thickness of 6 inches per layer. For the first layer placed over a loose sandy subgrade,
- F. Level and contour surfaces to elevations, profiles, and gradients indicated.
- G. Maintain optimum moisture content of fill materials to attain specified compaction density.
- H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- I. When aggregates are measured by the ton, scales or weighing equipment shall be tested by the Engineer or by authorized testing firms or agencies as often as the Engineer deems necessary to insure their accuracy.
- J. Prior to acceptance of the Crushed Aggregate Base Course, all areas shall be proof rolled with a loaded tandem-axle truck, to be observed by the Engineer. If this test roll shows any deflection or cracking of the base course, the base course shall be removed in these areas and subgrade excavated as necessary to remove all wet or unsuitable material. These areas shall be backfilled with approved material as directed by the Engineer.
- K. The Contractor shall be responsible for and maintain the base course until accepted.
- L. The Contractor shall minimize the dispersion of dust from the base course, including shoulders, during construction and maintenance operations, until acceptance of the base course, by the application of water or other approved dust control materials as provided in the contract or required by the Engineer.

- M. Install geotextile fabric over subgrade in accordance with manufacturer's instructions when directed by Engineer.
 - 1. Lap ends and edges minimum 6 inches (150 mm).
 - 2. Anchor fabric to subgrade when required to prevent displacement until aggregate is installed.

3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Flat Surface: 1/4 inch measured with 10 foot straight edge.
- C. Maximum Variation From Thickness: 1/4 inch.
- D. Maximum Variation From Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D1557 by Owner.
- B. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests: As determined by Owner.

3.6 COMPACTION

- A. Compact materials to 98 percent of maximum density as determined from test strip, in accordance with ASTM D2940.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Asphalt materials.
 - 2. Aggregate materials.
 - 3. Aggregate subbase.
 - 4. Asphalt paving upper layer and lower layer.
 - 5. Tack coat.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. HMA Pavement - Upper Layer:
 - 1. Basis of Measurement: By ton or square yard to the thickness indicated on the Bid Form. Load tickets shall be provided to the Engineer.
 - 2. Basis of Payment: Includes full compensation for furnishing, preparing, hauling, mixing, and placing of all materials, compacting the mixture, and for all labor, tools, equipment, and incidentals necessary to complete the work.
- B. HMA Pavement - Lower Layer:
 - 1. Basis of Measurement: By ton or square yard to the thickness indicated on the Bid Form. Load tickets shall be provided to the Engineer.
 - 2. Basis of Payment: Includes full compensation for furnishing, preparing, hauling, mixing, and placing of all materials, compacting the mixture, and for all labor, tools, equipment, and incidentals necessary to complete the work.
- C. HMA Pavement – Driveways:
 - 1. Basis of Measurement: By ton or square yard to the thickness indicated on the Bid Form. Load tickets shall be provided to the Engineer.
 - 2. Basis of Payment: Includes full compensation for furnishing, preparing, hauling, mixing, and placing of all materials, compacting the mixture, and for all labor, tools, equipment, and incidentals necessary to complete the work.
- D. Tack Coat:
 - 1. Basis of Measurement: By square yard.
 - 2. Basis of Payment: Includes full compensation for furnishing tack coat; for preparing the surface; for transporting and heating; for diluting with water; and for maintaining the completed work.
- E. The paving contractor shall be responsible for determining to his/her satisfaction that the base course layer is established to the proper elevation prior to paving. Additional payment will not be made for extra depth due to the level of the base course.

1.3 REFERENCES

- A. State of Wisconsin Department of Transportation Standard Specifications and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Submit product information for asphalt and aggregate materials.
 - 2. Submit mix design with laboratory test results supporting design.
- B. Material Certificates: For each paving material, from manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the Wisconsin Department of Transportation.
- B. Perform Work in accordance with Sections 450, 455, 460, and 465 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).
- C. Quality Management Program (QMP) provisions are not required on this project.

1.6 PROJECT CONDITIONS

- A. Transporting and Delivering Mixtures
 - 1. Deliver the mixture to the paver receiving hopper at a temperature between 260-300° F. Asphalt delivered below 260° F may be rejected by Engineer. Cover all loads during inclement weather or when the ambient air temperature falls below 65° F.
- B. Environmental Limitations:
 - 1. Tack Coat: Apply tack coat only when the air temperature is 36° F or more and the surface is dry and reasonably free of loose dirt, dust, or other foreign matter. Do not apply if weather or surface conditions are unfavorable or before impending rains.
 - 2. Place asphaltic mixture only on a prepared, firm and compacted base, foundation layer, or existing pavement substantially surface-dry and free of loose and foreign material. Do not place over frozen subgrade or base, or when the roadbed underlying the foundation or base is temporarily unstable from the effects of frost heaving. Unless the contract provides otherwise, incorporate loose roadbed aggregate as a part of preparing the foundation, in shoulder construction, or dispose of as the engineer approves.
 - 3. Do not place asphaltic mixture when the air temperature approximately 3 feet above grade, in shade, and away from artificial heat sources is less than 36 F for upper layers or 32 F for lower layers unless the engineer allows in writing. The contractor should place HMA pavement for projects in the northern asphalt zone

between May 1 and October 15 inclusive and for projects in the southern asphalt zone between April 15 and November 1 inclusive. WisDOT CMM 4-53 figure 2 defines asphalt zones. Notify the engineer at least one business day before paving.

4. Submit a written cold weather paving plan to the engineer at the preconstruction meeting. In that plan outline material, operational, and equipment changes for paving when the air temperature approximately 3 feet above grade, in shade, and away from artificial heat sources is less than 40 F. Include the following:
 - a. Use a WisDOT-accepted HMA mix design that incorporates a warm mix additive from the department's approved products list. Do not use a foaming process that introduces water into the mix.
 - b. Identify the warm mix additive and dosage rate.
 - c. Identify modifications to the compaction process and when to use them.
 - d. Engineer written acceptance is required for the cold weather paving plan. Engineer acceptance of the plan does not relieve the contractor of responsibility for the quality of HMA pavement placed in cold weather.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
- C. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320, Performance Graded Binder as specified:
 1. PG 58-28
- B. Tack Coat: ASTM D 977 emulsified asphalt or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 MIXES



GRADATIONS (NMA5)		MIN LAYER	MAX LOWER	MAX UPPER	TRAFFIC VOLUME		BINDER DESIGNAT	
1	37.5 mm	4.5"	6"	4.5"	LT	<2 ESALs	Low	S Standard
2	25.0 mm	3.0"	5"	4"	MT	2-8 ESALs	Med	H Heavy
3	19.0 mm	2.25"	4"	3"	HT	>8 ESALs	High	V Very Heavy
4	12.5 mm	1.75"	3"	2.5"				E Extrm Heavy
5	9.5 mm	1.5"	3"	2"				
6	4.75 mm							

- A. Asphalt Paving Mixtures: Design in accordance with HMA Pavement LT 58-28 S of Section 460 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition, and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications), unless otherwise noted.
- B. Asphaltic mixture, which, in the judgment of the Engineer, is not sufficiently mixed or is defective in another manner, will be rejected.
- C. POROUS PAVEMENT (Alternate)

Mix Properties:

- Aggregates shall be in conformance with WiDOT Specifications for 9.5 mm
- Asphalt binder shall be grade PG 58-28+12GTR modified AC with rubber.
- Asphalt binder content shall be between 5.7% - 6.0%.
- Air Voids shall be 18% - 20% (Va at 50 Gyrations).
- Tensile Strength Ratio (TSR at 5 cycles freeze/thaw) shall be 80% min. per ASTM D4867.
- Draindown at production temperature shall be 0.3% maximum.
- Granulated rubber at 1% - 3% of 15-minus by weight of mix.
- High temperature fibers (minimum of 450 degree flash point) at 3-5 pounds per ton of mix.
- Recycled Asphalt Product (RAP) at 10% max.

Aggregate Properties

- LA Abrasion loss of 13% max. @ 100 revolutions; 45% max. @ 500 revolutions per AASHTO T 96.
- Soundness at 12% max. loss per AASHTO T 104.
- Freeze-Thaw loss at 18% max. per AASHTO T 103
- Fractured faces: 2 faces – 90% min; 1 face 100% min.
- Thin or elongated: 5% max 5:1 ration per ASTM D4791.

Mixture Gradation

Sieve	
3/4"	-
1/2"	100
3/8"	90 -100
#4	30 - 40
#8	10 -20
#16	5 - 15
#30	3 -10
#200	1 - 4
VMA (%)	25 min

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proof-roll the sub-base with a loaded tri-axle dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. Contractor shall notify Engineer to inform him when proof rolling will take place. Provide a minimum of

24 hours notice. Engineer's recommendations shall not relieve Contractor of their warranty obligations.

- B. Proceed with paving only after unsatisfactory conditions have been corrected.
- C. Verify gradients and elevations of base are correct.
- D. Verify structure grates, frames, lids are installed in correct location and elevation.

3.2 EXISTING WORK

- A. Saw cut and notch existing paving as indicted on Drawings. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.3 TACK COAT

- A. Apply tack coat in accordance with Section 455 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).

3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

3.5 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted. Place asphalt pavement in accordance with Section 460 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).
- B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.

2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
- B. Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted in accordance with Section 460 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition and Additional Special Provision 6 (ASP 6 – Modifications to the standard specifications).
- C. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- D. Compact all layers of HMA mixture to 91.5% of target maximum density. The lower layer may be reduced to 89.5% if constructed directly on crushed aggregate.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 1. Lower Layer: Plus or minus 1/4 inch (6 mm).
 2. Upper Layer: Plus 1/4 inch (6 mm), no minus.

3.9 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them.

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fertilizing.
 - 2. Seeding.
 - 3. Hydroseeding.
 - 4. Mulching.
 - 5. Maintenance.
 - 6. Watering.
- B. Related Sections:
 - 1. ~~Section 32 91 13 - Soil Preparation~~

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Restoration with Seed, Fertilizer and Mulch:
 - 1. Basis of Measurement: By square yard.
 - 2. Basis of Payment: Seed, Fertilizer and Mulch will be measured and paid for at the contract unit price per square yard, which shall be full compensation for seed, fertilizer, and mulch in areas disturbed by the work as determined by the Engineer; for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

1.4 DEFINITIONS

- A. Weeds: Vegetative species other than specified species to be established in given area.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

- B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height.

1.7 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.
- B. Perform Work in accordance with Section 630 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition.
- C. Conform to the Wisconsin statutes and Wisconsin administrative code chapter ATP 20 regarding noxious weed seed content and labeling.
- D. Use seed within one year of the test date appearing on the label.
- E. Purity and Germination: Seed shall be tested when required in accordance with the methods and procedures used for the sampling and analyzing seed for purity and germination and noxious weed seed content as prescribed by the current edition of Rules for Testing Seed, published by the Association of Official Seed Analysis. Purity and germination shall conform to table of seed mixtures outlined in Section 630.2 of the State of Wisconsin Department of Transportation *Standard Specifications for Highway and Structure Construction*.

1.8 QUALIFICATIONS

- A. Seed Supplier: Company specializing in manufacturing Products specified in this section and State-certified seed of grass species.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
- D. Any seed delivered prior to use shall be stored in such a manner that it will be protected from damage by heat, moisture, insects, and rodents. Any previously tested and accepted seed that has become damaged shall be discarded and replaced by the Contractor.

1.10 MAINTENANCE SERVICE

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.

- B. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition.

PART 2 PRODUCTS

2.1 SEED MIXTURE

- A. Furnish Seeding Mixture in accordance with Section 630 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition or as approved by the Engineer.
 - 1. Seed Mixture shall be Madison Parks.
 - 2. In non-urban areas where a lawn type turn is not preferred, the appropriate seed mixture as indicated in Section 630 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition shall be used.

2.2 ACCESSORIES

- A. Mulching Material shall be in accordance with Section 627 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition or as approved by the Engineer.
 - 1. Mulching material shall consist of any straw or hay, or other fibrous material of similar nature, which is free of noxious weed seed and objectionable foreign matter.
 - 2. Tackifier material shall be an organically-based material compatible for use with the specified seed and/or Hydroseeding. The tackifier shall not inhibit plant growth and shall effectively bind mulch material to the soil until plant material is established. Tackifier shall be selected from the Wisconsin Department of Transportation's erosion control product acceptability list (PAL).
- B. Fertilizer shall be in accordance with Section 629 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition or as approved by the Engineer.
 - 1. Each container of packaged fertilizer shall be plainly marked with the analysis of the contents showing minimum percentages of total nitrogen, available phosphoric acid and soluble potash. When the fertilizer is furnished in bulk, each shipment shall be accompanied by an invoice indicating the minimum percentages of total nitrogen, available phosphoric acid, and soluble potash in the contents.
 - 2. Fertilizer shall be Type B and shall meet the following minimum requirements: nitrogen 16, phosphoric acid 6, soluble potash 24.
- C. Lime shall be in accordance with Section 629 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition or as approved by the Engineer.
- D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

2.3 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify prepared soil base is ready to receive the Work of this section.

3.2 MULCH

- A. Unless otherwise directed, the mulch shall be placed on a given area within two days after the seeding has been completed.
- B. Mulching operations shall not be performed during periods of excessively high winds, which preclude the proper placing of the mulch.
- C. The placed mulch shall be loose or open enough to allow some sunlight to penetrate and air to slowly circulate, but thick enough to shade the ground, conserve soil moisture and prevent or reduce erosion. The Contractor shall maintain the mulched areas and shall repair any areas damaged by wind, erosion, traffic, fire or other causes prior to final or partial acceptance of work under the contract.
- D. Placement: The Contractor, unless otherwise specified may place mulch in accordance with either Method A or Method B as described below:
 - 1. **Method A.** The straw or hay mulch shall be placed by either hand or mechanical means. The mulching material shall be uniformly spread over the designated areas to loose depth of ½ to 1 ½ inches. The mulch material from compacted bales shall be well loosened and made fluffy prior to placement. The target of application will be approximately 100 pounds per 1000 square feet. Straw or hay mulch shall be securely anchored with a disk, clodbuster or other approved equipment. Unless the Engineer directs otherwise, begin mulching at the top of the slopes and proceed downward.
 - 2. **Method B.** The straw or hay mulch or other fibrous material shall be placed by means of Hydroseeding.

3.3 FERTILIZING

- A. Fertilizer and Lime shall be applied in accordance with the requirements of Section 629 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition.

- B. The fertilizer selected for the seeding areas shall be uniformly applied thereon and incorporated in the soil by light discing or harrowing. Granular fertilizer shall be pulverized and free from lumps when applied. When fertilizer is incorporated with topsoiled areas, the fertilizer may be applied just prior to and in conjunction with the final discing or harrowing operations of the topsoil, or in the event the topsoil is manipulated by hand, just prior to the final raking and leveling.
- C. In the event fertilizer is to be placed on seeding areas where the seed is to be sown by means of a spray or stream of water under pressure, the required amount of fertilizer may be placed in the tank, mixed together with the water and the seed, and constantly agitated and applied in the seeding operation. Fertilizer applied by this method will not require disking or harrowing after being placed.
- D. Rate: Apply Fertilizer at 7 pounds per 1,000 square foot area.

3.4 SEEDING

- A. Grading, shouldering, topsoiling and fertilizing items, when part of the work under the contract, shall be completed before permanent seeding, except that when equipment designed for the purpose is used, the fertilizer and seed mixture may be placed in one operation.
- B. The area to be seeded shall be worked with discs, harrows, or other appropriate equipment until a reasonably even and loose seedbed is obtained immediately in advance of the seeding.
- C. Seeding: Unless otherwise specified, seeds may be sown at the option of the Contractor, by either Method A or Method B described below:
 - 1. **Method A.** The selected seed mixture shall be sown by means of equipment adapted to the purpose, or it may be scattered uniformly over the areas to be seeded, and lightly raked or dragged to cover the seed with approximately one-fourth inch of soil. After seeding, the areas shall be lightly rolled or compacted by means of suitable equipment not exceeding 112 lbs/linear foot, preferably of the cultipacker type when in the judgment of the Engineer the seedbed is either too loose or contains clods, which would reduce the germination of the seed. Slopes steeper than three to one need not be rolled.

Scattering seed shall be done only with satisfactory hand seeders and only at such times when the air is sufficiently quiet to prevent seeds from blowing away.

- 2. **Method B.** Upon the prepared seedbed, the seed shall be sown or spread by means of a stream or spray of water under pressure operated from an approved type of machine designed for that purpose. The selected seed mixture and water shall be placed into a tank, provided within the machine, in sufficient quantities that when the contents of the tank are sprayed on a given area the seed will be uniformly spread at the required rate of application. During the process, the contents of the tank shall be kept stirred or agitated to provide uniform distribution of the seed. The contents of the tank shall be emptied within one hour after the seed is added to the tank. Seed, which is allowed to remain mixed with the water for longer than one hour, shall be rejected. Dragging or rolling will not be required.

- D. Seeding Rate: Sow seeds uniformly at a minimum rate of 2 pounds per 1000 square feet of area for Seed Mixture No. 40. For other seed mixtures, seeding rate shall conform to Section 630.3.3.5 of the State of Wisconsin, Department of Transportation, *Standard Specifications for Highway and Structure Construction*, latest Edition.
- E. Do not seed areas in excess of that which can be mulched on same day.
- F. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.
- G. Roll seeded area with roller not exceeding 112 lbs/linear foot.
- H. Immediately following seeding and compacting, apply mulch to thickness of 1/2 to 1-1/2 inches. Maintain clear of shrubs and trees.
- I. Cleanup: All ground area disturbed as a result of the seeding operation shall be renovated to its original condition or to the required new appearance.
- J. Acceptability: When germination is complete and plants are visible, the Contractor shall notify the Engineer and request a germination inspection. Germination shall be deemed acceptable when all seed areas have evidence of germination and strong growth as determined by the Engineer, and where scattered bare spots not greater than one square foot do not exceed 10 percent of the area seeded.
- K. All washouts shall be regraded and reseeded immediately after the germination inspection. No partial acceptance will be made.
- L. All seeded areas that do not have a uniform germination by October 15 will not be accepted by the Engineer until the following spring when the criteria stated above is met.

3.5 HYDROSEEDING

- A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at the required application rate.
- B. Hydroseeding shall have continuous agitation action that keeps the seed mixed in the water slurry until pumped from the tank, and the pump pressure shall be such that a continuous nonfluctuating stream is maintained. Flood type nozzles shall be used to the fullest extent possible along with sufficient water volume to obtain total ground coverage.
- C. All materials used in Hydroseeding shall meet the requirements specified for the class of material named.
- D. Every effort shall be taken to obtain a uniform distribution over the seeded area. If a non-uniform distribution results, such as skipped areas and saw tooth patterns, the affected areas shall be reseeded at the Contractors expense. The seed-fertilization mixture shall be emptied within one hour after the seed is added to the tank. Seed that is allowed to remain mixed with the fertilizer for a period of longer than one hour will not be accepted

for use and no compensation will be made for seed so rejected. All ground area disturbed as a result of Hydroseeding operation shall be renovated to its original condition.

- E. After application, apply water with fine spray immediately after each area has been hydroseeded.
- F. Application Rate: The minimum application rates for hydroseeding shall be 6 pounds of seed per 1000 square feet, 8 pounds of fertilizer per 1000 square feet, and 40 pounds mulch per 1000 square feet. When specified by the contract a tackifier material such as Finn Hydro-stick shall be included in the Hydroseeding Mixture and applied at 60 pounds per acre, or as recommended by the Engineer.

3.6 SEED PROTECTION

- A. Cover seeded slopes as indicated on the Drawings with erosion fabric. Roll fabric onto slopes as indicated on the Drawing details without stretching or pulling.
- B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.
- C. Secure outside edges and overlaps at 36 inch intervals with stakes.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.7 MAINTENANCE

- A. Contractor shall be responsible to actively maintain new seeding for the first 30 days. Additional maintenance may be required depending on weather and to ensure that an adequate cover is established throughout the warranty period.

3.8 WATERING

- A. Water new seeding as required to ensure establishment of newly seeded areas as directed by Engineer.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 33 09 10

SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEM UPDATE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing and replacing the existing SCADA system components at the Well Nos. 1, 3 & 4 Pumphouses, and the Reservoirs Site. A new Master Telemetry Unit (MTU) shall be provided at the Well No. 1 Pumphouse. Remote Terminal Units (RTUs) shall be provided at the Well Nos. 3, 4 & 5 Pumphouses and the Reservoirs Site. Abandoning data wiring between the Well Nos. 1 & 2 Pumphouses as Well No. 2 is to be abandoned.
2. Installing the antenna on a pole at any facility location if determined necessary per a radio survey (Alternate Bid Items).
3. Providing all SCADA system software, programming, startup, testing, and training.
4. Furnishing and installing all electrical control panels referenced herein, switches, conduit, wire, transducers, radios, radio antennas and mounting brackets, coaxial cable, wiring, and misc. items for a complete operating control system.

B. Related Sections:

1. Division 26 - Electrical

1.2 PRICE AND PAYMENT PROCEDURES

A. Section 01 20 00 - Price and Payment Procedures Contract Sum/Price

B. SCADA System Update:

1. Basis of Measurement: By lump sum.
2. Basis of Payment: Includes full compensation for removal and disposal of existing SCADA system components, for furnishing and installing a new Master Telemetry Unit at the Well No. 1 Pumphouse, and for furnishing and installing new RTU panels at Well Nos. 3, 4 & 5 Pumphouses, and Reservoirs site. Also includes full compensation for furnishing and installing all electrical panels, switches, conduit, wire, radios, antennas and mounting structures, coaxial cable, and misc. items for a complete operating system. Also includes full compensation for radio surveys, all SCADA system software, programming, startup, testing, and Owner training services, operation and maintenance manuals, and furnishing all materials, tools, equipment, labor and incidentals necessary to complete the work in accordance with the Contract Documents.

