Project Manual for

Northwestern Water & Sewer District

Willowbend Pump Station Improvements

SS-307

NORTHWESTERN
THE DISTRICT
WATER & SEWER

2021

Board of Trustees

Mark Sheffer – Chairman
J. Douglas Miller, P.E. - Vice Chairman
Melinda Kale – Secretary

William Hirzel
John A. Cheney
Tim Phillips
Charles Latta

Steve Arnold
Bill Verbosky
Brooke Hahn

STATE OF OHIO
THEODORE A. BENNETT
E-70768
REGISTERED PROFESSIONAL ENGINEER

Theodore A. Bennett
8/12/2021

Jones & Henry
ENGINEERS, LTD.

3103 Executive Parkway, Suite 300
Toledo, Ohio 43606
419.473.9611

TABLE OF CONTENTS

C-111 Advertisement for Bids
C-200 Instruction to Bidders
C-410 Bid Form for Construction Projects
C-430 Bid Guaranty and Contract Bond
C-510 Notice of Award
C-520 Agreement Between Owner and Contract for Construction Contract
C-550 Notice to Proceed
C-610 Performance Bond
C-614 Maintenance and Guarantee Bond
C-620 Contractor's Application for Payment
C-620A Contactors Affidavit
C-625 Certificate of Substantial Completion
C-700 General Conditions
C-800 Supplementary Conditions
Exhibit 1 - Wage Rates
Exhibit 2 – OPWC Documents
Exhibit 3 – WPCLF Documents
Exhibit 4 – Electronic Document Release

Foreword to Technical Specifications

DIVISION 1 - GENERAL REQUIREMENTS

01010 Definition of Contract Items - (Single)
01021 Allowances
01043 Coordination and Control of the Work
01090 Reference Standards
01300 Submittals
01310 Construction Schedules and Documentation
01320 Electronic Project Management System (EPMS)
01350 Common Product Requirements
01410 Laboratory Services
01500 Maintaining Traffic
01565 Temporary Restoration and Maintenance of Pavements, Curbs, and Walkways
01568 Pollution Control
01800 Construction Survey Work
01810 Video Recording (Sewer & Water)
01820 Video Recording of Underground Infrastructure

DIVISION 2 - UNDERGROUND, PAVEMENT, AND SITE WORK
02100 Clearing and Grubbing
02110 Removal of Structures and Obstructions
02200 Excavation and Backfill
02201 Rock Excavation
02550 Storm and Sanitary Sewers - (Sewers)
02551 Precast Concrete Structures
02552 Precast Concrete Manholes
02555 Pressure Pipe (Sewer & Water)
02557 Valves
02600 Pavements, Curbing, and Walks
02790 Horizontal Directional Boring
02800 Sodding, Seeding, and Mulching

DIVISION 3 – CONCRETE
03305 Cast In Place Concrete
03310 Grout

DIVISION 4 – MASONRY

DIVISION 5 – METALS
05500 Metal Fabrications
05540 Iron Castings

DIVISION 6 - WOOD AND PLASTICS
06682 Sewer Pipe Drop Bowl

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

DIVISION 8 - DOORS AND WINDOWS
08320 Floor Doors

DIVISION 9 – FINISHES
09900 Painting

DIVISION 10 – SPECIALTIES

DIVISION 11 - EQUIPMENT AND SYSTEMS
11050 Common Equipment Requirements
11735 Pumping Equipment

DIVISION 12 – FURNISHINGS

DIVISION 13 - SPECIAL CONSTRUCTION
13665 Prefabricated Precast Building

DIVISION 14 - CONVEYING SYSTEMS

DIVISION 15 – MECHANICAL

15010 General Mechanical Provisions
15210 Piping
15211 Small Piping and Valves
15250 Valves
15400 Plumbing

DIVISION 16 – ELECTRICAL

16005 Electrical General Provisions
16122 Wiring Devices
16132 Accessories
16220 Diesel Generators
16251 Surge Protective Devices (SPD)
16430 Disconnect Switches
16431 Circuit Breakers
16432 Low Voltage Fuses and Fuse Holders
16440 Automatic Transfer Switches
16453 Mini-Power Zones
16510 Lighting
16902 Metering and Control Equipment
16903 Control Panels

IF ANY OF THE SECTIONS LISTED ABOVE ARE NOT INCLUDED IN THESE CONTRACT DOCUMENTS, PLEASE ADVISE.

END OF SECTION

NORTHWESTERN WATER & SEWER DISTRICT
WILLOWBEND PUMP STATION IMPROVEMENTS

ADVERTISEMENT FOR BIDS

Sealed Bids for Willowbend Pump Station Improvements, will be received by the Northwestern Water & Sewer District, at the District's Office, 12560 Middleton Pike, Bowling Green, Ohio 43402, until 11:00 A.M. local time, on Thursday October 7, 2021 at which time they will be publicly opened and read.

In general, the work consists of construction of a new sanitary sewer pump station, 5,100-feet of 12-inch through 20-inch force main by open-cut and trenchless methods in Perrysburg Township in Wood County and Monclova Township in Lucas County. Also included in the project are interconnections of several force mains and the abandonment of the existing pump station.

The issuing office is Jones & Henry Engineers, Ltd., 3103 Executive Parkway, Suite 300, Toledo, Ohio 43606. Copies of the Bidding Documents may be examined at the Owner's office listed above or the issuing office, without charge.

Technical questions regarding the project should be e-mailed to the Project Manager Theodore Bennett, P.E. at tbennett@jheng.com at Jones & Henry Engineers, Ltd.

Copies of Bidding Documents and Contract Documents may be obtained electronically from Newfax Corporation, Phone 419-241-5157, www.newfaxcorp.com. A non-refundable fee will be required for each set of Bidding and Contract Documents by Newfax Corporation payable to Newfax Corporation.

Neither Owner nor Engineer has