C. SCADA Antenna Installation on Utility Pole (ALTERNATE BID ITEMS):

1. Basis of Measurements: By Each.
2. Basis of Payment: Includes full compensation for installing SCADA antenna on a wood utility pole to the height deemed as necessary by the results of the radio survey including furnishing and installing the utility pole, Helix antenna cable,

stainless steel antenna mounting brackets and hardware, and furnishing all materials, tools, equipment, labor and incidentals necessary to complete the work in accordance with the Contract Documents. The alternate bid item is to cover the additional cost to mount the antenna on a wood utility pole instead of the building/control panel exterior.

1.3 REFERENCE STANDARDS

- A. The completed electrical installation shall meet all the requirements of the latest edition of the National Electric Code. This shall not be construed to permit a lower grade of construction where plans and specifications for workmanship or materials are required in excess of code requirements.
- B. The work herein specified shall be subject to inspection and approval by authorized representatives of the National Board of Fire Underwriters, State and local governing authorities and the Owner.
- C. All control panels shall be built by a UL certified 508 control panel manufacturer.
- D. Chapter NR 811, Requirements for the Operation and Design of Community Water Systems of the Wisconsin Administrative Code.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Panel elevations showing layout and dimensional information.
 - 2. Structure Descriptions.
 - 3. Conduit locations.
 - 4. Unit Descriptions.
 - 5. Nameplate Information.
 - 6. Schematic wiring diagrams.
- C. Product Data:
 - 1. Data Sheets and Publications on all major components.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of panels and final wiring diagrams and connections.
- C. Operation and Maintenance Data: Submit operation and maintenance instructions for components and devices.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with UL 508.
- B. Provide components compatible with functions required to form complete working system.
- C. Provide UL 508 label on complete assembly.
- D. Perform Work in accordance with National Electric Code, State of Wisconsin codes, and local building code and requirements.

1.7 QUALIFICATIONS

- A. Manufacturer/System Integrator: Altronex, a Division of LW Allen, Inc., 4633 Tompkins Drive, Madison, WI 53716, 608-210-1471 (Alan Clemens).
- B. Substitutions: Not permitted.

1.8 WARRANTY

- A. The control system manufacturer shall warrant that the Control System supplied shall be free of defective material and workmanship for one year from date of start-up. The manufacturer shall be obligated to furnish and install at no charge to the owner, replacement materials or units proven defective in the field within this warranty year. The warranty shall not be construed to cover fuses, lights or other materials normally consumed in operation, nor shall it cover damages through vandalism or acts of God.
- B. The control system manufacturer shall assume the total, undivided responsibility for the correct operation of the water control system.
- C. The manufacturer's price shall include everything required to make the proposed system work, including additional control changes if required. The existing system has various alarms, interlocks, lockouts, etc. All of these functions shall be retained in the new system as required.

1.9 SERVICE AND SPARE PARTS

- A. The manufacturer shall certify that he maintains factory trained personnel available on four hours' notice with complete spare parts and maintenance items and stocks as may be required under any and all circumstances.

1.10 IDENTIFICATION AND LABELING OF ELECTRICAL EQUIPMENT

- A. All control devices and device enclosures shall be labeled with individual nameplates or legend plates. Individual nameplates or legend plates shall be one of the following types:
 - 1. Black laminated plastic or micarta with white cut letters.
 - 2. Corrosion-resistant metal plates with engraved or raised letters and backfill.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. The complete control system shall function reliably within an operation temperature of -20° to $+70^{\circ}$ C (4° to $+158^{\circ}$ F). Humidity shall be 10% to 95% non-condensing. Each supervisory or remote unit shall be furnished with integral lightning protection devices to protect against lightning induced transients on power lines.
- B. The entire control system shall provide a typical system accuracy and repeatability of better than plus or minus 1% over a temperature range of 0° to $+50^{\circ}$ C ($+32^{\circ}$ to $+122^{\circ}$ F).

1.12 FACILITY LOCATIONS

- A. The following is a listing of facilities to be included in the control system:
 - 1. Well No. 1 Pumphouse – Master Telemetry Unit
 - 2. Well No. 2 Pumphouse – Abandon data wiring between Well No. 2 & MTU at Well No. 1. Pumphouse.
 - 3. Well No. 3 Pumphouse – New Remote Terminal Unit
 - 4. Well No. 4 Pumphouse – New Remote Terminal Unit
 - 5. Well No. 5 Pumphouse – New Remote Terminal Unit
 - 6. Reservoirs Site – New Remote Terminal Unit

1.13 RADIO TELEMETRY SYSTEM

- A. The Bidder shall provide the required radio path site surveys to determine the minimum power requirements for the new RTU locations and shall design the Radio Telemetry System for at least 99.9-percent reliability. Evidence of the radio path site surveys shall be submitted with the radio equipment submittal as supporting information for the choices of power outputs proposed and required antenna height at the RTU sites. The supplier shall submit the proposed mounting heights and required poles for all antennas. The Bidder shall note any repeater station locations needed to communicate with the new RTUs. An alternate bid item for mounting the antenna(s) to a pole(s) (pole to be furnished and installed by the Village) is included on the bid form to cover potential outcomes of the radio study. The alternate bid item will only be used if the radio study deems the poles as necessary.
- B. The Bidder shall furnish the antennas and mounting brackets required for the RTUs. The antenna shall be installed by the Bidder. The Bidder shall provide an antenna mounting detail for the RTUs. Particular importance shall be given to the correct installation of the antennas to give adequate radio signal strength, structural and lightning surge protection to the System.

PART 2 PRODUCTS

2.1 TELEMETRY SYSTEM

- A. All control signals, status signals, alarm or variable analog data shall be transmitted and received between the central data gathering site and the remote sites via a Supervisory Control and Data Acquisitions (SCADA) System using digital radio telemetry. The SCADA System shall convert commands, alarms and variable analog data to digital data blocks and transmit this information between a central and the multiple remote locations. The SCADA System shall be capable of communicating with up to a total of 96 remote terminal units (RTU's).
- B. Data security shall be provided by a complimentary double scan and cyclic redundancy check (CRC) code.
- D. Remote Terminal Units (RTU)
 - 1. Remote Terminal Unit (RTU) shall be capable of sending digital input signals to the central and receiving digital outputs from the central. Analog input signals are to be converted to 16 bit accuracy digital format for transmission to the central. RTU shall include an Allen-Bradley CompactLogix L24ER-QBIB series PLC.
 - 2. The RTU shall contain a tone modulator/demodulator (MODEM), micro-processor based processing unit, A/D converter, and digital input/output isolators and drivers. All RTU units shall be near-identical to allow easy replacement in the field.
 - 3. The RTU shall have a settable address and shall accept the incoming data which includes this address. In responding with data to the central, it shall include this address. In addition, every remote shall accept and process data which includes a single unique common address.
 - 4. All connections to the remote shall be through high density type terminal strips. Each input and output shall have a light emitting diode (LED) to indicate if it is on or off. The inputs shall accept contact closures or voltages and the outputs should open collector transistors to give a voltage output or to drive a relay.
 - 5. An LED indicator shall be provided to indicate if data is being sent or received.
 - 6. When a data fail occurs, all outputs from the RTU shall revert to an "OFF" position. The time before reversion shall be field adjustable from 0.5 minutes to 18 minutes.
 - 7. Each analog input shall accept 4-20 MA or 1-5 VDC signals. The range of each analog signal to be sent by the RTU shall be set by span and offset information stored in the RTU.

2.2 RADIO TRANSCEIVERS

- A. Power sources:
 - 1. Remote: 10-60 VDC.
- B. Environmental requirements:
 - 1. Operational Temperature Range: -40° to +70° C (-40° 158°F).
 - 2. Storage Temperature Range: -40° to +85° C (-40° 185°F)
 - 3. Humidity: 95% at 60° C (140° F) non-condensing.

- C. Manufacture & Model: MDS Orbit.

2.3 ANTENNA

- A. The Radio Telemetry System Bidder shall provide the radio antenna(s). The antenna shall be attached to the Pumphouse buildings, and Reservoir exterior control panel supports, or if required, to a wood utility pole as determined by the radio path site surveys. The alternate bid item is to cover the additional cost to furnish and install the wood utility pole and mount the antenna it instead of on the building/control panel exterior. Particular importance shall be given to the correct installation of the antenna to give adequate lightning protection to the System. All antennas and poles shall be suitable to withstand $\frac{3}{4}$ " of ice loading.
- B. Antenna(s) shall be directional or Omni-directional as needed. They shall be of all aluminum construction and rated to withstand at least 100 mph winds. Adequate lengths of Heliax cable shall be provided for connection between the antenna and radio transceiver at each location.
- C. Directional Antenna:
1. Type: Minimum of 5 element Yagi Type, forward gain of at least 9db.
 2. Front to Back Ratio: 20 db.
 3. Lightning Protection: Direct ground.
 4. Feedpoint Method: Weatherproof gamma match for coaxial feedline.
- D. Omni-Directional Antenna:
1. Type: Fiberglass Omni directional pattern.
 2. Gain: At least 6 dB Omni.
 3. Lightning Protection: DC ground through all metal support pipe.
- E. The Bidder shall provide ground rods and grounding materials to properly ground the antennas, antenna pole(s), new equipment and enclosures. All grounding and bonding shall meet or exceed the requirements of Article 250 of the National Electrical Code.

2.4 WELL NOS. 3 & 4 PUMPHOUSE REMOTE TERMINAL UNITS (RTUs)

- A. Contractor shall provide 120 VAC power to the RTU panel.
- B. Remove the existing control panel backpan and replace it with a new backpan including the following items:
1. Control breaker.
 2. 120 VAC lightning protection.
 3. Power supplies as required.
 4. Radio telemetry RTU as previously specified. Transmit:
 - i. Well Pump Status (on/off/failure)
 - ii. Well Water Level (analog – for potential future level transducer)
 - iii. Data Failure Alarm
 5. Provide control circuitry, including all necessary load relays, to allow the chlorine booster pump to run only if the well pump controller's auxiliary contract

and signal from the flow meter or flow switch are activated/received simultaneously.

6. DC Style UPS System.
7. Radio Transceiver as previously specified.
- C. Antenna as previously specified.

2.5 WELL NO. 5 PUMPHOUSE REMOTE TERMINAL UNIT (RTU)

A. Contractor shall provide 120 VAC power to the RTU.

B. Locate the following items in the empty section of the MCC relocated from the Well No. 2 Pumphouse to the proposed Well No. 5 Pumphouse:

1. Control breaker.
2. 120 VAC lightning protection.
3. Power supplies as required.
4. Radio telemetry RTU as previously specified. Transmit:
 - iv. Well Pump Status (on/off/failure)
 - v. Well Water Level (analog – for new level transducer)
 - vi. Flow Rate from flow meter
 - vii. Data Failure Alarm
 - viii. Intrusion Alarm
 - ix. Low Temperature Alarm – Pump Room
 - x. Low Temperature Alarm – Chemical Room
 - xi. Chemical Room Exhaust Fan Status (on/off)
5. Provide control circuitry, including all necessary load relays, to allow the chlorine booster pump to run only if the well pump controller's auxiliary contact **and** signal from the flow meter or flow switch are activated/received simultaneously.
6. Provide an unlabeled pushbutton for intrusion alarm activation/deactivation upon entry/exit.
7. Provide a door mounted air temperature sensor for the Pump Room.
8. Provide Chemical Room ventilation system and lights control with settable run time and interwire with door limit switch, exterior pilot light switch station, and interior room light switch. Provide ventilation system exhaust fan status to the SCADA system. Coordinate with the electrical plans.
9. Provide well pump pre-lube solenoid control circuit with control relay and timer.
10. DC Style UPS System.
11. Radio Transceiver as previously specified.

D. Pump Room occupancy sensor to detect unauthorized entry.

E. Chemical Room door limit switch to detect unauthorized entry & ventilation system control.

F. Chemical Room air temperature sensor.

G. Antenna as previously specified.

2.5 WELL NO. 1 PUMPHOUSE MASTER TELEMETRY UNIT (MTU)

- A. Contractor shall provide 120 VAC power to the MTU panel.
- B. Remove the existing control panel backpan and replace it with a new backpan including the following items for the New MTU:
 - 1. Control breaker.
 - 2. 120 VAC lightning protection.
 - 3. Power supplies as required.
 - 4. Radio telemetry RTU as previously specified. Transmit:
 - i. Well Pump Status (on/off/failure)
 - ii. Well Water Level (analog – For a future level transducer)
 - iii. Data Failure Alarm
 - iv. Low Temperature Alarm
 - 5. Reuse and reconfigure the existing Automation Direct brand OIT touch screen.
 - 6. Provide control circuitry, including all necessary load relays, to allow the chlorine booster pump to run only if the well pump controller's auxiliary contact and signal from the flow meter are activated/received simultaneously.
 - 7. Provide programming to facilitate operation of the Well Nos. 3, 4 & 5 well pumps based on reservoir levels, and alternation of the well pumps.
 - 8. SonicWALL, most current model, firewall connected to the owner provided internet service for secure remote access.
 - 9. Provide a door mounted air temperature sensor.
 - 10. Provide well pump pre-lube solenoid control circuit with control relay and timer.
 - 11. DC Style UPS System.
 - 12. Radio Transceiver as previously specified.
- C. Antenna as previously specified.

2.6 RESERVOIR RTU

- A. Contractor shall provide 120 VAC power to the RTU panel.
- B. Remove the control panel backpan and replace it with a new backpan including the following items in the New RTU Panel:
 - 1. Control breaker.
 - 2. 120 VAC lightning protection.
 - 3. Power supplies as required.
 - 4. 200 watt, 120 VAC condensation protective heater with integral thermostat and high temperature cutout thermoswitch.
 - 5. Radio telemetry RTU as previously specified. Transmit:
 - i. Tank Level (analog)
 - ii. Power Failure Alarm
 - iii. Data Failure Alarm
 - iv. Intrusion Alarm
 - 6. Replace the existing keyed switches for intrusion alarm.
 - 7. DC Style UPS System.
 - 8. Radio Transceiver as previously specified.
- C. Antenna as previously specified.

2.7 ANTENNA UTILITY POLE (ALTERNATE BID ITEM)

- A. 50 feet long, Southern Pine or Douglas Fir, ANSI 05.1 Class as required for tip load determined by antenna provider. Confirm pole length/height with radio survey results.

PART 3 EXECUTION

3.1 INSTALLATION, STARTUP AND TRAINING

- A. The manufacturer shall provide the services of a qualified Technician to assist in the initial installation of the control equipment.
- B. In addition, the manufacturer shall provide the services of a qualified factory Engineer to make final adjustments and instruct the operators in the use and maintenance of the equipment furnished at the various locations. This latter service shall be for a minimum of two days on the jobsite or as is necessary to complete the supervision to the satisfaction of the owner. Manufacturer is to include in his price one added trip without charge within the one year of acceptance.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 33 11 13

PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings for public line including potable water line, and fire water line.
 - 2. Tapping Sleeves and Valves.
 - 3. Valves and Fire Hydrants.
 - 4. Bedding and cover materials.
 - 5. Abandon Existing Watermain.
- B. Related Requirements:
 - 1. Section 03 30 00 - Cast-In-Place Concrete: Concrete for thrust restraints.
 - 2. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
 - 3. Section 31 23 16 -Earthwork: Product and execution requirements for excavation and backfill required by this section.
 - 4. Section 31 23 17 – Trenching and Backfilling: Execution requirements for trenching required by this section.
 - 5. Section 33 05 14 - Public Manholes and Structures.
 - 6. Section 33 12 13 - Water Service Connections
 - 7. Section 33 12 16 - Water Utility Distribution Valves.
 - 8. Section 33 12 19 - Water Utility Distribution Fire Hydrants.
 - 9. Section 33 13 00 - Disinfecting of Water Utility Distribution: Disinfection of water piping.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Section 01 20 00 - Price and Payment Procedures Contract Sum/Price
- B. Pipe and Fittings:
 - 1. Basis of Measurement: By the linear foot for each size of main installed. Basis of Payment: Includes hand trimming excavation piping and fittings, bedding, concrete thrust restraints, connection to public utility water source.
 - 2. Connecting to existing water mains shall be considered incidental to new water main construction.
 - 3. Temporary water service shall be considered incidental to new water main construction.
- C. Abandon Existing Water Main:
 - 1. Basis of Measurement: By Lump Sum if indicated on the bid form.
 - 2. Basis of Payment: Abandon existing water mains, fittings, and valves shall be payment in full for all excavation, removal, disposal, and backfill; and for furnishing of all labor, tools, equipment, and incidentals necessary to complete the work.
- D. Styrofoam Insulation:
 - 1. Basis of Measurement: Per Each 4'x 8' sheet.

Basis of Payment: Full compensation for furnishing of materials, labor, tools, equipment, and incidentals necessary to complete the work.

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Society of Mechanical Engineers:
 - 1. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
- C. 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 A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
 - 4. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - 6. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 7. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
 - 8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - 10. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
 - 11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- D. American Water Works Association:
 - 1. AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. AWWA C105 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 3. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm), for Water.
 - 4. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 5. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - 6. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
 - 7. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
 - 8. AWWA C200 - Steel Water Pipe 6 In. (150 mm) and Larger.

9. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
 10. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. and Larger - Shop Applied.
 11. AWWA C206 - Field Welding of Steel Water Pipe.
 12. AWWA C207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
 13. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
 14. AWWA C213 - Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
 15. AWWA C300 - Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.
 16. AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
 17. AWWA C500 - Gate Valves for Water and Sewage Systems.
 18. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
 19. AWWA C605 - Water Treatment - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water.
 20. AWWA C606 - Grooved and Shouldered Joints.
 21. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
 22. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
 23. AWWA C702 - Cold-Water Meters - Compound Type.
 24. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
 25. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. through 12 In. (100 mm Through 300 mm), for Water Distribution.
 26. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 36 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.
 27. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.
- E. Manufacturer's Standardization Society of the Valve and Fittings Industry:
1. MSS SP-60 - Connecting Flange Joint between Tapping Sleeves and Tapping Valves.
- F. National Fire Protection Agency:
1. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. **All American Iron and Steel (AIS) materials need to be certified by the manufacturer.**
- C. **Contractor shall certify upon substantial completion of the project that all iron and steel products installed were produced in the United States.**
- D. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.
- E. Shop Drawings: Indicate piping layout, including piping specialties.
- F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- G. Test reports as specified in this section.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

- A. Valves: Mark valve body with manufacturer's name and pressure rating.
- B. Perform Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction.
- C. Comply with requirements of water utility. Include tapping of water mains and backflow prevention.
- D. Comply with standards of authorities having jurisdiction for fire protection systems. Include materials, hose threads, installation, and testing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver and store valves in shipping containers with labeling in place.
- C. Block individual and stockpiled pipe lengths to prevent moving.
- D. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
- E. Store polyethylene materials out of sunlight.

1.8 EXISTING CONDITIONS

- A. Verify field measurements prior to fabrication. Indicate field measurements on shop drawings.

PART 2 PRODUCTS

2.1 WATER PIPING

- A. Water main pipe shall conform to Chapter 8.18.0 of the State of Wisconsin Standard Specifications for Sewer and Water Construction, Latest Edition.
- B. PVC Pipe, AWWA C900

1. Pipe Class: Class 150 (DR 18)
2. Pipe Marking: Nominal pipe size, type of plastic pipe material DR number, AWWA Designation, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for the transport of potable water.
3. Fittings: Ductile iron, AWWA C110. Compact fittings AWWA C153.
 - a. Coating and Lining:
 - 1) Bituminous Coating: AWWA C110.
 - 2) Cement Mortar Lining: AWWA C104, double thickness.
 - b. Lugged Retainer Glands: Approved mechanical joint lugged retainer glands (Mega Lug or equal)
4. Joints:
 - a. Mechanical and Push-On Joints: AWWA C111.
 - b. Restrained Joints: Boltless, push-on type, joint restraint independent of joint seal.

C. Polyethylene Pipe for HDD:

1. Pipe: AWWA C901/C906, ASTM 2239, ASTM 2737, ASTM 3035 and ASTM F714 for 200 PSI DR9 DIPS.

D. Fusible Polyvinyl Chloride Pipe for HDD

1. Pipe Supplier shall furnish fusible polyvinylchloride pipe conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.
2. All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.
3. Fusible polyvinylchloride pipe shall conform to AWWA C900, AWWA C905, ASTM D2241 or ASTM D1785 for standard dimensions, as applicable. Testing shall be in accordance with the referenced AWWA standards for all pipe types.
4. Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
5. Fusible polyvinylchloride pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified.
6. Fusible polyvinylchloride pipe shall be blue in color for potable water use.
7. Unless otherwise specified, fusible polyvinylchloride pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for this procedure.

2.2 TAPPING SLEEVES AND VALVES

A. Tapping Sleeves:

1. Manufacturer and Product List:
 - a. Kennedy Valve Co.
 - b. Mueller Co.

B. Tapping Valves:

1. Manufacturer and Product List:
 - a. Kennedy Valve Co.
 - b. Mueller Co.

2.3 VALVES AND FIRE HYDRANTS

- A. Valves: Conform to Section 33 12 16.
- B. Fire Hydrants: Conform to Section 33 12 19.

2.4 ANCHORING

- A. Metal tie rods and clamps or lugs: Galvanized steel sized in accordance with NFPA 24 thoroughly coated with bituminous paint.

2.5 BEDDING AND COVER MATERIALS

- A. Bedding: Type 3 Embedment as specified in Section 31 23 17.
- B. Cover: Type 3 Embedment as specified in Section 31 23 17.
- C. Soil Backfill from Above Pipe to Finish Grade: Native backfill as specified in Section 31 05 13. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.6 FINISHES

- A. Steel: Galvanizing, ASTM A123/A123M; hot dip galvanize after fabrication.

2.7 ACCESSORIES

- A. Concrete for Thrust Restraints: Conform to Section 03 30 00. Wood blocking is not allowed.
- B. Manhole and Cover: Conform to Section 33 05 14.
- C. Steel rods, bolt, lugs and brackets: ASTM A36/A36M or ASTM A307 Grade A carbon steel.
- D. Protective Coating: Bituminous coating.
- E. Electrical conductivity across joints and fittings shall be provided according to the manufacturer's recommendations. Conductivity devices may be cable bond type or a copper conductivity strip. Either shall be capable of carrying 500 amperes continuously. Metal wedges are not permitted. Lead-tipped rubber gaskets or lead-caulked joints are not permitted.
- F. For fittings and shortened pipe sections where cable bond type or copper conductivity type continuity devices are not provided by the manufacturer the Contractor shall field weld a lug onto the fitting, hydrant, valve or shortened pipe section and shall field install a strip or cable capable of carrying 500 amperes continuously between the sections. Cable bonds or copper conductivity strips can be installed around such fittings, valves or shortened pipe sections; but hydrants shall be equipped with continuity devices.

2.8 TRACER WIRE

- A. Tracer Wire shall be ten (10) gauge (AWG) single strand copper wire with 60 mil of black, cross-linked polyethylene (XLPE) insulation specifically manufactured for direct burial applications.

2.9 STYROFOAM INSULATION

- A. Provide 4'x8'x2" sheets of polystyrene insulation board that conforms to the requirements for Extruded Insulation Board, AASHTO Designation M230, except remove the flammability requirement.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify existing utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Pre-Construction Site Photos:
 - 1. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
 - 2. Show mail boxes, curbing, lawns, driveways, signs, culverts, and other existing site features.
 - 3. Include project description, date taken and sequential number on back of each photograph.
- C. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. The use of chisels or hand saws will not be permitted. Grind edges smooth with beveled end for push-on connections.
- D. Remove scale and dirt on inside and outside before assembly.
- E. Prepare pipe connections to equipment with flanges or unions.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated on Drawings.
- B. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

- C. Provide sheeting and shoring in accordance with Section 31 23 17.
- D. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.

3.4 INSTALLATION - PIPE

- A. Install pipe in accordance with AWWA C600.
- B. Handle and assemble pipe in accordance with manufacturer's instructions and as indicated on Drawings.
- C. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.
- D. Maintain 8 ft horizontal separation of water main from sewer piping and where water mains cross over sewers, maintain 6 inches minimum vertical separation and where water mains cross under sewers, maintain minimum 24 inches minimum vertical separation in accordance with NR 811 code.
- E. Cutting of Existing Mains: The Water Utility will operate all distribution system valves. The Contractor shall cut the water main, remove any plugs or caps, and pump the water out of the trench caused by cutting of the main or removal of the plugs or caps. All excavations required shall be made by the Contractor.
- F. Install pipe to indicated elevation to within tolerance of 5/8 inches. Piping shall have a minimum cover of 7 feet below finished grade unless otherwise indicated.
- G. Unless otherwise ordered, pipe shall be laid with the bell ends facing the direction of laying. When the grade exceeds 2 feet of rise per one hundred feet of trench, the bells shall face upgrade.
- H. Line and Grade for Open-cut Construction: The Engineer will establish the centerline, locate changes in alignment, hydrant locations, and reference elevations at suitable intervals. The Contractor shall, at his own expense, furnish the necessary equipment and technical personnel to transfer the alignments and grades from stakes to the water main location. The Contractor shall check the alignment and grade of the water main at each staked station, or as directed by the Engineer. If it is determined that any or all water main is not installed in conformance with the staked plan or alignments and grades, the Contractor shall make the necessary corrections at his expense.
- I. Obstructions in Line or Grade: Whenever it becomes necessary to lay a main over, under, or around a known obstruction and so shown on the plans, the Contractor shall furnish and install the required fittings. The laying of such fittings will be considered incidental to the lineal foot of water main, unless accounted for on the bid form. No additional compensation will be paid to the Contractor for any expenses incurred because of such obstruction.
- J. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. Precautions shall be

taken to prevent foreign materials from entering the joint space and the joint recess shall be carefully checked for foreign material before the gasket is installed.

- K. The pipe shall be secured in place with bedding material, placed by hand or equally careful means, keeping the bell end open. Pipe and fittings, which do not allow a sufficient and uniform space for joints, shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space.
- L. Protection of Open Pipe: At all times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry. No pipe shall be laid in water or when in the opinion of the Engineer, trench conditions are unsuitable.
- M. Cleaning of Pipe: The interior and exterior of all pipe shall be clean and free from all foreign material before being installed. The Contractor shall provide the necessary means to wipe, brush, swab or air blast to remove any foreign material from the interior of the pipe as directed by the Engineer.
- N. Install ductile iron piping and fittings to AWWA C600.
- O. Install Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction standards.
- P. Contractor shall have sufficient supplies on site to plan for varying conditions that will be encountered. Contractor shall coordinate with local businesses and residents to prepare for planned water shut-off's. If necessary for business or health considerations, contractor shall provide temporary water services.
- Q. Contractor shall obtain a safe water sample prior to acceptance of the new main.

3.5 INSTALLATION - VALVES AND HYDRANTS

- A. Install valves in accordance with Section 33 12 16.
- B. Install hydrants in accordance with Section 33 12 19.

3.6 INSTALLATION - TAPPING SLEEVES AND VALVES

- A. Install tapping sleeves and valves in accordance with shop drawings and in accordance with manufacturer's instructions.

3.7 THRUST RESTRAINT

- A. All mechanical joint fittings are to be restrained by thrust restraint retainer glands (Mega Lug or approved equal). This includes but is not limited to valves, tees, bends, caps, and plugs. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and so pipe and fitting joints will be accessible for repair. Provide sq ft thrust restraint bearing on subsoil. Thrust restraint shall be provided for all joints within 30 feet of the above items.

- B. Install tie rods, clamps, set screw retainer glands, or restrained joints. Protect metal restrained joint components against corrosion by applying a bituminous coating, or by concrete mortar encasement of metal area. Do not encase pipe and fitting joints to flanges.
- C. Install thrust blocks, tie rods, and joint restraint at dead ends of water main.

3.8 SERVICE CONNECTIONS

- A. Install service connections in accordance with Section 33 12 13.

3.9 ABANDON EXISTING WATER MAIN

- A. Water mains shall be excavated and removed if it conflicts with new underground utilities or at the locations indicated on the plans. These mains shall be disposed of off-site. If not otherwise noted, existing mains may be plugged and abandoned in place.
- B. All abandoned water mains shall be capped with a mechanical joint cap connected to the pipe end with a mega-lug or bolted to the flange of existing tees where applicable.
- C. Caps shall be adequately blocked with solid concrete blocking or a poured concrete buttress.
- D. Existing water valves to be abandoned shall be closed. The top section of the valve box shall be removed, and the remainder of the valve box shall be filled with 3/8" to 1" diameter clear stone.
- E. No utilities shall be abandoned until new utilities are fully operational and have passed the testing requirements.
- F. Fire hydrants shall be removed and salvaged to the Owner.

3.10 STYROFOAM INSULATION

- A. Place 4'x8'x2" sheets of polystyrene insulation board where storm sewer crosses over or under water mains or laterals as indicated on the plans. Total of 4 inch thickness required.
- B. Prior to placement of polystyrene boards, bedding material shall be placed to a height of 6-12 inches over the top of the pipe, leveled, and compacted.
- C. The insulating boards shall be placed on the cover material with the long side parallel to the centerline of the water main for a minimum width of 48". The boards shall be placed in a staggered arrangement so as to eliminate continuous transverse joints. If two or more layers of insulation board are used, each layer should be placed so as to cover the joints of the layer immediately below.
- D. The first lift of backfill material shall consist of 6-inches of bedding material which shall be end or side dumped onto the insulation board and spread in such a manner that construction equipment does not operate directly on the insulation. This layer shall be compacted with equipment that exerts a contact stress of 70 to 80 psi. Once this layer

has been compacted to the specified density, the remaining layers of backfill may be constructed utilizing conventional procedures.

3.11 TEMPORARY WATER SERVICE

- A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations. Connect to existing water source. Coordinate with Owner for metering water usage.

3.12 BACKFILLING

- A. Backfill pipe in accordance with Section 31 23 17.

3.13 DISINFECTION OF POTABLE WATER PIPING SYSTEM

- A. Flush and disinfect system in accordance with Section 33 13 00.

3.14 FIELD QUALITY CONTROL

- A. Pressure test system in accordance with AWWA C600 and the following:
 - 1. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
 - 2. Conduct hydrostatic test for at least two-hour duration.
 - 3. Pressure and leakage test shall be completed with corporations and curb stops installed.
 - 4. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
 - 5. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
 - 6. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
 - 7. Compute maximum allowable leakage by the following formula:

$L = (SD\sqrt{P})/C$
L = testing allowance, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during hydrostatic test, in psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

- 8. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

- B. Compaction Testing for Bedding: In accordance with ASTM D1557 if required by Engineer.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Compaction Tests: one test per 500 feet of trench for each 2 foot lift if required by the Engineer.

END OF SECTION

SECTION 33 12 13

WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe and fittings for domestic water service connections to buildings.
 - 2. Corporation stop assembly.
 - 3. Curb stop assembly.
 - 4. Bedding and cover materials.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete.
 - 2. Section 31 05 13 - Soils for Earthwork.
 - 3. Section 31 23 16 - Earthwork.
 - 4. Section 31 23 17 - Trenching and Backfilling.
 - 5. Section 33 13 00 - Disinfecting of Water Utility Distribution

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Pipe and Fittings:
 - 1. Basis of Measurement: By linear lineal foot. Basis of Payment: Includes full compensation for excavation, bedding, backfill, compaction, testing, and furnishing all materials, fittings, tools, equipment, labor and incidentals necessary to complete the work in accordance with the Contract Documents. New corporation stops, curb boxes, and reconnecting to existing laterals are incidental to water service construction unless accounted for as a bid item on the Bid Form. All water services shall be Copper Type K unless specified on the plans or in the bid form.
- B. Corporation Stop Assembly:
 - 1. Basis of Measurement: By the unit. When no quantity is provided, it is incidental to the cost of water service construction.
 - 2. Basis of Payment: Includes corporation stop, fittings and accessories.
- C. Curb Stop Assembly:
 - 1. Basis of Measurement: By the unit. When no quantity is provided, it is incidental to the cost of water service construction.
 - 2. Basis of Payment: Includes curb stop, curb box and cover, fittings, and accessories.

1.3 REFERENCES

- A. Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition.
- B. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

- C. American Society of Mechanical Engineers:
 - 1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
 - 2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- D. American Water Works Association:
 - 1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - 2. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
 - 3. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
 - 4. AWWA C702 - Cold-Water Meters - Compound Type.
 - 5. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
 - 6. AWWA C800 - Underground Service Line Valves and Fittings.
 - 7. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
 - 8. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. All American Iron and Steel (AIS) materials need to be certified by the manufacturer.**
- C. Contractor shall certify upon substantial completion of the project that all iron and steel products installed were produced in the United States.**
- D. Product Data: Submit data on pipe materials, pipe fittings, corporation stop assemblies, curb stop assemblies, service saddles, and accessories.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of piping mains, curb stops, connections, thrust restraints, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with the Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition, except as modified in this section.
- B. Wisconsin Administrative Plumbing Code, as administered by the Department of Commerce, shall govern the installation of water services, except as modified in this section.
- C. All iron and steel products must be produced in the United States and meet American Iron and Steel requirements as described in the contract documents. 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. During loading, transporting, and unloading of materials and products, exercise care to prevent any damage.
- C. Store products and materials off ground and under protective coverings and custody, away from walls and in manner to keep these clean and in good condition until used.
- D. Exercise care in handling precast concrete products to avoid chipping, cracking, and breakage.

PART 2 PRODUCTS

2.1 WATER PIPING AND FITTINGS

- A. Water service lines shall be 1 inch unless otherwise shown on the plans.
- B. Water service material shall be as indicated on the engineering drawings or bid form.
- C. Water services shall comply with Chapter 8.24.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition, with tracer wire installed along PE service laterals as specified in Chapter 2.11.0.
- D. Copper Tubing: ASTM B88, Type K, seamless copper tubing, annealed:
 - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper. All water service fittings shall be compression type fittings. Flared fittings shall not be allowed.
 - 2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

2.2 CORPORATION STOP ASSEMBLY

- A. Corporation stops shall comply with Chapter 8.30.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition.
- B. Manufacturers:
 - 1. Ford Type F-1000-QNL
- C. Corporation Stops:
 - 1. Brass or red brass alloy body conforming to ASTM B62.
 - 2. Inlet end threaded for tapping according to AWWA C800.
 - 3. Outlet end suitable for service pipe specified.
- D. Service Saddles:

1. Minimum 12" wide stainless steel service saddle, designed to hold pressures in excess pipe working pressure.

2.3 CURB STOP ASSEMBLY

- A. Curb Valves shall comply with Chapter 8.31.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition.
- B. Service boxes shall comply with Chapter 8.25.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition.
- C. Manufacturers: Shall match municipal standard.
 1. Ford B44-444-Q-NL
- D. Curb Stops:
 1. Brass or red brass alloy body conforming to ASTM B62.
 2. Plug type valve.
 3. Positive pressure sealing.
- E. Curb Boxes and Covers:
 1. Poly Curb Boxes without extension (Argonics - MP-PCB-SM31518W-B90 / Poly Curb Box System – minn)
 2. Minneapolis Pattern Base.
 3. Lid with inscription WATER, with Pentagon Plug.
 4. No Extension rod.
 5. Curb boxes shall be sized to match the curb stops, as directed by the manufacturer.

2.4 BEDDING AND COVER MATERIALS

- A. Bedding: Type 3 Embedment as specified in Section 31 23 17.
- B. Cover: Type 3 Embedment as specified in Section 31 23 17.
- C. Soil Backfill from Above Pipe to Finish Grade: Native backfill as specified in Section 31 05 13. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.5 ACCESSORIES

- A. Concrete for Thrust Restraints: high early strength concrete or solid concrete blocks. Wood blocking is not allowed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

- B. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings.
- C. Contractor shall be responsible for identifying and reconnecting all existing water laterals to the new water main. Laterals are to be replaced from the new main to just beyond the existing curb stop or as directed by the Engineer.

3.2 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION - CORPORATION STOP ASSEMBLY

- A. Make connection for each different kind of water main using suitable materials, equipment and methods approved by the Engineer.
- B. Provide service clamps for mains other than of cast iron or ductile iron mains.
- C. Screw corporation stops directly into tapped and threaded iron main at 10 and 2 o'clock position on main's circumference; locate corporation stops at least 12 inches apart longitudinally and staggered.
- D. For plastic pipe water mains, provide full support for service clamp for full circumference of pipe, with minimum 2 inches width of bearing area; exercise care against crushing or causing other damage to water mains at time of tapping or installing service clamp or corporation stop.
- E. Use proper seals or other devices so no leaks are left in water mains at points of tapping; do not backfill and cover service connection until approved by the Engineer.

3.4 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 17 for Work of this Section.
- B. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.
- C. Backfill around sides and to top of pipe in accordance with Section 31 23 17.
- D. Maintain optimum moisture content of fill material to attain required compaction density.

3.5 INSTALLATION - PIPE AND FITTINGS

- A. Maintain separation of water main from sewer piping in accordance with NR811 code.
- B. Group piping with other site piping work whenever practical.

- C. Install piping with minimum cover of 6-1/2 feet below finished grade unless otherwise indicated.
- D. Contractor shall be equipped with varying types and sizes of fittings to accommodate the types of connections that may be required due to varying existing conditions.
- E. Contractor shall coordinate with City Water Department for operation of existing valves and hydrants.

3.6 INSTALLATION - CURB STOP ASSEMBLY

- A. Place curb stop and box on a concrete brick or block. Wrap bottom of curb box with polyethylene wrap. Center and plumb curb box over curb stops. Set box cover flush with finished grade.
- B. Curb boxes shall have a minimum length of 7 feet when extended without the use of extension section.

3.7 INSTALLATION – PIPE MARKERS

- A. When not connecting to an existing lateral, lateral ends shall be marked with a 6-foot steel fence post with 1-foot of the post below the end of the service. A 6-foot tall 4x4 treated wood post shall also be installed at the end of the service with 3-feet of the post being buried below grade. The exposed portion of the post shall be painted blue.
- B. Tracer Wire
 - 1. Install tracer wire on all HDPE services.
 - 2. Tracer wire shall be laid flat and shall be securely fastened to the pipe at ten-foot intervals. The wire shall be protected from damage during installation and backfilling. The tracer wire shall be extended out the length of the service line and brought up in the curb box.

3.8 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Flush and disinfect system in accordance with Section 33 13 00.

3.9 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements, 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Pressure test system in accordance with AWWA C600 and the following:
 - 1. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
 - 2. Conduct hydrostatic test for at least two-hour duration.
 - 3. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
 - 4. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.

5. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
6. Compute maximum allowable leakage by the following formula:

$L = (SD\sqrt{P})/C$
L = testing allowance, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during hydrostatic test, in psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

7. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 33 12 16

WATER UTILITY DISTRIBUTION VALVES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cut-In Valves.
 - 2. Valve boxes.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete.
 - 2. Section 33 12 13 - Water Service Connections.
 - 3. Section 33 12 19 - Water Utility Distribution Fire Hydrants.
 - 4. Section 33 13 00 - Disinfecting of Water Utility Distribution.
- C. Cut-In Valves:
 - 1. Basis of Measurement: Each.
 - 2. Basis of Payment: Includes excavation, valve, valve box, pipe, fittings, accessories, tests, backfill and any other necessary items to complete the work. Adjustment of water valve boxes to finish grade shall be incidental to valve installation.

1.2 REFERENCES

- A. American Water Works Association:
 - 1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
 - 2. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
 - 3. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.
 - 4. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
- B. National Sanitation Foundation:
 - 1. NSF 61 - Drinking Water System Components - Health Effects

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. **Contractor shall certify upon substantial completion of the project that all iron and steel products installed were produced in the United States.**
- C. Shop Drawing:
 - 1. Installation Plan: Submit description of proposed installation.
- D. Design Data: Submit manufacturer's latest published literature include illustrations, installation instructions, maintenance instructions and parts lists.

- E. Manufacturer's Certificates: Submit Statement of Compliance, supporting data, from material suppliers attesting that valves and accessories provided meet or exceed AWWA Standards and specification requirements. **All American Iron and Steel (AIS) materials need to be certified by the manufacturer.**

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of valves.
- C. Provide Operation and Maintenance Data for valves.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction standard.
- B. Comply with requirements of local water utility.

1.6 QUALIFICATIONS

- A. Manufacturer: company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years experience.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Prepare valves and accessories for shipment according to AWWA Standards and seal valve and ends to prevent entry of foreign matter into product body.
- C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.9 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate work with State of Wisconsin standards and utilities within construction area.

PART 2 PRODUCTS

2.1 RESILIENT WEDGE GATE VALVES

- A. Gate valves shall conform to Chapter 8.27.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition.
- B. Valves shall be American Flow Control's Series 2500 Ductile Iron NRS w/ Alpha restrained joint ends, Resilient Wedge, or approved equal. Valves shall include a Trumbell extension stem, or approved equal.
- C. Manufacturers:
 - 1. Waterous Series 2500 RW w/ Alpha restrained joint ends.
 - 2. Substitutions: Section 01 60 00 - Product Requirements Not Permitted.

2.2 VALVE BOXES

- A. 12 inch diameter Valves and Smaller: Domestic cast iron, three-piece, screw type.
- B. Valve boxes shall conform to Chapter 8.29.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition, specified for 7.5-foot bury (or as required for varying depths), and include valve box adaptor, Adaptor, Inc. or equal.
- C. Castings shall be thoroughly coated with a 1 mil minimum thickness bituminous coating.
- D. Cast iron lid, marked "Water".

2.3 ACCESSORIES

- A. Concrete for Thrust Restraints: Concrete type specified in Section 03 30 00. Valves shall be placed on a solid concrete block (8"x8"x16").

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Determine exact location and size of valves from Drawings; obtain clarification and directions from Engineer prior to execution of work.

- C. Verify invert elevations of existing work prior to excavation and installation of valves.

3.2 PREPARATION

- A. Identify required lines, levels, contours and datum locations.
- B. Locate, identify, and protect utilities to remain from damage.
- C. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.
 - 1. Notify Engineer and Owner not less than 2 days in advance of proposed utility interruption.
 - 2. Do not proceed without written permission from the Engineer.
- D. Perform trench excavation, backfilling and compaction in accordance with Section 31 23 17.

3.3 INSTALLATION

- A. Install valves in conjunction with pipe laying; set valves plumb.
- B. Provide buried valves with valve boxes installed at $\frac{1}{2}$ " to $\frac{3}{4}$ " below finished pavement elevations.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Flush and disinfect system in accordance with Section 33 13 00.

3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements : Field inspecting, testing, adjusting, and balancing.
- B. Pressure test system in accordance with AWWA C600 and the following:
 - 1. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
 - 2. Conduct hydrostatic test for at least two-hour duration.
 - 3. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
 - 4. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
 - 5. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.

6. Compute maximum allowable leakage by the following formula:

$L = (SD\sqrt{P})/C$
L = testing allowance, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during hydrostatic test, in psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

7. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 33 12 19

WATER UTILITY DISTRIBUTION FIRE HYDRANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire hydrants.
- B. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete.
 - 2. Section 33 12 13 - Water Service Connections.
 - 3. Section 33 12 16 - Water Utility Distribution Valves.
 - 4. Section 33 13 00 - Disinfecting of Water Utility Distribution.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Fire Hydrants:
 - 1. Basis of Measurement: Each.
 - 2. Basis of Payment: Includes excavation, fire hydrant, accessories, test and backfill.

1.3 REFERENCES

- A. American Water Works Association:
 - 1. AWWA C502 - Dry-Barrel Fire Hydrants.
 - 2. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.
 - 3. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
- B. National Sanitation Foundation:
 - 1. NSF 61 - Drinking Water System Components - Health Effects.
- C. National Fire Protection Association:
 - 1. NFPA 281 - Recommended Practice for Fire Flow Testing and Marking of Hydrants.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. **Contractor shall certify upon substantial completion of the project that all iron and steel products installed were produced in the United States.**
- C. Shop Drawing:
 - 1. Installation Plan: Submit description of proposed installation.
- D. Design Data: Submit manufacturer's latest published literature. Include illustrations, installation instructions, maintenance instructions and parts lists.

- E. Manufacturer's Certificates: Submit Statement of Compliance, supporting data, from material suppliers attesting that hydrants and accessories provided meet or exceed AWWA Standards and specification requirements. **All American Iron and Steel (AIS) materials need to be certified by the manufacturer.**

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of fire hydrants.
- C. Provide Operation and Maintenance Data for fire hydrants.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction.
- B. Perform work in accordance with AWWA C502.
- C. Comply with requirements of local water utility.
- D. Maintain one copy copies of each document on site.
- E. **All iron and steel products must be produced in the United States and meet American Iron and Steel requirements as described in the contract documents. 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.**

1.7 QUALIFICATIONS

- A. Manufacturer: company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer.

1.8 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation Meeting.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing and protecting products.
- B. Prepare hydrants and accessories for shipment according to AWWA Standards and seal hydrant and ends to prevent entry of foreign matter into product body.

- C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.11 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate work with local municipality's standards and utilities within construction area.

PART 2 PRODUCTS

2.1 FIRE HYDRANTS

- A. Fire Hydrants shall conform to Chapter 8.26.0 of the Standard Specifications for Sewer and Water Construction in Wisconsin, Sixth Edition.
- B. Hydrants shall have a 5 ¼" valve opening with two 2 ½" nozzle openings and one 4 ½" pumper nozzle with caps and chains. Hydrants shall be for 7.5' bury or as required, and have a ground line breakable flange.
- C. Manufacturers:
 - 1. Waterous Pacer with Alpha Bases.
 - 2. Substitutions: Section 01 60 00 - Product Requirements Not Permitted.

2.2 ACCESSORIES

- A. Concrete for Thrust Restraints: Concrete type specified in Section 03 30 00.
- B. Aggregate: Aggregate for hydrant drainage specified in Section 31 05 16.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

- B. Determine exact location and size of hydrants from Drawings; obtain clarification and directions from Architect/Engineer prior to execution of work.
- C. Verify invert elevations of existing work prior to excavation and installation of fire hydrants.

3.2 PREPARATION

- A. Identify required lines, levels, contours and datum locations.
- B. Locate, identify, and protect utilities to remain from damage.
- C. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.
 - 1. Notify Engineer not less than two days in advance of proposed utility interruption.
 - 2. Do not proceed without written permission from the Engineer.
- D. Perform trench excavation, backfilling and compaction in accordance with Section 31 23 17.

3.3 INSTALLATION

- A. Install fire hydrants; provide support blocking and drainage gravel; do not block drain hole.
- B. Hydrants shall be restrained to tee with concrete buttresses and lugged retainer glands.
- C. Set hydrants plumb with pumper nozzle facing roadway; set hydrants with centerline of pumper nozzle 18 inches above finished grade and safety flange not more than 6 inches nor less than 2 inches above grade.
- D. For fittings, hydrants, valves and shortened pipe sections where cable bond type or copper conductivity type continuity devices are not provided by the manufacturer the Contractor shall field weld a lug onto the fitting, hydrant, valve or shortened pipe section and shall field install a strip or cable capable of carrying 500 amperes continuously between the sections. Cable bonds or copper conductivity strips may be installed around such fittings, valves or shortened pipe sections; but hydrants shall be equipped with continuity devices.
- E. Hydrant color shall be Red, original manufacturer enamel coating.
- F. Hydrant shall be set on a 12"x16"x8" solid concrete block. One-half (1/2) cubic yard of crushed stone shall be placed around the hydrant and a 6-mil poly shall be placed over the crushed stone as shown on the details. Hydrants shall be solidly buttressed against the trench wall.
- G. After hydrostatic testing, flush hydrants and check for proper drainage.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Flush and disinfect system in accordance with Section 33 13 00.

3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Pressure test system in accordance with AWWA C600 and the following:
1. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
 2. Conduct hydrostatic test for at least two-hour duration.
 3. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
 4. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
 5. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
 6. Compute maximum allowable leakage by the following formula:

$L = (SD\sqrt{P})/C$
L = testing allowance, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during hydrostatic test, in psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

7. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 33 13 00

DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes disinfection of potable water distribution and transmission system; and testing and reporting results.
- B. Related Sections:
 - 1. ~~Section 33 11 16 - Site Water Utility Distribution Piping Product and Execution requirements for installation, testing, of site domestic water distribution piping.~~

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Disinfection:
 - 1. Basis of Measurement: Payment will be incidental to installation of the water main and temporary water services.
 - 2. Basis of Payment: Includes preparing, disinfecting, testing, and reporting.

1.3 REFERENCES

- A. American Water Works Association:
 - 1. AWWA B300 - Hypochlorites.
 - 2. AWWA B301 - Liquid Chlorine.
 - 3. AWWA B302 - Ammonium Sulfate.
 - 4. AWWA B303 - Sodium Chlorite.
 - 5. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - 6. AWWA C651 - Disinfecting Water Mains.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.
- C. Test Reports: Indicate results comparative to specified requirements.
- D. Certificate: Certify cleanliness of water distribution system meets or exceeds specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Disinfection Report:
 - 1. Type and form of disinfectant used.

2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24 hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological Report:

1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certify water conforms, or fails to conform, to bacterial standards of authority having jurisdiction.

D. Water Quality Certificate: Certify water conforms to quality standards of Municipality of authority having jurisdiction, suitable for human consumption.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with AWWA C651.

1.7 QUALIFICATIONS

- A. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this section.
- B. Testing Firm: Company specializing in testing examining potable water systems, certified approved by State of Wisconsin.
- C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify piping system has been cleaned, inspected, and pressure tested.
- C. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.
- D. Flushing of the main and operation of any existing valves shall be done in the presence of the appropriate municipal official.

3.2 INSTALLATION

- A. Provide and attach required equipment to perform the Work of this section.
- B. Perform disinfection of water distribution system and installation of system and pressure testing. Refer to Section 33 11 13.
- C. At a minimum, samples shall be collected for every 1,200 feet of the new water main, in addition to one set from each water main branch, and from the end of the new mains.
- D. Samples must be collected for all temporary water services.
- E. Inject treatment disinfectant into piping system.
- F. Maintain disinfectant in system for 24 hours. Valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service.
- G. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water. Isolation valves shall be operated only by the Water utility.
- H. Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Disinfection, Flushing, and Sampling:
 - 1. Disinfect pipeline installation in accordance with AWWA C651. Use of liquid chlorine is not permitted.
 - 2. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.

3. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water.
4. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption.

END OF SECTION

SECTION 33 21 13

PUBLIC WATER SUPPLY WELLS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Drilling and casing for water well.
 - 2. Well performance testing.
 - 3. Water quality testing.
- B. Related Sections:
 - 1. Section 31 25 13 – Erosion Controls
 - 2. Section 31 26 16 - Earthwork
 - 3. Document: Test Well Construction Report.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Bore Hole Drilling:
 - 1. Basis of Measurement: By vertical foot.
 - 2. Basis of Payment: Includes drilling bore hole per specified drilling method, furnishing drilling mud when specified, and all labor, tools, equipment, and incidentals required to complete the work in accordance with the Contract Documents.
- B. Well Casing:
 - 1. Basis of Measurement: By vertical foot.
 - 2. Basis of Payment: Includes furnishing & installing new casing pipe as specified, welding, spacers, and all labor, tools, equipment, and incidentals required to complete the work in accordance with the Contract Documents.
- C. Well Screen:
 - 1. Basis of Measurement: By vertical foot.
 - 2. Basis of Payment: Includes furnishing & installing new well screen as specified, with K-packer and welded stainless steel bottom plate, including all labor, tools, equipment, and incidentals required to complete the work in accordance with the Contract Documents
- D. Gravel Filter Pack:
 - 1. Basis of Measurement: By lump sum.
 - 2. Basis of Payment: Includes materials and placement of filter pack including all labor, tools, equipment, and incidentals required to complete the work in accordance with the Contract Documents.
- E. Sand Seal:
 - 1. Basis of Measurement: By lump sum.

2. Basis of Payment: Includes materials and placement of sand seal including all labor, tools, equipment, and incidentals required to complete the work in accordance with the Contract Documents.
- F. Clay Seal:
1. Basis of Measurement: By lump sum.
 2. Basis of Payment: Includes materials and placement of clay seal including all labor, tools, equipment, and incidentals required to complete the work in accordance with the Contract Documents.
- G. Grouting:
1. Basis of Measurement: By bag (One bag = 94lbs., 5.5 gallons of water per bag).
 2. Basis of Payment: Includes materials and placement of grout including all labor, tools, equipment, density testing, and incidentals required to complete the work in accordance with the Contract Documents.
- H. Plumbness & Alignment Testing:
1. Basis of Measurement: By lump sum.
 2. Basis of Payment: Includes furnishing all labor, tools, equipment, reports, and incidentals required to complete the work in accordance with the Contract Documents.
- I. Collect & Deliver Drilling Samples, Well Construction Report, Casing Pipe Report & Daily Reports:
1. Basis of Measurement: By lump sum.
 2. Basis of Payment: Includes furnishing all labor, tools, equipment, sampling, transportation of samples to WGNHS, reports, and incidentals required to complete the work in accordance with the Contract Documents.
- J. Well Development:
1. Basis of Measurement: By lump sum.
 2. Basis of Payment: Includes furnishing all labor, tools, pump, discharge piping, equipment, fuel, reports, and incidentals required to complete the work in accordance with the Contract Documents.
- K. Furnish, Install, Remove Test Pump & Well Disinfection:
1. Basis of Measurement: By lump sum.
 2. Basis of Payment: Includes furnishing all labor, tools, installation of test pump and discharge piping, removal of test pump and piping, chlorine, and incidentals required to complete the work in accordance with the Contract Documents.
- L. Performance Test Pumping:
1. Basis of Measurement: By hour.
 2. Basis of Payment: Includes furnishing all labor, tools, equipment, fuel, reports, and incidentals required to complete the work in accordance with the Contract Documents.
- M. Water Quality Testing:
1. Basis of Measurement: By lump sum.

2. Basis of Payment: Includes furnishing all labor, tools, equipment, sampling, transportation of samples to laboratory, laboratory fees, reports, and incidentals required to complete the work in accordance with the Contract Documents.

N. Seal Casing, Site Clean-up & Demobilization

1. Basis of Measurement: By lump sum.
2. Basis of Payment: Includes furnishing all labor, tools, steel plate, welding, cutting, removal of all debris and equipment from the site, and incidentals required to complete the work in accordance with the Contract Documents.

1.3 REFERENCES

A. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM C150 - Standard Specification for Portland Cement.

B. American Water Works Association:

1. AWWA A100 - Standard for Water Wells.

C. State of Wisconsin Administrative Code:

1. Chapter NR 809, Safe Drinking Water.
2. Chapter NR 811, Requirements for the Operation and Design of Community Water Systems.
3. Chapter NR 812, Well Construction and Pump Installation

1.4 SYSTEM DESCRIPTION

- A. The proposed construction of the well is shown on the proposed well profile found on the Plans. The depths and lengths of the various holes and casings are approximate and will be finalized by the Engineer and Contractor (Well Driller) during construction. The Contractor shall keep the Engineer fully and currently informed of the nature of the formations being encountered while drilling so that the well construction is proper for the conditions encountered.

1.5 PERFORMANCE REQUIREMENTS

- A. Water well capable of producing minimum 1,200 gallons of water per minute (gpm), with a pump test rate up to 1,800 gpm.
- B. Maximum Settleable Solids in Delivered Water: 5 ppm at a pumping rate of 1,200 gpm.

1.6 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. All American Iron and Steel (AIS) and BABA materials need to be certified by the manufacturer.**

C. Contractor shall certify upon substantial completion of the project that all iron and steel and BABA products installed were produced in the United States of America.

D. Product Data/Invoices:

1. Casing pipe (indicating conformance to ASTM standards, size, and wall thickness).
2. Well Screen (indicating slot size and materials of construction)
3. Filter Pack (indicating supplier and gradation)
4. Sand Sea (indicating supplier and gradation)
5. Clay Seal (indicating supplier and type)
6. Grout (indicating water cement ratio, cement type, and conformance to ASTM standard).

1.7 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Accurately record actual locations of well, depth, subsoil strata, and drilling difficulties encountered.
- C. Formation Samples.
- D. Casing Pipe Records.
- E. Daily Reports.
- F. Plumbness & Alignment Testing Reports.
- G. Well Development Report
- H. Performance Pump Testing Reports.
- I. Water Quality Testing Reports.
- J. Well Construction Report as required by Wisconsin Department of Natural Resources (WDNR).
- K. Samples and documents required by the WDNR and Wisconsin Geological & Natural History Survey.

1.8 LOCAL CONDITIONS

- A. It is the Contractor's responsibility to review whatever geologic data and existing well reports he deems appropriate to familiarize himself with aquifer conditions. The Engineer will make available whatever pertinent data and information he has upon request of the Contractor.
- B. DISCLAIMER: The Owner and Engineer do not guarantee the accuracy of data or information they provide, nor do they represent that the data and information are necessarily indicative of the conditions to be encountered at the proposed site. Neither the information provided nor information contained in the plans and specifications shall

relieve the Contractor from any responsibility contracted hereunder, from fulfilling any and all terms of the contract, nor to any additional payment except as set forth in the Contract Documents.

- C. Electricity: All electric power necessary for construction and testing of the well shall be provided by the Contractor at no additional cost to the Owner.
- D. Water: Water necessary for construction and testing of the well will be provided by the Village of Viola at no fee to the Contractor. Contractor is responsible for coordinating with the Village to obtain water from the hydrant nearest to the well site. Cost to convey water from the hydrant to the well site is the responsibility of the Contractor.
- E. Pump Engine: If an engine is used for test pumping, it shall be equipped with silencers such that, surrounding residents are not disturbed.
- F. Boundaries of Work: The Contractor shall confine his operations to the well site as indicated on the drawings. No work shall be performed outside this area without the written consent of the Owner.

1.9 QUALITY ASSURANCE

- A. Perform Work in accordance with AWWA A100 – Water Wells.
- B. Perform Work in accordance with Chapters NR 809, NR 811 & NR 812 of the State of Wisconsin Administrative Codes.
- C. Maintain one copy of each document on site.
- D. **All iron and steel (AIS) and Build America, Buy America (BABA) products must be consumed in, incorporated into, or affixed to an infrastructure project produced in the United States and meet American Iron and Steel (AIS) and Build America, Buy America (BABA) requirements as described in the contract documents. The term “iron and steel products” means the following products are 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.**

1.10 QUALIFICATIONS

- A. Drilling Firm: Company specializing in performing Work of this section with minimum five years documented experience and licensed in State of Wisconsin.
- B. Competent Workers: The Contractor shall employ only competent workers for the execution of this work and all such work shall be performed under the direct supervision of an experienced Well Driller licensed in the State of Wisconsin.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Well Casing: All steel well casing pipe shall conform to ASTM, A 53 Grades A or B, ASTM A 106; ASTM A 589 Type I, Grade A or B, Type II, Grade A or B; or API 5L. All casing joints shall be welded water-tight, outside bevel, electric, continuous butt welds per American Welding Society manual AWS D10.12-89, "Recommended Products and Procedures for Welding Low Carbon Steel Pipe" and NR 812.18. All casing pipe shall be new prime pipe free of oil grease, rust, or other detrimental materials. Inner casing shall have a smooth interior with no projecting welds or seams. Invoices from supplier shall be submitted to Engineer prior to placing any casing pipe in the well.
1. 30-inch Casing: 0.500-inch-thick walls with at least 157.53 pounds per foot weight (plain ends) per Table 1, NR 811.12(7).
 2. 24-inch Casing: 0.500-inch-thick walls with at least 125.49 pounds per foot weight (plain ends) per Table 1, NR 811.12(7).
 3. 18-inch Casing: 0.375-inch-thick walls with at least 70.59 pounds per foot weight (plain ends) per Table 1, NR 811.12(7).
 4. Wall thicknesses given are per Table 1, Chapter NR 811.12(7). It is the responsibility of the Contractor to decide if heavier pipe is needed for successful installation. Pipe damaged during installation shall be removed and replaced at Contractor's expense.
 5. Centering guides shall be placed on all casings to be grouted in place. The centering guides shall be placed at intervals no greater than 20 feet with sets of three guides welded to the pipe at third points around the circumference of the pipe.
 6. All pipe to be driven shall have a drive shoe with drawings to be submitted for approval.
- B. Well Screen: Continuous slot, wire-wound, Type 304 stainless steel screen with slot size as indicated in the Well Profile on the plans. Screen wire shall have a triangular cross section providing inlet slots with sharp outer edges, widening inward to minimize clogging. Provide a welded plate bottom of Type 304 stainless steel. Screen shall be manufactured by Johnson Screens or approved equal.
- C. Filter Pack: Physical characteristics of the filter pack shall conform to those listed in sections 6.3.1 to 6.3.6 of AWWA A100 – Standard for Water Wells. Filter pack shall be gradation size # 30 as provided by Red Flint Sand and Gravel or approved equal.
- D. Sand Seal: Clean silica sand (sugar sand).
- E. Clay Seal: Bentonite pellets.
- F. Grout: Portland cement type ASTM C150, Type 1, or API-10A, Class A, or ASTM C595 Type 1L with not more than 6 gallons of water per 94-pound bag of cement.
- G. Water:
1. The Driller shall take great care to avoid introducing iron bacteria into the well during drilling and test pump operations. All drilling fluid mix, make up, and mix water should be chlorinated to a minimum 100 ppm even if from a chlorinated municipal supply.

- Due to its instability, chlorine should be added periodically to the drilling mud to maintain a 10 ppm free chlorine residual during drilling operations.
2. Providing water for drilling operations is the responsibility of the Contractor.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify site conditions are capable of supporting equipment for performing drilling operations and testing.

3.2 PREPARATION

- A. Protect structures near well from damage.

3.3 WELL CONSTRUCTION SEQUENCE & METHODS

- A. The proposed construction of the well is shown on the proposed well profile found on the Plans. The depths and lengths of the various holes and casings are approximate and will be finalized by the Engineer and Contractor (Well Driller) during construction. The Contractor shall keep the Engineer fully and currently informed of the nature of the formations being encountered while drilling so that the well construction is proper for the conditions encountered.
- B. Depths and quantities of work may be changed by the Engineer during construction.
- C. Drilling Mud: The minimum feasible amount of mud, bentonite, or other drilling aids shall be used. Use of such material is subject to the Engineer's approval. The purpose of this limitation is to minimize the binding of the pores in the sand formation. No drilling mud shall be allowed in the screened area or 15 feet above it.
- D. 30-inch Upper Enlarged Drill Hole & Temporary Casing: A steel casing shall be placed from the ground surface to a depth of 20 feet below ground surface (bgs).
- E. 24-inch Temporary Outer Casing: A steel casing shall be placed from the ground surface to a depth of 106 feet below ground surface (bgs).
- F. 18-inch Permanent Casing: Contractor shall drill and install an 18-inch casing to a depth of 73 feet below ground surface (bgs). The casing shall be centered in the temporary outer casing with centering guides (sets of 3) welded to the pipe at third points around the circumference of the pipe. The centering guides shall be placed at intervals no greater than 20 feet.
- G. The 18-inch casing shall extend 36 inches above the ground surface.

- H. 18-inch Screen Placement: The screen shall be welded to the bottom of the 18-inch permanent casing and set with installation of the 18-inch permanent casing.
- I. Gravel Filter Pack: Prior to placement, the filter pack material shall be treated with a chlorine solution having a 50 mg/L free-chlorine residual. The filter pack shall be placed in the annular space between the temporary casing and the screen/permanent casing up to the depth shown on the Well Profile in the Plans. The filter pack shall be placed by use of a tremie pipe to prevent hydraulic segregation and bridging. The pipe shall terminate 5 ft above the bottom of the hole, lifted gradually, and sections removed as the level of filter pack rises. The top of the tremie pipe shall be fitted with funnel fittings so that filter pack can be shoveled or dumped into the tremie. Clean water may be mixed with the filter pack to facilitate placement. A careful record and computation must be made and furnished as to the amount of filter pack introduced into the annulus of the well to compare it with the total required to properly pack the well.
- J. 24-inch Temporary Casing Pull Back: After installation of the filter pack, the bottom of the temporary casing shall be pulled back to 73 feet bgs exposing the filter pack and screen to the aquifer from 73 feet to 106 feet bgs. The drill string or a weight attached to a sand line shall be placed on the bottom of the screen while the casing is being pulled back to keep the screen in place.
- K. Development: The well shall be developed after the filter pack has been installed and the temporary casing pulled back. Development shall be completed in accordance with the Development subsection of this specification section.
- L. Filter Pack Addition: After the well has been fully developed, the depth to the top of the filter pack shall be measured. Additional filter pack shall be placed if necessary to bring the top of the filter pack back to the depth as shown on the Well Profile in the Plans. Comply with filter pack placement methods stated above.
- M. Sand & Clay Seals: The sand and clay seals shall be placed in the annular space between the temporary and permanent casings above the gravel filter pack to the depths as shown on the Well Profile in the Plans. The seal materials shall be placed by using a tremie pipe.
- N. Grout Placement & Temporary Casings Removal: The permanent casing shall be tested for plumbness and alignment by the Contractor in the presence of the Engineer prior to grouting. After installation of the sand and clay seals, the annular space above the sand and clay seals between the permanent and 24-inch temporary casings shall be sealed with grout in accordance with the Grouting subsection of this specification section. The temporary casings shall be removed during grouting operations.
- O. Final Plumbness & Alignment Test: The plumbness and alignment of the well shall be tested no sooner than 72 hours after grouting has been completed, and in accordance with the Plumbness & Alignment Testing subsection of this specification section.
- P. Clean Well Required: Upon completion, the well shall be left free from tools, equipment, timber, debris or foreign objects of any kind which may be left through drilling operations or in any way at any time previous to acceptance of the well by the Owner.

3.4 GROUTING

- A. The annular space between the permanent inner (protective) casing and the temporary outer casing/bore hole wall above the clay seal shall be filled with neat cement grout. Comply with all requirements of NR 811.12(14) and NR 811.18.
- B. The method of grouting shall consist of a tremie pipe and grout pump with a back-up tremie pipe and grout pump on site in case of emergency. The Engineer shall be notified 48 hours prior to beginning the grouting operation so they can have a representative present to observe the placement of the grout seal.
- C. The inner casing shall be centered in the drill hole before grouting and shall be plumb. Sufficient and adequate centering guides shall be used to assure that the casing shall remain centered and plumb. The inner permanent casing shall be tested for plumbness and alignment before grouting by the Contractor in the presence of the Engineer.
- D. Any materials used as drilling aids or other foreign material shall be removed from the annular space.
- E. The grout for sealing the annular space surrounding the inner casing shall be forced from the bottom of the space to be grouted towards the surface under pressure using a tremie pipe and pump. This shall be a continuous operation and shall be entirely placed before the occurrence of initial set.
- F. The casing shall remain full of water or drilling fluid to counteract the pressure from the grout on the outside of the casing during grouting operations until the grout has set for a minimum of 72 hours.
- G. Grout shall be allowed to overflow from the annular opening until such time as the density is the same as that of the grout being placed. The Contractor shall provide satisfactory evidence to the Engineer that this condition has been satisfied by use of a mud balance to measure grout density.
- H. The grout level shall be maintained above the bottom of the outer temporary casing during withdrawal procedure.

3.5 PLUMBNESS AND ALIGNMENT

- A. The drill hole shall be no smaller than the size specified, circular in bore, vertical and straight. A crooked, slanted or flattened hole will not be accepted.
- B. Tests for plumbness and alignment shall be made by the Contractor in the presence of the Engineer. The Contractor shall provide the necessary equipment for the test. The plumb and alignment tests shall be completed as described in AWWA A-100 Specifications for Water Wells and NR 811.12(15). The well shall not pass if: (1) the dummy fails to move freely throughout the area being tested; or (2) the well varies from the vertical in excess of two-thirds of the smallest inside diameter being tested per 100 feet to the depth of the pump setting plus 25%; or (3) the well does not allow the free passage of the pump to be permanently installed in the well to the depth of the pump setting plus 25% of that depth; or (4) the well contains kinks, bends or corkscrews.

- C. The plumb and the rings on the dummy shall be no greater than 1/2" less than the smallest diameter of the portion of the well being tested. The dummy used for the alignment test shall be 40' long with rings located at each end and in the middle.
- D. The Contractor shall plumb test the 18" diameter permanent casing. The casing shall be plumb tested prior to and after grouting. All plumbness and alignment tests shall be observed by the Engineer.
- E. If the well fails to meet the above requirements, the Contractor shall correct the alignment at his own expense. Should the alignment not be corrected, the Owner shall have the right to refuse payment for the well and refuse to accept the well. An unacceptable well shall be abandoned in accordance with NR811.13 requirements at the Contractor's expense.

3.6 DEVELOPMENT

- A. After cleaning the well, and before test pumping, the well shall be fully developed.
- B. The design intention is to develop a well capable of supplying acceptable quality, sand free water at the rate of 1,200 gpm for the final production rate and 1,800 gpm for the pump test. For the pump test, assume an approximate 82-foot pumping water level at 1,800 gpm.
- C. The Contractor shall furnish all necessary pumps, compressors, plungers, bailers, or other needed equipment and shall develop the well by such approved methods as shall be necessary to give the maximum yield of water per foot of drawdown and extract from the water-bearing formation to the maximum practical quantity of such sand as may, during the life of the well, be drawn when the well is pumped under maximum conditions of drawdown.
- D. Complete development shall be interpreted as that point at which the sand content of the pumped water is no longer increasing or decreasing. A maximum sand content of 5 mg/l at a pumping rate of 1,200 gpm is desired. Sand content shall be measured by a Rossum centrifugal sand sampler installed as shown on AWWA A-100-84, Appendix D.
- E. Contractor and Engineer shall discuss and agree upon the best method for development prior to Contractor starting development operations.

3.7 TEST PUMPING

- A. Following development of the well, the Contractor shall test the well for performance characteristics in accordance with these specifications and the requirements of NR 811.12(16). The performance test shall be the constant rate method, step-composite method, or other method appropriate to the design specifications and well conditions.
- B. The well test pump shall have a capacity of 1,800 gpm. The actual pumping rate will be based on the specific capacity (drawdown) and other production factors. The test shall consist of at least a continuous 24 hour test. The test pumping shall include:
 - 1. Measuring the static water level.
 - 2. Pumping for a minimum of 4 hours at 1,200 gpm.

3. Periods at other selected rates up to 1,800 gpm.
 4. Obtaining the pump water level every 30 seconds for the first 10 minutes, then every minute for the next 20 minutes, then every half hour until shut-down. The recovery levels should be read at the same intervals as start-up.
- C. The Contractor shall review the proposed performance test method with the Engineer prior to beginning the test.
 - D. Contractor shall furnish all material, labor and equipment including air lines, pump, motor, power, metering devices, discharge piping and related appurtenances necessary to perform the test. Contractor shall provide necessary discharge pipe to carry the water to waste without causing any flooding or injury to property.
 - E. Contractor shall keep appropriate records of the test and furnish copies to the Engineer and Owner. The records shall include date, time, elapsed time or duration, pumping rate, drawdown, recovery rate, and other pertinent operation.
 - F. Removal of Test Pump: Removal of the test pump shall not interfere with well recovery readings. These readings will be taken frequently immediately after pump shutdown and at longer intervals for 24 hours or more. The Contractor shall furnish labor to take recovery readings.

3.8 SAMPLES, RECORDS, AND REPORTS

- A. Samples of Formations: Contractor shall collect formation samples and maintain records per requirements of NR 811.12(17). The Contractor shall keep an accurate record of the location of the top and bottom of each formation penetrated and shall save two (2) samples of material taken from each 5 feet of drilling and at every change of formation. Sampling shall be in accordance with the Geological Survey instructions. Unless otherwise specified elsewhere, one (1) set of samples and report shall be delivered to the Owner and one (1) set to the Wisconsin State Geological and Natural History Survey 3817 Mineral Point Road, Madison, Wisconsin 53705, in collection bags provided by the survey or in equivalent plastic bags. The formation depths sampled shall be clearly and permanently marked on each bag.
- B. Record of Casing Pipe: The Contractor shall keep an accurate record, as assembled, of the order, number, size and lengths of the individual pieces of pipe installed in the well, and deliver that record to the Owner.
- C. Daily Reports: The Contractor shall submit a daily report describing the nature of materials encountered, the work done during each day, including the items of work accomplished such as depth drilled, casing set, the water level in the well at the beginning and end of each shift, drilling time, and such other pertinent data as the Engineer requests that he make a record of. These reports shall be submitted daily to the Engineer in duplicate and shall cover the period from the beginning of erection of drilling equipment to removal of that equipment.
- D. Driller's Availability: The Contractor shall make arrangements so that he can be reached by phone at any time during the working day. The Driller shall immediately, by phone, advise the Engineer of any circumstances which might alter construction of the well or

have an effect in determining where drilling operations might be changed. Failure of the Contractor to keep the Engineer advised of drilling progress and conditions will result in non-payment to the Contractor for items of work which the Engineer did not wish performed, e.g., extra length of casing, hole, etc.

- E. Water Quality Samples and Testing: Near the end of the test pumping, Contractor shall take two water samples, a minimum of eight (8) hours apart, to be sent to the State Laboratory of Hygiene, Madison, or a laboratory certified by DHSS under ch. HSS 165. It is the Contractor's responsibility to obtain a safe water certification and he shall take the necessary steps to do so, should the initial samples test unsafe.
 - 1. The Contractor shall take water samples at the end of the pumping test for a complete NR 809 chemical analysis. The water samples shall be sent to a state certified laboratory for analysis.
 - 2. Contractor to provide a smooth end sampling faucet on test pump discharge pipe from which samples may be obtained.
- F. Well Construction Report: The Well Driller shall submit a Well Construction Report to the DNR per NR 811.12(17)(b) with a copy to the Owner upon completion of the well.

3.9 PROTECTION OF WATER QUALITY AND DISINFECTION

- A. Precautions to Be Taken: The Contractor shall take such precautions as are necessary or as may be required permanently to prevent contaminated water or water having undesirable physical or chemical characteristics from entering, through the openings made by the Contractor in drilling the well, the stratum from which the well is to draw its water supply. He shall also take all necessary precautions during the construction period to prevent contaminated water, gasoline, etc. from entering the well, either through the opening or by seepage through the ground surface. All drilling fluid mix, make up and mix water should be chlorinated to a minimum of 100 ppm, even if from a chlorinated municipal supply. Due to its instability, chlorine should be added periodically to the drilling mud to maintain a 10 ppm free chlorine residual during drilling operations. At the end of each days drilling, the driller shall place chlorine tablets and/or chlorine powder into the drill hole to maintain this residual.
- B. Disinfection: Once the well is completed and before it is test pumped, it shall be thoroughly disinfected. The chlorine solution shall remain in the well at least 24 hours prior to being pumped to waste. At least 100 ppm of available chlorine shall be obtained for the entire depth of the well.
 - 1. In the event that the test pump is installed after the well has been disinfected, all exterior parts of the test pump coming in contact with the water shall be disinfected with chlorine as directed by the Engineer.
- C. Corrective Work: In the event the well becomes contaminated or if water having undesirable physical or chemical characteristics does enter the well due to the neglect of the Contractor, he shall, at his own expense, perform such work or supply such casing, seals, sterilizing agents or other material as may be necessary to eliminate the contamination or shut off the undesirable water.
- D. Removal of Lost Tools: Any bits, drill bars, rods, cables or tools lost in the well must be removed if the work can be done in 10 days from the time of the accident. If they

cannot be removed in 10 days, the Driller should drill past the tools with the full size of the hole. This will only be allowed, however, 100 feet below the anticipated setting of the pump. If the Driller cannot drill past the tools, or if the tools are lost where the pump is to be set, a new hole shall be started at the Contractor's expense.

3.10 MEASUREMENTS

- A. The total depth of the well will be measured by the Contractor in the presence of a representative of the Owner.

3.11 FINISHED CASING ELEVATION

- A. The Engineer will provide the elevation to the Contractor for the proper finished height of the well casing (3' above existing grade). Contractor shall install sufficient casing to meet the finished elevation.

3.12 CAPPING

- A. At all time during the progress of the work, the Contractor shall protect the well in such manner as to effectively prevent either tamper with the well or the entrance of foreign matter into it.
- B. After completion of the pumping test and removal of equipment from the well, the Driller shall cap the well by welding a steel plate across the well casing. The plate shall form a watertight and airtight seal.

3.13 ABANDONING WELLS

- A. In the event that the production well is determined unacceptable per the terms of these specifications, the Contractor shall abandon the well at his own expense.
- B. Well abandonment shall be done in accordance to NR 811.13, NR 812.26, and with specifics as follows:
- C. Any debris or obstructions that may interfere with sealing operation shall be removed from the well prior to abandonment.
- D. Fill material for the well shall be applied through a conductor pipe unless a dump bailer is used. When concrete is placed under water by a conductor pipe, the bottom end of the conductor pipe shall be submerged in the concrete at all times.
- E. The well shall be filled with concrete, neat cement grout or approved bentonite chips.
- F. Contractor shall cut off the casings and remove the concrete grout to a depth of 5' below ground surface and return site to existing grades upon completion of abandonment.
- G. A Well/Drillhole Abandonment Report (DNR Form 3300-5) shall be submitted to and approved by the Department of Natural Resources within 30 days of well abandonment and prior to approval of final payment.

- H. Contractor to furnish the materials, equipment and skills necessary for the proper abandonment of the well.

END OF SECTION

SECTION 33 29 00

PUBLIC WATER SUPPLY WELL ABANDONMENT – WELL NO. 2

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removal of well pump equipment and permanently abandoning water supply well.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Well No. 2 Abandonment:

1. Basis of Measurement: By lump sum.
2. Basis of Payment: Includes disconnection of the electrical feeders to well pump motor; removal of the electric motor, discharge head, column pipe & shaft, well pump, and salvaging removed items for Owner or off-site disposal at Owner's discretion; removal of any piping in the well, filling the 12 inch diameter 110 feet deep well, submitting required well abandonment report to the WDNR, and for furnishing all materials, labor, tools, equipment, reports, and incidentals required to complete the work in accordance with the Contract Documents.

1.3 REFERENCES

A. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM C150 - Standard Specification for Portland Cement.

B. American Water Works Association:

1. AWWA A100 - Standard for Water Wells.

C. State of Wisconsin Administrative Code:

1. Chapter NR 811, Requirements for the Operation and Design of Community Water Systems.
2. Chapter NR 812, Well Construction and Pump Installation

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Neat Cement Grout (indicating water cement ratio, cement type, and conformance to ASTM standard).
2. Sand-Cement Grout (indicating water cement ratio, cement type, and conformance to ASTM standard).
3. Concrete (indicating water cement ratio, cement type, and conformance to ASTM standard).

4. Slow-Hydrating Bentonite Chips (indicating conformance to NR 811.13(5)).

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Well/Drillhole/Borehole Filling & Sealing Report (DNR Form 3300-5).

1.6 LOCAL CONDITIONS

- A. It is the Contractor's responsibility to review existing well construction reports. The Engineer will make available whatever pertinent data and information he has upon request of the Contractor.
- B. Water: Water necessary for abandonment of the well can be provided by the City of Prairie du Chien at no fee to the Contractor. Contractor is responsible for coordinating with the City to obtain water from the water supply location as designated by the City. Trucks, tanks, equipment, materials, labor and all costs to convey water from the supply location to the well site is the responsibility of the Contractor.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with AWWA A100 – Water Wells.
- B. Perform Work in accordance with Chapters NR 811 & NR 812 of the State of Wisconsin Administrative Codes.
- C. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

Competent Workers: The Contractor shall employ only competent workers for the execution of this work and all such work shall be performed under the direct supervision of an experienced Well Driller or Well Pump Installer licensed in the State of Wisconsin.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All Types of Grout: Comply with all requirements of NR 811.12(14).
- B. Neat Cement Grout: ASTM C150, Type I or API-10A, Class A Portland cement with not more than 6 gallons of water per 94-pound sack of cement.
- C. Sand-Cement Grout: The mixture may not exceed 2 parts by weight of sand to one part of ASTM C150, Type I or API-10A, Class A Portland cement and not more than 6 gallons of water to each 94-pound sack of cement.

- D. Concrete: The concrete shall contain not less than 6 sacks of cement per cubic yard and not more than 6 gallons of water to each 94-pound sack of cement. The gravel size may not exceed 0.75 inch. The volumetric ratio of either gravel or sand to cement may not exceed 2.5 parts to one part. Wisconsin department of transportation grade A concrete is also acceptable.
- E. Bentonite Chips: Slow-hydrating chips complying with NR 811.13(5)(b).
- F. Water: Supplied from a known bacteriologically safe and uncontaminated source.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify site conditions are capable of supporting equipment for performing abandonment operations.

3.2 PREPARATION

- A. Notify local WDNR water supply engineer prior to commencing work.
- B. Obtain and review a copy of well construction report of the well to be abandoned.
- C. Protect structures near well from damage.

3.3 WELL PUMP EQUIPMENT DISCONNECTION AND REMOVAL

- A. Disconnect electrical feeders from the well pump motors.
- B. Remove electric motor, discharge head, column pipe & shaft, well pump, and any piping in the well. Package and transport items to be salvaged to the location designated by the Owner. Items not to be retained by Owner shall be properly disposed of off-site at Contractor's expense.

3.4 FILLING

- A. Any debris or obstructions that may interfere with sealing operation shall be removed from the well prior to abandonment.
- B. The portion of the well from the bottom to three feet below the top of the casing shall be filled with neat cement grout, sand-cement grout, concrete, or bentonite chips. The top three feet below the top of the casing shall be sealed with concrete.
- C. All abandoned wells shall be filled from the bottom of the well to the top of the casing.

- D. The bottom end of the conductor pipe shall be submerged in the sealing material at all times.
- E. Sealing materials shall be placed by use of a conductor pipe or by means of a dump bailer except when approved bentonite chips are used.
- F. Bentonite chips may be poured into the well in accordance with NR 811.12(5)(b).
- G. Conductor piping used for pressure methods shall meet the requirements of NR 811.12(14)(b)8. for well grouting.
- H. Conductor piping used for non-pressure methods shall meet the requirements of NR 811.13(6)(c).

3.5 REPORTS

- A. A Well/Drillhole/Borehole Filling & Sealing Report (DNR Form 3300-5) shall be submitted to and approved by the Department of Natural Resources within 30 days of well abandonment and prior to approval of final payment.

END OF SECTION

SECTION 33 31 13

PUBLIC SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sanitary sewer pipe and fittings.
2. Connection to existing manholes.
3. Manholes.
4. Wye branches and tees.
5. Sanitary Laterals.
6. Bedding and cover materials.
7. Abandon Existing Sanitary Sewer

B. Related Sections:

1. ~~Section 03 20 00 - Concrete Reinforcing.~~
2. Section 03 30 00 - Cast-In-Place Concrete: Concrete type for manhole base pad construction.
3. Section 31 05 13 - Soils for Earthwork: Soils for backfill in trenches.
4. Section 31 23 16 -Earthwork: Product and execution requirements for excavation and backfill required by this section.
5. Section 31 23 17 – Trenching and Backfilling: Execution requirements for trenching required by this section.
6. Section 33 01 32 - Sewer and Manhole Testing.: Pressure, infiltration, and deflection tests.
7. Section 33 05 14 - Public Manholes and Structures: Concrete manholes, frames and grates for sanitary sewer.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:

1. Basis of Measurement: By the linear foot for each size of pipe.
2. Basis of Payment: Includes hand trimming excavation, bedding, pipe and fittings, to indicated depth feet and connection to existing sewer.

Sanitary wyes, fittings, and 4"x4" wood posts should be considered incidental to the construction of PVC lateral pipe of the size specified.

Connection to the existing sewers and manholes shall be incidental to sanitary sewer construction.

B. Manholes:

1. Basis of Measurement: By the each.
2. Basis of Payment: Includes hand trimming excavating, foundation pad, unit installation with accessories, connection to sewer piping.

C. Abandon Existing Sanitary Mains & Manholes:

1. Basis of Measurement: By Lump Sum or each as indicated on the bid form.
2. Basis of Payment: Shall be full compensation for furnishing all materials, for excavation and backfilling when necessary, for removal and off-site disposal, and for all labor, tools, equipment and incidentals necessary to complete the work.

If no price is stated in the Bid Form, abandoning existing mains & manholes shall be considered incidental to new main and manhole construction

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
4. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
5. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
6. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
7. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
8. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
9. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
10. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
11. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
13. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
14. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
15. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
16. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
17. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

18. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
19. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
20. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
21. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. American Water Works Association:

1. AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - American National Standard for Ductile-Iron and Grey-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water and Other Liquids.
4. AWWA C111 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C150 - ANSI Standard for the Thickness Design of Ductile Iron Pipe.
6. AWWA C151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
7. AWWA C153 - American National Standard for Ductile-Iron Compact Fittings for Water Service.

D. National Fire Protection Association:

1. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product data and shop drawings: Submit catalog cuts and other pertinent data indicating proposed materials, accessories, details, and construction information.
- C. Submit reports indicating field tests made and results obtained.
- D. Manufacturer's Installation Instructions:
 1. Indicate special procedures required to install Products specified.
 2. Submit detailed description of procedures for connecting new sewer to existing sewer line and directional drilling pipe jacking installation.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction standard.
- B. Sanitary laterals shall be installed in conformance with the Department of Commerce Plumbing Code and any local plumbing codes and regulations.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section.
- B. Installer: Company specializing in performing work of this section.

1.8 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver and store valves in shipping containers with labeling in place.
- C. Block individual and stockpiled pipe lengths to prevent moving.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements and elevations are as indicated.

1.11 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate the Work with Municipality of authority having jurisdiction.
- C. Notify affected utility companies minimum of 72 hours prior to construction.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPE AND FITTINGS

- A. Plastic Pipe: ASTM D3034, SDR 35, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of inches 4" to 15", bell and spigot style rubber ring sealed gasket joint.
 - 1. Fittings: PVC.

2. Joints: ASTM F477, elastomeric gaskets.

B. Plastic Pipe: ASTM F679, PS 46, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of inches 18" to 36", bell and spigot style rubber ring sealed gasket joint.

1. Fittings: PVC.

2. Joints: ASTM F477, elastomeric gaskets.

2.2 NON-FLEXIBLE COUPLINGS

A. Non-Flexible Coupling: PVC SDR 35 Gasketed Repair Coupling or PVC Gasketed Repair Stop Coupling .

2.3 FLEXIBLE PIPE BOOT FOR MANHOLE PIPE ENTRANCES

A. Manufacturers:

1. Lock Joint Flexible Manhole Sleeve, Inc. Model.

2. Substitutions: Section 01 60 00 - Product Requirements.

B. Flexible Pipe Boot: ASTM C923, ethylene propylene rubber (EPDM), Series 300 stainless steel clamp and stainless steel hardware.

2.4 MANHOLES

A. Manholes: As specified in Section 33 05 14; precast concrete, 48 inch diameter, eccentric conical top, water tight cast iron frames and covers.

2.5 BEDDING AND COVER MATERIALS

A. Bedding and Cover: Type 3 Sand or Sand Screenings bedding as specified in Section 31 23 17 and as shown in the detail.

B. Soil Backfill from Above Pipe to Finish Grade: Native backfill or select granular backfill as specified in Section 31 23 17. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.6 ACCESSORIES

~~A. Grout: Specified in Section 03 60 00. 04 05 03.~~

B. Cellular concrete shall meet the following specifications: 1 part cement, 1 part fly ash, and 8 parts sand or an approved equal and water. Cement shall meet the requirements of Subsection 501.3.2 of the Standard Specifications for Type 1 Portland Cement. Sand shall meet the requirements of Subsection 501.3.6.3 of the Standard Specifications. Water shall meet the requirements of Subsection of 501.3.5 of the Standard Specifications.

2.7 Fernco Connections

A. All ferncos must have stainless steel shear rings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify trench cut excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

- A. Correct over excavation with coarse aggregate.
- B. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.
- C. Protect and support existing sewer lines, utilities and appurtenances.
- D. Maintain profiles of utilities. Coordinate with other utilities to eliminate interference. Notify Engineer where crossing conflicts occur.

3.3 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 17.
- B. Excavate to lines and grades shown on Drawings or required to accommodate installation of encasement.
- C. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.
- D. Provide sheeting and shoring in accordance with Section 31 23 17.
- E. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth; compact to 95 percent.

3.4 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.
- B. Lay pipe to slope gradients noted on layout drawings. Begin at downstream end and progress upstream.
- C. Assemble and handle pipe in accordance with manufacturer's instructions except as modified on the Drawings or by Architect/Engineer.
- D. Keep pipe and fittings clean until work is completed and accepted by Architect/Engineer. Cap open ends during periods of work stoppage.

- E. Lay bell and spigot pipe with bells upstream.
- F. Connect pipe to existing sewer system as noted. Connecting to existing sewer shall be incidental to new main unless otherwise indicated on the bid form.
- G. When replacing existing sewer, the existing sanitary sewer shall be excavated and removed as construction occurs. The new sewer shall be connected to the existing sewer at the end of each workday. Raw sewage shall not be allowed to run into the trench. Pumping sewage between manholes will be required.
- H. Install trace wire continuous over top of pipe when shown on the plans or bid form.

3.5 INSTALLATION - CONNECTION TO EXISTING MANHOLE

- A. Core drill existing manhole to clean opening. Using pneumatic hammers, chipping guns, sledge hammers, is not permitted.
- B. Connection to existing manholes shall be made with a watertight KOR-N-SEAL boot.
- C. Prevent construction debris from entering existing sewer line when making connection.

3.6 INSTALLATION - MANHOLES

- A. Install manholes in accordance with Section 33 05 14.

3.7 INSTALLATION - WYE BRANCHES AND TEES

- A. Install wye branches or pipe tees at locations indicated on Drawings concurrent with pipe laying operations. Use standard fittings of same material and joint type as sewer main.
- B. Maintain minimum 5 feet separation distance between wye connection and manhole.
- C. Use saddle wye or tee with stainless steel clamps for taps into existing piping. Mount saddles with solvent cement or gasket and secure with metal bands. Layout holes with template and cut holes with mechanical cutter. Clamp on wye branches shall not be permitted.

3.8 INSTALLATION - SANITARY LATERALS

- A. Construct laterals from wye branch to terminal point at right-of-way or as shown on the plans or as directed by the Engineer.
- B. Where depth of main pipeline warrants, construct riser type laterals from wye branch.
- C. Maintain 8 feet minimum depth of cover over pipe unless connecting to existing laterals with less cover.
- D. Maintain minimum 5 feet separation distance between laterals.

- E. Lateral cards provided by Engineer must be completed by Contractor for each lateral.
- F. It is the responsibility of the contractor to identify and reconnect all existing live laterals.
- G. Sewer and water services may be placed in a common trench if installed concurrently. If not installed concurrently, a minimum 10-foot horizontal separation must be maintained between the sewer and water services.
- H. The minimum size sewer service shall be 4-inches in diameter. Sewer service size and class shall be as specified in the Contract Documents.
- I. The alignment of a sewer service shall be straight extending from the spur or socket of the main sewer in a direction at right angles to the main sewer to a point even with the water service curb stop as specified on the plans.
- J. Sanitary sewer services shall have a slope of one-fourth inch per foot where possible. In no case shall the slope be less than one-eighth inch per foot. Between the lot line and the sewer main, or riser pipe, the sewer shall be laid at uniform slope not exceeding one-half inch per foot. Between the lot line and the building, the slope shall not exceed one-half inch per foot, except for a change in elevation, which shall be made by use of 45-degree fittings.
- K. When not connecting to existing lateral, install watertight plug, braced to withstand pipeline test pressure thrust, at termination of lateral.
- L. All existing sewer services shall be reconnected with PVC SDR 35 pipe and a suitable PVC coupling unless otherwise specified or directed by the Engineer.
- M. Contractor shall note the condition of the existing lateral beyond the reconnection point and notify the Engineer of the condition.

3.9 LOCATION OF EXISTING SEWER SERVICES

- A. The Contractor will be furnished available recorded measurements for the location of existing sewer services. Evidence of existing trenches and any other pertinent evidence also shall be used in their location.
- B. The Contractor is responsible for locating live laterals.

3.10 ABANDON EXISTING SANITARY MAINS & MANHOLES

- A. All existing sewer mains shall be properly abandoned at all locations where the new sewer replaces the existing. The abandoned sewer pipe shall be plugged with cellular concrete in accordance with the pertinent requirements of Section 204 of the Wisconsin Department of Transportation Standard Specifications and as directed by the engineer. The abandoned manholes shall have the walls removed at least 2 feet below subgrade within the roadbed and at least 2 feet below grade outside the roadbed. Fill remaining sections of manholes with acceptable fill material.

3.11 BACKFILLING

- A. Backfill around sides and to top of pipe with cover fill in maximum lifts of 6 inches, tamp in place and compact to 95 percent. Place and compact material immediately adjacent to pipes to avoid damage to pipe and prevent pipe misalignment.

3.12 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Pressure Test: Test in accordance with Section 33 01 32.
- C. Infiltration Test: Test in accordance with Section 33 01 32.
- D. Deflection Test: Test in accordance with Section 33 01 32.
- E. Compaction Testing: In accordance with ASTM D1557 AASHTO T180 ASTM D2922 ASTM D3017.
- F. When tests indicate Work does not meet specified requirements, remove work, replace and retest.
- G. Frequency of Compaction Tests: one test per 400 feet of trench per 2 foot lift.

3.13 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

3.14 SCHEDULE

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 40 23 25

POTABLE WATER WELL PUMP, PIPING & EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Potable Water Well Pump
 - 2. Potable Water Chemical Feed Equipment
 - 3. Potable Water Process Piping & Fittings
 - 4. Potable Water Process Valves
 - 5. Potable Water Flow Metering Equipment

1.2 RELATED SECTIONS

- A. Division 26 - Electrical

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Well No. 5 Well Pump, Chemical Feed Equipment, Process Piping, Valves & Flow Metering Equipment:
 - 1. Basis of Measurement: By lump sum.
 - 2. Basis of Payment: Payment for furnishing and installing the well pump, well pump motor, chemical feed equipment, process piping, valves & flow metering equipment shall be included in the bid item for the Pumphouse bid item. Payment includes full compensation for furnishing and installing all specified equipment, testing, start-up, owner training, operation and maintenance manuals, and furnishing all materials, equipment, labor and incidentals necessary to complete the work in accordance with the Contract Documents.
 - a. The **base bid item** includes payment for salvaging the pump base, column assembly (pipe, line shaft, bearings) and suction pipe from the Well No. 2 Pumphouse and installing those items along with a new motor, new bowl assembly, and new cone strainer to provide the specified flow rate at the specified total dynamic head (TDH).
 - b. The **alternate bid item** includes payment for salvaging and rebuilding the Well No. 2 pump bowl assembly with new bearings, wear rings, & shaft and adding one stage to the bowl assembly to provide the specified flow rate at the specified total dynamic head (TDH) instead of furnishing a new bowl assembly as specified in the base bid item.

1.4 REFERENCES

- A. American National Std. Institute (ANSI) / American Water Works Assoc. (AWWA)
 - 1. AWWA C104 - ANSI Standard for Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. AWWA C105 - ANSI Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 3. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm), for Water.
 4. AWWA C111 - ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 5. AWWA C115 - ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 6. AWWA C151 - ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
 7. AWWA C153 - ANSI Standard for Ductile-Iron Compact Fittings for Water Service.
 8. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
 9. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.
- B. American Society for Testing and Materials (ASTM):
1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 2. ASTM A48 - Gray Iron Castings
 3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 4. ASTM A126 - Valves, Flanges, and Pipe Fittings
 5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- C. National Sanitation Foundation:
1. NSF 61 - Drinking Water System Components - Health Effects
- D. Public Works Industry Improvement Program:
1. "Standard Specifications for Sewer and Water Construction in Wisconsin", most current edition, with all addendums.
- E. State of Wisconsin Administrative Code:
1. Chapter NR 811 - Requirements for the Operation and Design of Community Water Systems.
 2. Chapter SPS 332 - Public Employee Safety and Health

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. **All American Iron and Steel (AIS) materials need to be certified by the manufacturer.**
- C. **Contractor shall certify upon substantial completion of the project that all iron and steel and BABA products installed were produced in the United States of America.**
- D. Design Data: Submit manufacturer's latest published literature including illustrations, installation instructions, maintenance instructions and parts lists.

- E. Product Data: Submit data on pipe materials, pipe fittings, valves, equipment, paint, and accessories.
- F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- G. Certified Pump Tests and Curve: A certified factory hydrostatic and performance test shall be performed on each pump unit in accordance with Hydraulic Institute Standards, latest edition. Tests shall be sufficient to determine the curves of head, input horsepower, and efficiency relative to capacity from shutoff to 150% of design flow. A minimum of six points, including shutoff, shall be taken for each test. At least one point of the six shall be taken as near as possible to each specified condition. Results of the performance tests shall be certified by a Registered Professional Engineer and submitted for approval before shipment.

1.6 CLOSE OUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of valves, fittings and equipment.
- C. Provide Operation and Maintenance Data for valves, pumping equipment and chemical feed equipment.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction.
- B. Perform Work in accordance with Chapters NR 809, NR 811 & NR 812 of the State of Wisconsin Administrative Codes.
- C. **All iron and steel (AIS) and Build America, Buy America (BABA) products must be consumed in, incorporated into, or affixed to an infrastructure project produced in the United States and meet American Iron and Steel (AIS) and Build America, Buy America (BABA) requirements as described in the contract documents. The term "iron and steel products" means the following products are 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.**
- D. All pumping equipment furnished under this Section shall be of a design and manufacture that has been used in similar applications and it shall be demonstrated to the satisfaction of the Owner that the quality is equal to equipment made by that manufacturer specifically named herein.

- E. Unit responsibility: Pump, complete with motor, necessary guards and all other specified accessories and appurtenances shall be furnished by the pump manufacturer to insure compatibility and integrity of the individual components, and provide the specified warranty for all components.
- F. The pump specified in this section shall be furnished by and be the product of one manufacturer.
- G. Pumps are to be engineered and manufactured under a written Quality Assurance program. The Quality Assurance program is to be in effect for at least ten years, to include a written record of periodic internal and external audits to confirm compliance with such program.
- H. Pump is to be engineered and manufactured under the certification of ISO-9001:2000.

1.8 QUALIFICATIONS

- A. Manufacturer: company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years experience.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Protect piping from entry of foreign materials and water by temporary covers, completing sections of work, and isolating parts of completed system.
- C. Prepare valves and accessories for shipment according to AWWA Standards and seal valve and ends to prevent entry of foreign matter into product body.
- D. Accept system components on site in manufacturer's original containers or configuration. Inspect for damage.
- E. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

PART 2 PRODUCTS

2.1 WELL PUMP – VERTICAL TURBINE LINE SHAFT

- A. General

This specification covers a deep well lineshaft turbine pump with above ground discharge, arranged for water lubrication of the lineshaft bearings by the water being pumped and furnished with suitable driver and accessories as specified herein. The new pumping unit components and assemblies shall be designed and furnished in accordance with the latest Hydraulic Institute and AWWA specifications for lineshaft turbine pumps.

B. Operating Conditions

The deep well turbine pump shall be of the surface discharge type of standard manufacture and design to meet the following operating conditions:

Design pumping rate 1,200 Gallons per minute
Design Head..... 366 Feet total dynamic head (TDH)
Minimum pump efficiency of 84 Percent
Maximum allowable speed..... 1,800 RPM
Liquid to be pumped Water
Well Casing diameter O.D. 18 inches
Pump setting (Top of bowls) 60 feet
Non-Overloading Motor Horsepower 150

C. Service Conditions

The pump shall be designed and constructed to operate satisfactorily with a reasonable service life, when installed in a typical continuous turbine pump application.

D. Manufacture

1. The pump shall be the product of, and manufactured by, Gould's Pumps, Peerless Pumps, or American-Marsh Pumps, or approved substitution per Section 01 60 00 - Product Substitution Procedures.

E. Bowl Assembly

1. The base bid item includes furnishing a new bowl assembly. The alternate bid item includes salvaging the Well No. 2 bowl assembly, rebuilding it with new bearings, wear rings, & shaft, and adding one stage to obtain the required pumping rate at the required total dynamic head. The following specifications apply to components required for rebuilding the bowl assembly and/or furnishing a new bowl assembly.

2. The bowls shall be flanged and constructed from close grained cast iron, and shall conform to ASTM designation A48, class 30. They shall be free from sand holes, blow holes, or other faults and must be accurately machined and fitted to close tolerances. They shall be capable of withstanding a hydrostatic pressure equal to twice the pressure at rated flow or 1.5 times shut-off head, whichever is greater. The bowls shall have porcelain enamel/vitra glass lined waterways for maximum efficiency and wear protection. All intermediate bowls shall be of identical design for

interchangeability. A flanged by threaded discharge bowl shall be used to connect the intermediate bowls to the discharge column. To ensure quality and consistency of product, cast iron components must be produced in a foundry owned by the pump manufacturer. A non-witnessed factory performance test shall be performed on the bowl assembly using a lab calibrated motor. The results of the factory performance test shall be approved by the Engineer prior to shipment of the bowl assembly. When bolted bowl construction is used, 316 stainless steel fasteners shall be used. All the bowls (including the discharge bowl) shall be fitted with sleeve type bearings of bronze alloy C89835.

3. Impellers: the impellers shall be constructed from Silicon Bronze ASTM B584 Modified Alloy C876 and shall be the enclosed type. They shall be free from defects and must be accurately cast, machined, balanced, and filed for optimum performance and minimum vibration. Impellers shall be balanced to grade G6.3 of ISO 1940 as minimum. Impellers are to be standard product of the pump manufacturer and not contain special workmanship to temporarily increase efficiency. They shall be securely fastened to the bowl shaft with taper locks of 416 stainless steel. The impellers shall be adjustable by means of a top shaft adjusting nut.
4. The suction bowl shall be provided with a non-soluble grease packed bronze bearing, and a bronze sand collar shall be incorporated in the pump design to protect this bearing from abrasives. The bearing housing shall have sufficient opening at the bottom for easy removal of the bearing.
5. Wear rings: pumps 6" and larger shall be fitted with replaceable wear rings of bronze material in the suction bowl and intermediate bowls. Wear rings shall have the minimum practical clearance to the mating cylindrical surface of the impeller to provide adequate sealing independent of vertical positioning of the impellers. Wear rings to be ASTM B584 Alloy C903 bronze.
6. The bowl shaft shall be constructed from ASTM 582 type 416 stainless steel. It shall be precision turned, ground and polished and shall be supported by water lubricated bronze bearings.
7. The Engineer will ask for the discharge and suction nozzles to be removed in the field prior to installation to verify the manufacturing characteristics as specified.

F. Column Assembly – Water Lubricated

1. The column assembly from the Well No. 2 well pump shall be salvaged and reused. If any components of the salvaged column assembly are found to require replacement, they shall meet the following specifications.
2. Pump speeds up to 2200 RPM shall have intermediate column lengths and lineshaft bearing spacing not to exceed 10 feet.
3. Column pipe: The column pipe shall be furnished in sections not exceeding nominal length of 10 feet. The length of the top and bottom sections shall not be more than 5 feet. The column pipe shall be 8" diameter ASTM A53 Grade A steel pipe with the ends machined with 8 threads per inch with 3/16" taper and faced parallel to butt against the centering spiders. Inside diameter of the pipe shall be such that the head losses shall not be over 5 feet per 100

feet of pipe, and shall weigh not less than 28.55 lbs./ft. (Sch. 40.) Pipe shall be connected with threaded sleeve type steel couplings.

4. Lineshaft shall be of ample size to operate the pump without distortion or vibration. Diameter of the shaft shall be such that it does not exceed the horsepower limitation indicated in the engineering section of the pump catalog. Shaft shall be furnished in interchangeable section not over ten feet in length, and shall be coupled with extra-strong threaded steel couplings machined from solid bar steel. Lineshaft and couplings shall be 416 stainless steel and shall have left-hand thread to tighten during pump operation. The diameter of the shaft and coupling shall be designed in accordance with AWWA E101 Standard. The shaft shall be provided with stainless steel sleeve to act as a journal at each bearing location. The sleeve shall be placed on a full size shaft without undercutting and secured in position by a suitable adhesive.
5. Silicon bronze ASTM B584 centering spiders of the drop-in type shall be furnished for shaft stabilization at each column pipe coupling. Bearings shall be fluted rubber retained in the spider by a shoulder on each end of the bearing.

G. Suction Pipe and Strainer

1. The suction pipe from the Well No. 2 well pump shall be salvaged and reused. If it is found to require replacement, a new suction pipe shall meet the following specifications.
2. The suction pipe shall be 10 feet in length and shall have a minimum inside diameter and weight equal to that of the discharge column pipe.
3. A suitable cone strainer of 304 stainless steel shall be provided having a free area of at least four times the flow area of the suction pipe. The strainer shall have female threads for connection to the suction pipe.

H. Discharge Head Assembly – Water Lubricated

1. The discharge head assembly from Well No. 2 shall be salvaged and reused. If any of its components are found to require replacement, they shall meet the following specifications.
2. Discharge head shall be of the high profile type and be suitable base of high grade cast iron, ASTM A48-30, or fabricated steel. It shall be provided for mounting the motor with a discharge elbow having an above ground flanged discharge outlet for 8-inch standard pipe. The design shall have sufficient capacity to carry the combined weight of the column assembly. The design shall allow the top shaft to couple above the stuffing box. The head shall have a 1/4" NPT connection for a pressure gauge. One 2" tapped hole for the vent, one 1" tapped hole for the airlines and one 1 1/2" tapped hole shall allow access for the transducer. Provide a sanitary seal around the airline and transducer cable.
3. The stuffing box shall be cast iron and shall contain a minimum of five rings of packing. It shall have grease inlet and pressure relief connections. The packing gland shall be a 316 stainless steel split type secured in place with noncorrosive studs and nuts. The bearing shall be C89835 bronze. A rubber slinger shall be secured to the shaft above the packing gland.

4. The head shaft going through the stuffing box shall be of ASTM 582 type 416 stainless steel. It shall be precision ground and polished with surface finish better than 40 RMS.
 5. The Contractor shall furnish, install and permanently grout the base plate onto the pump foundation. The Contractor shall provide stainless steel anchoring bolts and nuts to anchor the base plate to the concrete pump base.
- I. Airline Assembly
1. Dual airlines of 1/4" ID neoprene and polyethylene shall extend in continuous lengths from the tip of the bowl assembly through the head, one connected to a direct read drawdown gauge and the other sealed.

2.2 WELL PUMP MOTOR FOR VERTICAL TURBINE LINE SHAFT PUMP

- A. Codes & Standards
1. The motors shall be fabricated, assembled and tested in accordance with the most current applicable standards as defined by the following institutions:
 - a. American National Standards Institute (ANSI).
 - b. Institute of Electrical and Electronic Engineers (IEEE).
 - c. National Electrical Manufacturers' Association (NEMA).
 - d. Anti-Friction Bearing Manufacturers' Association (AFBMA).
 - e. American Society of Testing Materials (ASTM)
 - f. Hydraulic Institute (HI)
 - g. American Water Works Association (AWWA)
 2. All materials and equipment shall be labeled or listed as being approved by the Underwriters Laboratories (U.L.) whenever applicable. Equipment offered as meeting the intent of the U.L. requirements may be acceptable subject to the approval of the Purchaser.
 3. Motor manufacturer shall have experience in the design and manufacture of similar products for a minimum of 10 years. Buy-out or private labeled motors are not acceptable.
- B. Submittal Data
1. Dimension Print and Frame Size
 2. Approximate Motor Weight
 3. Complete Motor Nameplate Information
 4. Motor Performance Data, including the following:
 - a. Guaranteed minimum efficiencies at 100%, 75% and 50% of full load.
 - b. Guaranteed minimum power factor at 100%, 75% and 50% of full load.
 - c. Locked Rotor Current
 - d. Full Load Current
 - e. Starting Torque
 - f. 1 Full Load Torque

- g. Breakdown Torque
- 5. Job site Storage Requirements.
- 6. Recommended Spare Parts List
- 7. Required with motor upon shipment:
 - a. Operation and Maintenance Manuals
 - b. Connection Diagrams
 - c. Test Reports
- C. Acceptable Manufacturers:
Motors shall be U.S. Electrical Motors' "TITAN Line" , or approved substitution per Section 01 60 00 - Product Substitution Procedures.
- D. Service Conditions
 - 1. Motor shall be suitable for continuous operation on a 3-phase, 60 hertz system rated 480 volts.
 - 2. Motor shall be designed to operate at rated load in a maximum ambient temperature of 40°C.
 - 3. Indoor service.
- E. Design Requirements
 - 1. The motor shall be a vertical, heavy duty, squirrel cage induction type, 1.15 service factor, 1760 RPM, hollow shaft, NEMA P base, minimum 150 hp.
 - 2. The horsepower rating of the motor shall be sufficient to satisfactorily operate the pump under the conditions and head specified without being overloaded.
 - 3. The speed/torque and speed/current characteristics shall comply with NEMA Design B.
 - 4. Motor shall be premium efficiency in accordance with NEMA PREMIUM values for enclosure, horsepower and poles.
 - 5. Motor shall be capable of withstanding all normal forces which may be imposed upon it during the course of normal operation, including starting and normal stops.
 - 6. Motor shall be suitable for across-the-line starting and shall be able to start and accelerate the connected load to full load speed with 90% of rated voltage at the motor terminals.
 - 7. Motor shall be capable of continuous operation at full load and rated frequency with a voltage variation of +10%.
 - 8. Motor shall be capable of continuous operation at full load and rated voltage with a frequency variation of +5%.
 - 9. Combination of # 7 & # 8 above not to exceed 10%.
 - 10. Motor starting current shall not exceed a value equal to 650% of the motor full load current.
 - 11. Motor will be applied to variable frequency drive and shall adhere to NEMA MG-1, Part 31, and shall be name-plated accordingly.

- F. Enclosure
1. NEMA Weather Protected, Type I (WP-I)
 2. Openings on all Weather Protected designs shall be covered with zinc-galvanized or stainless steel guard screens having a mesh openings size no larger than 1/4 inch.
 3. Enclosures shall be of fabricated steel or cast iron construction in accordance with the manufacturer's standard design. Canopy caps shall be of aluminum, cast iron or sheet metal and shall be easily removable for maintenance purposes.
- G. Stator Construction
- Stator laminations shall be of fully processed steel. Each lamination surface shall be given the necessary treatment so as to have core plate type C-5 insulation.
- H. Insulation
1. Insulation shall be rated minimum Class F (155°C)
 2. Maximum temperature rise by resistance at rated HP shall not exceed Class B limits (130°C).
 3. Maximum temperature rise at 1.15 Service Factor shall not exceed Class F limits (155 ° C).
 4. Magnet wire shall be copper and rated Class H (180 degrees C.) or better.
 5. Magnet wire shall be classified Pulse Endurance, suitable for variable frequency applications.
 6. Insulation systems shall receive a minimum of two vacuum pressure impregnation treatments using a 100% solids epoxy resin.
- I. Rotor Construction
- Rotors shall be of cast or fabricated aluminum in accordance with manufacturer's standard design.
- J. Bearings
1. Bearings supplied shall be of type and size sufficient to satisfy thrust loading requirements for each motor in accordance with manufacturer's standard design. Bearings shall be rated for an in-service B-10 life of 8,800 hours.
 2. For this vertical motor application, bearings shall be capable of withstanding a momentary up-thrust of at least 30% of the normal down-thrust.
 3. The motor bearings shall be adequate to receive the entire hydraulic thrust load of the pump and weight of all of the rotating parts under all conditions of operation.
 4. Thrust Bearings
 - a. Motor shall be designed and constructed with thrust bearings on top to allow inspection and/or replacement without requiring complete disassembly of motor.
 - b. Thrust bearings shall be deep-groove ball, angular contact ball or spherical roller type. Bearings mounted back-to-back or in tandem

are acceptable and may be furnished when required according to manufacturer's standard design.

- c. Deep-groove ball bearings shall be used only on normal thrust design motors and shall be capable of handling thrust loads in either direction.
 - d. High thrust design motors shall be supplied with angular contact ball bearings whenever possible and in accordance with manufacturer's standard design.
 - e. Where thrust requirements restrict the use of angular contact bearings, spherical roller bearings shall be furnished.
 - 1) Spherical roller bearings shall be oil lubricated and shall not require water cooling.
 - 2) Spherical roller bearings shall be spring loaded to keep the lower bearing race in contact and prevent bearing damage during starting and momentary upthrust conditions.
5. Guide Bearings
- a. Guide bearings shall be deep-groove ball type and shall be located at the bottom of the motor.
 - b. Guide bearings may be stacked when necessary according to manufacturer's standard design to accommodate specified upthrust conditions.
 - c. Guide bearings or bearing assemblies shall be provided with sufficient means for preventing the leakage of lubricant or entrance of foreign matter along the shaft.

K. Lubrication

- 1. Thrust bearings shall be oil lubricated and contained in an oil reservoir with oil sight level gauge and oil fill and drain openings with plugs.
- 2. Deep-groove ball bearings furnished as thrust bearings for normal thrust motors shall be grease lubricated. When furnished as guide bearings for high thrust units, they shall be oil lubricated.
- 3. Grease lubricated bearings shall be furnished with provisions for in-service positive lubrication. A drain shall be provided to guard against over lubrication.

L. Noise Level

Sound pressure levels shall be measured according to IEEE 85 and shall not exceed 90 decibels as measured on the A-Weighted Scale at a distance of five (5) feet from any motor surface under free field conditions.

M. Nameplates

Motor nameplate shall be of stainless steel and shall be securely fastened to the motor frame with pins of a like material.

N. Terminal Box

1. Terminal box shall be of fabricated steel or cast iron construction to be compatible with the motor enclosure specified and when possible, shall be diagonally split and capable of rotation in 90° increments. Boxes not suitable for rotation must be capable of top entry.
 2. The area in which the main terminal box is connected with the motor frame shall be fully gasketed in order to prevent entrance of foreign matter into the motor and to provide support for the stator leads where they pass through the motor frame.
 3. A properly sized grounding terminal shall be mounted in the main terminal box when specified.
 4. The main terminal box shall be sufficiently oversized to allow stress cone terminations of shielded power cables and to allow mounting of any surge capacitors, lightning arrestors or current transformers as may be specified.
- O. Leads
1. Main motor leads shall have EPDM or equal type jackets and shall be permanently tagged for identification.
 2. The relationship between lead markings and the direction of rotation shall be indicated on a separate motor nameplate.
- P. Lifting Lugs & External Fasteners
1. Motor shall have permanent lifting eyes or lugs capable of a safety factor of 10.
 2. All external fasteners shall be hexagon-head, cadmium or zinc plated rated class 5 or better. Slotted head, Phillips head and socket head fasteners are acceptable only for use internally and not exposed to the external environment. Metric fasteners are not acceptable.
- Q. Vibration
- Vibration shall not exceed 0.08 inches per second, peak to peak.
- R. Non-Reverse Ratchet
- A ball-type non-reverse ratchet shall be provided to prevent backspin of the pump and motor. Maximum reverse rotation shall be limited to 5 degrees of arc.
- S. Warranty
1. The motor shall be warranted to be free from defects in material or workmanship for a period of 24 months from start-up, not to exceed 30 months from shipment by the manufacturer.
 2. Contractor shall be responsible for proper storage of equipment prior to placing in service in accordance with the manufacturers' recommendations and instructions.

2.3 TRANSDUCER & CARRIER PIPE

- A. The Contractor shall furnish and install 1" diameter flush joint PVC piping or polyethylene piping in well casing for access to the level transducer. Furnish and

install a model PTX 1830 transducer as manufactured by GE/Druck or approved equal substitution per Section 01 60 00 - Product Substitution Procedures.

- B. Provide adequate length of submersible cable to wire transducer to a model STE 110 Sensor Termination Enclosure (NEMA 4X with lightning arrestor and pipe mounting kit) as manufactured by GE/Druck or approved equal substitution per Section 01 60 00 - Product Substitution Procedures, furnished and installed by the Contractor. Sensor Termination Enclosure shall be mounted on carrier pipe.
- C. Wire the well level transducer to be powered from the SCADA RTU panel such that the well levels will be displayed on the touch screen operator interface of the SCADA.

2.4 PROCESS PIPING

- A. **All iron and steel products must be produced in the United States and meet American Iron and Steel requirements as described in the contract documents. 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. Ductile Iron Pipe & Fittings:
 - 1. Pipe Class:
 - a. Exposed Piping: AWWA C115, Class 53
 - b. Buried Piping: AWWA C151, Class 52
 - 2. Coating and Lining:
 - a. Exterior Coating:
 - 1) Exposed Piping: Shop prime coating & field applied intermediate & finish coatings.
 - 2) Buried Piping: Bituminous.
 - b. Interior Lining: Cement Mortar, AWWA C104, double thickness, seal coated.
 - 3. Pipe Marking: Weight, class or nominal thickness, and casting period shall be shown on each pipe. Manufacturer's mark, the year in which the pipe was produced, and the letters "DI" or the word "Ductile" shall be cast or stamped on the pipe.
 - 4. Joints:
 - a. Exposed Piping:
 - 1) Flanges: ANSI B16.1-Class 125 rated at 250 psi maximum pressure, minimum 1/8" thick full face rubber, or Flange-Tyte gaskets as manufactured by U.S. Pipe, conforming to the latest revision of AWWA Standard C111 (ANSI A21.11).
 - 2) Flange Bolts: Carbon steel (ASTM A307), cadmium-plated (ASTM B766), or zinc-coated (ASTM A153 or B633), bolts (ANSI B18.2.1) and nuts (ANSI B18.2.2) with hex heads and rated working pressures of the pipes and fittings.
 - b. Buried Piping:

- 1) Push-on Joints: Rubber gaskets per AWWA C111
 5. Fittings: Ductile iron, AWWA C110. Compact fittings AWWA C153.
 - a. Coating and Lining: As specified for piping.
 - b. Joints:
 - 1) Buried: Conductive Class 250 mechanical joints with rubber gaskets per AWWA C111
 - 2) Exposed: Flanges & Flange Bolts as specified for exposed piping.
 6. Electrical Conductivity: All mechanical and push-on joints shall be furnished with bonding straps capable of carrying 500-600 amps for an extended period of time to provide electrical conductivity without field welding. Copper inserts in gaskets will be permitted in lieu of bonding straps.
 7. Polyethylene Encasement: 8 mil. Thick. AWWA C105 (ASA A215). Encasement shall be placed around all buried ductile iron pipe and fittings where indicated on the plans or ordered by the Engineer in the field.
 8. Buried Pipe Bedding & Cover Materials:
 - a. Bedding: Type 3 Embedment as specified in Section 31 23 17.
 - b. Cover: Type 3 Embedment as specified in Section 31 23 17.
 - c. Soil Backfill from Above Pipe Cover to Finish Grade: Suitable Native Backfill or Select Granular Backfill as specified in Section 31 05 13 with no rocks over 3 inches in diameter, frozen earth or foreign matter.
- C. Galvanized Iron Piping:
1. Pipe Class: Schedule 40, Specifications for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses, ASTM A-53.
 2. Fittings: galvanized malleable iron.
 3. Unions: An ample number of unions shall be provided for disassembling pipe.
- D. Copper Tube:
1. Pipe Class:
 - a. Exposed: ASTM B 88, Type L, hard temper.
 - b. Buried: ASTM B88, Type K, seamless copper tubing, annealed.
 2. Fittings:
 - a. ASME B16.18, cast copper, or ASME B16.22, wrought copper.
 - b. Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer.
 - c. Unions: Extra heavy 3- part.
 - d. Joints:
 - 1) Exposed: Join with lead free flux, ASTM B813, and solder, ASTM B32.
 - 2) Buried: Compression – type.

- E. Pipe Supports:
1. Piping shall be supported, even though not shown on the drawings, with base fittings and concrete pads when bottom of pipe is less than 6 inches above the floor
 2. Adjustable pipe saddle with floor flange to 6 feet above the floor: Galvanized cast iron pipe support with galvanized steel stanchion, Anvil #264 pipe support with #63T stanchion, or equal.
 3. Adjustable iron or heavy steel pipe hangers with supporting clamps or inserts for pipe more than 6 feet above the floor: Anvil, Grinnell or equal.
 4. Exposed piping in chemical feed rooms shall be supported with a plastic support system, Aikinstrut Series K, or equal.
- F. Pipe Flange Adaptors:
1. Flange: Ductile iron ASTM A536 flange with ANSI/AWWA C110/A21.10 or ANSI B16.1, class 125 flange bolt circle.
 2. Gasket: Buna-N.
 3. Bolts & Nuts: Carbon steel (ASTM A307), cadmium-plated (ASTM B766), or zinc-coated (ASTM A153 or B633), bolts (ANSI B18.2.1) and nuts (ANSI B18.2.2) with hex heads and rated working pressures of the pipes and fittings.
 4. Anchor Studs: Carbon steel ASTM 193 Grade B7 electro-galvanized with di-chromate seal anchor studs.
 5. Pipe flange adaptors shall be E-Z Flange Series 1000 by EBAA Iron, Uni-flange Series 400-C by The Ford Meter Box Company, or approved substitution.
- G. Buried Pipe Insulation: Two (2) inch thick, 4 foot wide sheets, minimum 25 psi, high density, polystyrene board, as manufactured by Dow Chemical Company, or equal.
- H. Paint System:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.
 2. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 3. The following manufacturers are referred to in the paint schedule found in Part 3: Tnemec Co., Inc.

2.5 PROCESS VALVES

- A. Gate Valves
1. Gate valves shall conform to the latest revision of AWWA Standard C509 (cast iron) or C515 (ductile iron). All valve components shall conform to ANSI/NSF Standard 61.
 2. Working Pressure: 200 psig.
 3. Body & Bonnet: Class 150 iron per ASTM A126, Class B for Gray Cast Iron valves, or ASTM A395 or ASTM A536 for Ductile Iron valves.

4. Gate: Gray Cast Iron (ASTM A126, Class B) or Ductile Iron (ASTM A395 or ASTM A536).
5. Seat: Resilient wedge. Bonded or mechanically attached to gate.
6. Stem: Non-rising forged bronze.
7. Stem Seal: Two O-rings Buna-N or NBR rubber meeting ASTM D2240.
8. Connections: Flanged and bolted joint per ANSI/AWWA C111/A21.11, or ANSI B16.1, class 125. Carbon steel (ASTM A307), cadmium-plated (ASTM B766), or zinc-coated (ASTM A153 or B633), bolts (ANSI B18.2.1) and nuts (ANSI B18.2.2) with hex heads and rated working pressures of the valve.
9. Coatings: Interior and exterior coated with fusion bonded epoxy ANSI/NSF 61 certified for use with potable water
10. Handwheels: All interior valves shall be flanged and have high strength cast iron handwheels. Right angle actuators shall be provided if required because of valve location.
11. Manufacture & Model: Series 2500 as manufactured by American Flow Control, or approved equal substitution per Section 01 60 00 - Product Substitution Procedures.

B. Butterfly Valves

1. Butterfly valves shall meet all requirements of the latest revision of AWWA C504. All valve components shall conform to ANSI/NSF Standard 61.
2. Working Pressure: 200 psig.
3. Body Type & Class: Wafer, Class 150B.
4. Body: Valve bodies shall be epoxy coated gray cast iron (ASTM A126, Class B) or ductile iron ASTM A536. Valves shall be capable of withstanding bi-directional line hydrostatic test pressures up to 225 psi without leaking.
5. Shafts: 304 stainless steel with diameter meeting the 150B standard per AWWA C504 for butterfly valves.
6. Disk: ASTM A536 Grade 65-45-12 ductile iron with solid 316 stainless steel sealing edge.
7. Seats: Buna-N and shall be molded in and vulcanized to valve body. Seats shall also contain an integral shaft seal protecting the valve bearings and packing from line debris.
8. Bearings: Permanently lubricated, non-metallic bearings for smooth, low torque operation.
9. Shaft Seals: Self-compensating split-V-type of standard O-ring seal.
10. Interior: The interior of the valve body shall have a full rubber lining vulcanized to the valve body, and ANSI/NSF 61 certified for use with potable water
11. Connections: Wafer end connections shall be designed for installation between ANSI B16.1 Class 125 iron flanges. Carbon steel (ASTM A307), cadmium-plated (ASTM B766), or zinc-coated (ASTM A153 or B633) bolts (ANSI B18.2.1) and nuts (ANSI B18.2.2) with hex heads and rated working pressures of the valve.
12. Exterior Coating: Fusion bonded epoxy

13. Latch Lock Levers: Latch lock levers shall provide automatic, positive latching in the open, closed or eight intermediate positions on all manually activated butterfly valves less than 8-inches in diameter.
14. Manual Actuators: Valves with 8 inch diameters or greater shall be furnished with a totally enclosed, water-tight sealed and lubricated gear box actuator with handwheels and valve disc position indicators.
 - a. Handwheels: High-strength cast iron rotary manual hand wheels positively secured to the operator input shaft (in conformance with AWWA C500).
 - b. Stop-Limiting Devices: Self-locking with a permanent factory set stop at each end of its travel. The disc shall not creep or flutter under service conditions. The valve shall seat close at an angle of 90o from full open.
 - c. Torque Requirements: The actuator shall be designed for the output torque according to AWWA C504. Maximum input torque required to develop the rated output shall not exceed 150-foot pounds for any size valve.
 - d. Seal: The actuator case shall be completely watertight, sealed by means of approved gaskets, gasket compounds, O-rings or threaded plugs.
 - e. Lubricants: Actuators shall be filled with a suitable oil lubricant or thoroughly coated with an approved grease at the factory. If the operator lubricant is oil, provide suitable fill and drain plugs.
15. Electric Motor Actuators: Provide electric motor actuators where indicated on the plans. Electric motor actuators shall have totally enclosed oil-lubricated drive gearing, and shall comply with the requirements of the latest revision of AWWA Standard C540.
 - a. Enclosure: NEMA 4 rated with an integral heater.
 - b. Handwheel: Provide an auxiliary handwheel for each electrically operated actuator for manual override operation.
 - c. Valve Disc Position Indicator: A valve disc position indicator shall be provided for each electrically actuated butterfly valve.
 - d. Sizing: Properly sized for the required operating torque of each valve.
 - e. Limit and Torque Switches: Provided in both the "open" and "closed" direction of travel.
 - f. Stops: Provide "open" and "closed" mechanical end stops.
 - g. Manufacture & Model: Model SG 10.1 as manufactured by AUMA, Series 2000 as manufactured by EIM, or approved equal.
16. Butterfly Valve Manufacture & Model: Model BAW as manufactured by DeZurick, Series 2000 as manufactured by Val-matic Valve and Manufacturing Corporation, approved equal substitution per Section 01 60 00 - Product Substitution Procedures. Valves larger than 12 inches in diameter shall be Mueller Linesal III or approved equal substitution per Section 01 60 00 - Product Substitution Procedures equal.

C. Check Valves

1. Check valves shall conform to latest revision of AWWA Standard C508. All valve components shall conform to ANSI/NSF Standard 61.
2. Working Pressure: 200 psig.
3. Body & Cover: Ductile iron ASTM A536 Grade 65-45-12
4. Disc: molded Buna-N (NBR) ASTM D2000-BG
5. Valve Position Indicator: Mechanical rod in contact with disc at all times providing disc position indication
6. Connections: Flanged and bolted joint per ANSI/AWWA C111/A21.11, or ANSI B16.1, class 125. Carbon steel (ASTM A307), cadmium-plated (ASTM B766), or zinc-coated (ASTM A153 or B633), bolts (ANSI B18.2.1) and nuts (ANSI B18.2.2) with hex heads and rated working pressures of the valve.
7. Coatings: Interior and exterior coated with fusion bonded epoxy ANSI/NSF 61 certified for use with potable water
8. Model & Manufacture: Swing-Flex 500AMI series as manufactured by Val-Matic Valve and Manufacturing Corp. or approved equal substitution per Section 01 60 00 - Product Substitution Procedures equal.

D. Well Pump Air Release/Vacuum Valve

1. Air/Vacuum valve shall conform to latest revision of AWWA Standard C512. All valve components shall conform to ANSI/NSF Standard 61.
2. Working Pressure: 150 psig.
3. Body & Cover: Gray cast iron ASTM A126 Class B.
4. Float: Stainless steel.
5. Internal Parts: 316 stainless steel.
6. Seat: Resilient Buna-N
7. Accessories: The discharge orifice shall be fitted with an adjustable dual port or dual acting throttling device to regulate the flow of escaping air.
8. Inlet Connection: The air/vacuum valve shall have a 2-inch threaded inlet. Connect a ball valve to the inlet by threaded galvanized steel piping. Connect air valve inlet pipe to ductile iron process piping with threaded saddle as specified in the water main specification section.
9. Outlet Connection: The air/vacuum valve shall have a 2-inch outlet. Connect discharge piping to valve outlet. Screen end of discharge pipe with stainless steel or brass 24 mesh as shown on the Plans.
10. Coatings: Interior and exterior coated with fusion bonded epoxy ANSI/NSF 61 certified for use with potable water
11. Model & Manufacture: Model 102ST valve with dual port throttling device as manufactured by Val-Matic or approved equal substitution per Section 01 60 00 - Product Substitution Procedures equal.

E. Ball Valves:

1. Body: Bronze, two piece, full port.
2. Ball: 316 stainless steel.
3. Seat and Seal: Reinforced Teflon.

4. Stem: blow-out proof rated at 600 psi nonshock WOG.
5. Valve shall be capable of disassembly without removing valve from piping.
6. Model T/S-585-70-66 as manufactured by Nibco or equal.
7. Motor Actuator:
 - a. Furnish motor actuators for ball valves where indicated on the Plans.
 - b. Construction: Capacitor type reversible electric motor, gear train, limit switches and terminal block all within a NEMA 4 die cast aluminum enclosure.
 - c. Heater: integral heater.
 - d. Actuator shall be properly sized for the required operating torque of each valve.
 - e. Limit and Torque Switches: Provide in both "open" and "closed" directions of travel.
 - f. Speed of Rotation: 10 seconds per 90°.
 - g. Operational Power: 120 VAC/1-phase/60HZ power supply.
 - h. Override: Manual handwheel.
 - i. Status Indicator: Valve position indicator.
 - j. Model MAR-10-10-4 as manufactured by Raymond Control Systems (RCS) or approved equal substitution per Section 01 60 00 - Product Substitution Procedures.

F. Prelube Solenoid Valve

1. Furnish and install a solenoid valve for the prelube line as shown on the Plans. Valve shall be rated for use with water, have a working pressure rating of at least 250 psi.
2. Valve shall have a cast bronze body, packless internal piston, pilot operated, class N coils rated NEMA 4X, stainless steel plunger tubes, brass piston assembly filled with Teflon piston rings and stainless steel expanders, stainless steel pilot valves and springs. Valve shall be Type M-3V as manufactured by J.D. Gould Company, Inc. or approved equal substitution per Section 01 60 00 - Product Substitution Procedures equal.
3. The valve shall be normally closed when de-energized (energized to open) and shall operate with a 120 VAC electrical power supply.

2.6 WATER FLOW METERING EQUIPMENT

A. Magnetic Flow Meter

1. Meters shall conform to latest revision of AWWA Standard C701 class II. All components shall conform to ANSI/NSF Standard 61.
2. Accuracy: +/- 0.25% of rate.
3. Repeatability: +/- 0.1%.
4. Power Supply: AC.
5. Output: 4-20mA signal output to RTU of SCADA system located in the pumphouse.

6. Measuring Tube: 316 Stainless steel.
 7. Measuring Tube Size: As indicated on the Plans.
 8. Flanges: ANSI B16.5/AWWA Class 150 steel.
 9. Maximum Operation Pressure: 155 psi.
 10. Liner: Hard rubber ANSI/NSF Standard 61 certified for use with potable water.
 11. Electrodes: 316 stainless steel.
 12. Grounding Rings: stainless steel.
 13. Meter Enclosure Classification: NEMA 4.
 14. Amplifier/Resister: microprocessor, programmable, noise dampening, empty pipe detection, unidirectional flow, cast aluminum powder coated housing mounted to meter flow tube.
 15. Display/Measurement Units: 4 line x 20 character back-lit LCD display, six digit programmable/resettable totalizer in gallons, instantaneous flow rate indication in gallons per minute.
 16. Manufacture & Model: ModMAG M-Series M2000 with M2000 Amplifier as manufactured by Badger Meter, Inc. or approved equal substitution per Section 01 60 00 - Product Substitution Procedures.
 17. Locate flow meter required number of pipe diameters downstream and upstream of any valves, bends, obstructions, or fittings per manufacturer's direction.
- B. Ductile Iron Spool Piece: Contractor shall also furnish a ductile iron pipe spool piece that can be interchanged with the flow meter at Owner's discretion.
- C. Conduit & Wiring:
1. Furnish and install conduit(s) required for power supply and signal wire for the meter. Conduits shall be installed under the floor slab.
 2. Furnish and install signal wiring in conduits from meter converter to RTU of SCADA system. Flow rate indicated by meter shall be transmitted to main SCADA panel.
 3. Provide control components in MCC and wiring such that chlorine booster pump will not be energized unless flow meter detects flow and well pump controller indicates that the motor is energized.

2.7 PIPE COUPLINGS AND RESTRAINTS

- A. Pipe Coupling: Pipe couplings identified on the drawings shall be equal to Smith-Blair 912 Flanged Coupling Adapter or equal. Contractor shall provide tension ties and tie ears as shown on the drawings and specified herein.
- B. Tension Ties
1. All tension ties, rod ties, and control rods shall be provided to resist a minimum 150 psi (250 psi surge allowance) pressure in the pipe line.
 2. Contractor shall provide tie ears to secure tension rods to flanges.
 3. Rods shall be provided with nuts and washers on both sides of tie ears.

4. All nuts shall be carbon alloy steel conforming to A563 and washers shall be hardened steel conforming to ASTM F436.
5. Rods shall be ASTM A36 steel at a minimum.
6. Tie rods shall be equally spaced around pipe.

The following table lists the minimum number and diameter in inches for the tie rods for various sizes of pipe:

Pipe Size (inches)	150 psi Pressure		250 psi Pressure	
	Minimum Number	Minimum Size (inches)	Minimum Number	Minimum Size (inches)
4-10	4	5/8	4	5/8
12	4	5/8	4	3/4
14	4	3/4	4	7/8
16	4	3/4	4	1
18	4	7/8	4	1-1/8
20	4	1	4	1-1/4
24	4	1-1/8	4	1-1/2

2.8 SAMPLE TAPS/FAUCETS

- A. Provide lead-free cast brass sampling faucet with 1/2 inch male NPT threaded (MIP) inlet, plain/smooth outlet, and tee handle. Pressure rating: 80 to 125 psi. Model No. FY-692LF as manufactured by Matco-Norca, or approved substitution.

2.9 PRESSURE GAUGES

- A. Furnish and install 3-1/2 inch dial, 0-300 psi pressure gauges, as shown on the plans. The gauges shall have a steel lower mount case, acrylic window with steel friction ring, brass movement, copper alloy tube and socket, 1/4" NPT connection and aluminum black pointer. Gauges shall have an ASME Grade A accuracy of 2-1/2% ($\pm 1\%$ of range across middle of half scale). Pressure gauges shall be model J8058B as manufactured by Marsh Instruments, or approved equal. Gauges shall be installed where indicated on the plans and as follows:
 1. Discharge head gauge
 2. System head gauge
 3. Drawdown gauge
 4. Chlorine Booster pump – upstream
 5. Chlorine booster pump - downstream
- B. Provide brass shut-off ball valve for each gauge.

2.10 NON-SHRINK MORTAR

- A. Non-shrink mortar shall be All-Crete, as manufactured by Concrete Products, Inc., Woodland, California; Speed Crete, as manufactured by Tamms Industries, Inc., Itasca, Illinois; or approved equal substitution per Section 01 60 00 - Product Substitution Procedures. Non-shrink mortar shall be placed in accordance with manufacturer's recommendations.

2.11 CHEMICAL FEED EQUIPMENT

A. Chlorine Feed Equipment

1. Chlorinator System

- a. The chlorinator system shall be a vacuum operated, solution-feed, type and shall automatically switch the chlorine supply from an empty cylinder to a full cylinder.
- b. The Vacuum-Operated Automatic Switchover Chlorinator shall consist of the following components:
 - i. Two (2) automatic switchover vacuum regulators for mounting directly on chlorine gas cylinder valves
 - ii. One (1) pressure-relief (vent) valve
 - iii. One (1) chlorine gas flow meter panel with rate valve
 - iv. One (1) ejector/check valve assembly
 - v. Two (2) automatic emergency chlorine gas cylinder shutoff valves
- c. The vacuum regulators shall mount directly onto the cylinder valve by means of a positive yoke type clamp having an integral tightening screw with slide bar handle. The main vacuum regulating diaphragm of each chlorinator shall have a minimum operating area of 13 sq. inches in order to achieve required accuracy and repeatability of the set chlorine flow rate. All metallic bolts shall mate with metallic threaded nuts or inserts. Plastic mating threads for metallic bolts shall not be acceptable. Each chlorinator vacuum regulator shall have its own diaphragm, safety-shutoff/inlet valve and switchover detent mechanism, thereby, allowing chlorination to continue should it become necessary to remove either vacuum regulator from service for leaning or servicing. Switchover detent mechanism shall be made of corrosion-resistant materials and shall not require any field adjustment.
- d. The Emergency Shutoff Valve Actuator shall quickly close a gas cylinder valve when a leak is detected. The actuator must fit a 150 lb. gas cylinder, and the actuator system shall consist of a valve stem mounting adaptor, touch screen control panel, and valve actuator. The adaptor shall mount on the stem in seconds providing a tight fit onto the stem. The placement of the actuator on top of the adaptor shall not require tools.
- e. The actuator shall be part of an emergency gas shutoff system. The actuator shall be connected to a gas detector and to a local control system that provides an input signal to close based on a detected condition. The time from detection to valve closure shall be no longer than five seconds.

- f. The control panel and each actuator shall have battery backups to ensure valve closure even with lost signal or power failure. The touch screen control panel shall show the status of each cylinder, gas detection level, and have an emergency shutoff button on the main screen. Additionally, it shall have a twenty-four hour historian that shows times and detected gas levels at individual time intervals.
- g. The automatic emergency shutoff valve actuators shall be controlled by the Chlorine Gas Leak Monitoring System specified below.
- h. The system shall have a maximum capacity of 50 lbs./24 hrs (2000 gms/hr) and shall be REGAL Model 216 Vacuum-Operated Automatic Switchover Chlorinator with Regal Series 9000 Emergency Shutoff Valve Actuators as manufactured by Chlorinators Incorporated, Stuart, Florida.

2. Scale

- a. Provide an electronic operated dual cylinder scale system with electronic display/control module and a platform for each of the two cylinders with cylinder bar with restraining chains. The system shall have a 150% overload capacity, 32oF to 120oF operating temperature range, and +/- 1% accuracy.
- b. The scale display/control module shall be electronic based, fuse protected and operate on 120 VAC, 1-phase electrical power. It shall have a bright, easy to read 4-digit LCD display, 0.5 inch annunciator LEDs indicating programming and alarm event conditions, front panel keypad with four tactile doom push buttons for operator interface and auto-zero feature (+/- 4 graduations) with back-up pushbutton. The unit shall display gross and net cylinder weight, be capable of 4-20mA (500ohms) output and include 5A or better, C form (N/O & N/C) relays for low weight alarm relay.
- c. Each platform shall accommodate a maximum cylinder diameter of 14 inches and have a 300 lbs. capacity. Platforms shall be low profile (1.5" thick) solid PVC with stainless steel hardware, stainless steel electronic strain gage load cell (5 VDC excitation), and cylinder centering posts. Scale platforms shall tilt up for cleaning the floor underneath.
- d. The dual cylinder scale system shall be Model ECS402 as manufactured by Chlorinators Incorporated, Stuart, Florida.

3. Chlorine Solution Booster Pump

- a. Furnish and install as shown on the Plans, a booster pump to provide the flow rate at the differential pressure required by the chlorinator system specified in item #1 above which is a minimum flow rate of 28 gallons per minute (gpm) at a total dynamic head of 281 feet.

b. Pump Construction:

- i. Casting: 316L stainless steel with 360 psi working pressure rating.
- ii. Fixing Plate: Corrosion resistant cast aluminum base.
- iii. Floating Neck Ring: Self-centering, floating neck rings composed of PPS included with each sage.
- iv. Impeller: Enclosed design, AISI 316 stainless steel with continuous welds along all vanes.
- v. Diffuser Bowl: Each stage shall have a bowl & diffuser stage, constructed of AISI 316 SS and include a silicon carbide journal bearing.
- vi. Mechanical Shaft Seal: Cartridge type mechanical shaft seal assembly composed of a Silicon Carbide (SiC) rotating face, Carbon graphite stationary, EPDM elastomers and AISI 316 stainless steel hardware.
- vii. Integral Thrust Bearing & Coupling Housing Assembly: One-piece machined aluminum housing with oversized thrust bearings, capable of managing all pump thrust, include a coupling to securely connect the pump shaft to motor shaft and require no adjustment to the impeller stack. The thrust bearing(s) shall be standard automotive type bearings, easily replaced in the field by removal of circlips locking the bearing(s) into the aluminum housing and allow the use of standard off-the-shelf TC or TSC frame motors instead of special high-thrust motors.
- viii. Pump Shell: AISI 316 SS steel, polished and with chamfered edges top and bottom.
- ix. Motor: NEMA standard design TC-TSC frame suitable for vertical mounting and close coupled to the pump unit. Motors shall be of a manufacturer's standard catalog design and must not use special bearings as a thrust handling device. The motor rating shall be: 3 HP, 3600 RPM, 1- Phase, 60 Hz, 230 Volts, TEFC Enclosure with 1.15 Service Factor.
- x. Inlet/Outlet Connections: 1.25" round flanges.

- c. The booster pump shall be a VR Series vertical multi-stage booster pump, Model 6VR1100NF1A with a 3 Hp, 230 VAC, 1-phase motor as manufactured by Franklin Electric.

4. Provide control components in MCC and wiring such that booster pump will not be energized unless flow meter detects flow and well pump motor is energized.

B. Chemical Feed Conduit, Tubing and Injectors

1. Furnish and install conduit in floor between chemical feed room and wellhead discharge piping, as indicated on the Plans. Long sweep 90 degree bends shall be used in chemical feed tubing conduits.

2. Furnish and install polyethylene solution tubing from the chlorine booster pump to the injection point. Tubing shall be unaffected by chemical it carries and shall withstand the operating conditions of the chemical feed system it is installed for.
 3. Conduit & tubing shall be color coded per requirements of NR 811.32(6).
 4. Furnish and install 1" NPT polypropylene nozzle with bronze corporation stop model no. 10741 as manufactured by LMI Milton Roy or approved equal substitution per Section 01 60 00 - Product Substitution Procedures) for the chemical feed injection point.
- C. Chlorine Gas Leak Monitor & Alarm System
1. System shall continuously monitor the Chlorine Room for the presence of chlorine gas and display the concentration level in parts per million while simultaneously indicating the highest level detected on an LED bar graph.
 2. System shall be composed of a water-tight wall mounted sensor in the Chlorine Room and a wall mounted monitoring unit (NEMA 4X enclosure) located in the Pump Room adjacent to the Chlorine Room viewing window.
 3. The system shall include an audible alarm horn and light activating for a WARNING condition (1 PPM) and for a DANGER condition (2 PPM).
 4. The system shall be wired to the automatic emergency chlorine gas cylinder shutoff valves shutting off the cylinders in the event of a detected leak.
 5. Alarm relays shall be wired to the SCADA system for remote alarm annunciation.
 6. Monitor shall be provided with battery backup.
 7. Manufacturer & Model: Regal Model No. 3001 as manufactured by Chlorinators Incorporated, Stuart, Florida.
- D. Chemical Feed Accessories
1. Test Kit: Owner will provide one (1) chlorine test kit, DPD method, smallest increment 0.1 mg/l. Kit to be Pocket Colorimeter Model No. 58700-00 as manufactured by Hach.
 2. Personal Protective Equipment: Owner will provide protective safety gloves, face shield and apron to protect water utility workers against the specific chemicals that are to be present in the chemical feed room.
 3. Warning Signs: Contractor shall provide warning signs per requirements of Chapter SPS 332, Wisconsin Administrative Code for the chemical room entrance door, tanks and equipment.
 - a. Chemical Room Door: Furnish 6"x6" diamond shaped sign(s) meeting the NFPA 704 standard and constructed of a durable, exterior-grade material with a hard-coated plastic, impact resistant top layer which functions as a UV filter to prevent fading for mounting to the exterior side of the chemical room door. The sign should show the appropriate NFPA® health, fire, instability and special hazard ratings for chemicals within the room.
 - b. Scale Indicators Chemical Identification: Furnish and install an engraved plastic wall tag indicting chemical measured above scale indicator units.

PART 3 EXECUTION

3.1 WELL NO. 2 WELL PUMP SALVAGE & REUSE

A. BASE BID (NEW BOWL ASSEMBLY):

1. Remove the well pump motor, pump base, column assembly (column pipe, line shaft & bearings), bowl assembly, and suction pipe from the Well No. 2 Facility.
2. The salvaged pump base, column assembly, and suction pipe shall be reused for the new well pump.
3. Disassemble the column assembly and inspect bearings for wear. Inspect the pump base for wear. Furnish a condition report with recommendations for reuse or replacement of the bearings to the Owner for review and approval prior to proceeding with any further work.
4. Install the salvaged pump base, column assembly, and suction pipe with a new motor, bowl assembly, and cone strainer at Well No. 5.

B. ALTERNATE BID ITEM (REUSE WELL NO. 2 BOWL ASSEMBLY):

1. Transport the bowl assembly to the Contractor's facility. Furnish and provide all labor, tools, equipment, materials, and incidentals required to load, transport, and off-load the bowl assembly at the Contractor's facility. Contractor shall be responsible for any damage, including but not necessarily limited to piping, bolts, nuts, washers, mounting brackets and hardware, caused by its own operations to transport and disassemble the bowl assembly.
2. Disassemble, inspect and clean the bowl assembly. Inspect shaft for straightness and all parts for wear. Furnish condition report with rehabilitation/rebuild recommendations to Owner for review and approval prior to proceeding with any further work.
3. Upon written approval of the Owner, the following shall be performed:
 - a. Rebuild bowl assembly with new wear rings, bearings and shaft.
 - b. Furnish and install an additional stage trimmed to provide specified flow rate at the specified total dynamic head (TDH).
4. Transport the rebuilt bowl assembly to the Well No. 5 Pumphouse and install with salvaged column assembly (pipe, shaft & bearings), salvaged discharge head, and new cone strainer and motor.

3.2 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.3 INSTALLATION

- A. Handle and assemble pipe and valves in accordance with manufacturer's instructions and as indicated on the Plans.

- B. Install Work in accordance with State of Wisconsin Standard Specifications for Sewer and Water Construction standards.
- C. Support
 - 1. All interior or exposed pipelines, shall be securely supported by adjustable metal saddles, brackets, or adjustable hangers supported directly by concrete, masonry work, or tile.
 - 2. In general, the maximum spacing of supports shall not exceed 10 feet on centers unless approved by Engineer.
 - 3. Contractor shall furnish and place hangers, supports, wall pipes, sleeves, and floor boxes in the forms before concrete is poured wherever needed or shown on the Plans.
 - 4. All piping shall be adequately supported and braced to resist thrust at bends and joints. Use base elbows, poured concrete or rod ties.
 - 5. The weight of the piping shall be supported independently of connected equipment and valves.
- D. The appropriate number, size, and lengths of spool pieces and flange fillers needed for plumbing and leveling any existing piping shall be included in the price bid.

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements.
- B. Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, and testing, adjusting.
- C. All piping shall be flushed or blown out after installation prior to testing.
- D. All piping, interior or exposed, shall be subject to test before being covered with insulation or paint. All piping and appurtenances shall be watertight or airtight and free from visible leaks.
- E. Leak Testing: Test pipe and valve connections under normal static system pressure. Inspect for visible leaks. All leaks shall be repaired prior to installation of insulation or painting.
- F. Well Pump Tests:
 - 1. After installation of the well pump, motor, motor controls, chemical feed equipment, and other associated well equipment, the Contractor shall conduct a 2-hour pumping test to waste to prove the pump meets the head-capacity, power consumption and efficiency as specified in this section of the specifications. The back pressure shall be varied to provide a minimum of four testing points to plot on the factory certified pump curve. The following test parameters must be measured and recorded during the duration of the well pump test:
 - a. Time

- b. Flow Rate (gpm)
- c. Altitude Gauge Reading (ft.)
- d. Pumping Water Level (ft.)
- e. Drawdown (ft.)
- f. Back Pressure (psi)
- g. Specific Capacity (gpm/ft.)
- h. Motor Power Consumption (amps)

2. The well pumping equipment shall be free of excessive vibration. Vibration measurements shall be taken during the well pump test. Measurement locations and procedures shall comply with the most recent edition of the Standard for Centrifugal and Vertical Pumps for Vibration Measurements and Allowable Values (ANSI/HI 9.6.4). Vibration probes shall not be placed on flexible panel or cylinder walls such as motor end cover. Such covers shall be removed to allow measurement on a stiff part of the motor. Unfiltered RMS velocity readings in inches per second shall be taken at the locations shown in Figure 9.6.4.13 of ANSI/HI 9.6.4. The input power in BHP or kW corresponding to each measurement made shall be recorded. Contractor shall furnish power and vibration measuring equipment. The maximum field measured value recorded in each of the three planes (vertical, horizontal and axial) shall not exceed the allowable values shown in Figure 9.6.4.13 of ANSI/HI 9.6.4.
3. If the pump motor does not have enough power to operate pump without overheating, or otherwise showing signs of inadequate power, or adjustment, or if the pump fails to operate satisfactorily from a mechanical or hydraulic standpoint, and does not comply with the proposal and specifications, the Well Contractor will be notified and it will be a part of his contract to put the unit in satisfactory operating condition so that it will comply with the specification. After it is finally adjusted, it should operate 50 days without signs of distress before final payment. Any extra expense caused the Owner or Engineer because of the Contractor's failure to supply equipment up to the standards and guarantee made with the bid, will be deducted from payments due to the Contractor.
4. The pump supplier is to guarantee the pump parts and workmanship for one year. If the pump fails or the rate of pumping decreases from the rate as specified, it is the supplier's responsibility to remove the pump and to replace it in the well in satisfactory condition. If the failure is due to a change in water available, the Contractor shall not be held responsible.

G. Well Equipment Tests

1. Well Contractor shall demonstrate the proper operation of all the well pumping related equipment to the Owners and Engineers satisfaction. Tested equipment to include, but not necessarily limited to, the chemical feed systems, level transducer, flow meter, and well pump controls.

3.5 PAINTING

- A. Surface Preparation:
 - 1. Remove oil, grease, dirt, and other foreign substances from shop prime.
 - 2. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
- B. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
- C. Application: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
- D. Ferrous Metal Potable Water Piping Paint Schedule:
 - 1. Surface Preparation: SSPC-SP10
 - 2. Shop Primer: Tnemec Omnithane Series 1 or Pota-Pox Plus N140F @ 2.5 – 3.5 mils dry film thickness (DFT).
 - 3. Intermediate: Tnemec Series 66 Hi-Build Epoxiline (polyamide epoxy) @ 4-6 mils DFT (200 s.f./gallon).
 - 4. Finish Coat: Tnemec Series 66 Hi-Build Epoxiline (polyamide epoxy) @ 4-6 mils DFT (200 s.f./gallon)

3.6 CLEANING AND DISINFECTION

- A. All equipment and materials shall be clean before installation. Contractor shall disinfect and flush the system before it is put in service.
- B. A bacteriological safe sample shall be obtained as determined by the State Hygiene Lab before the work is accepted by the Owner.

3.7 OPERATION AND MAINTENANCE MANUALS

- A. The Well Contractor shall provide the Owner with three complete operation and maintenance manuals with parts lists, supplier listings and wiring diagrams for all major mechanical equipment prior to approval of final payment on project.

3.8 TRAINING

- A. The manufacturer's representative shall instruct the Owner's operating personnel as to the proper procedures for operating and maintaining the equipment as follows:
 - 1. Start-up and Training Instruction – One (1) Eight-Hour Day (minimum)
 - 2. The following equipment and systems require owner training.

- 1) Pumps
 - 2) Valves
 - 3) Controls
 - 4) Chemical Feed Systems
 - 5) Flow Meter
3. The Owner Training Certificate included in Appendix A of this specification section shall be completed by the Contractor for each item requiring owner training. The completed form(s) shall be given to the Engineer prior to receiving final payment for this project.

APPENDIX A
OWNER TRAINING

Project: _____

Contractor: _____

Representative for the Contractor: _____

Equipment System: _____

Instructions given for the following equipment systems: _____

Operation and Maintenance Manual given for the system: ____ Yes ____ No

We/I have received instructions on the operation of the above mentioned system and fully understand its operation and maintenance procedures. We/I have been given a booklet(s) describing the operation and maintenance of the equipment system.

Signed _____
For the Owner

Signed _____
For the Contractor

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK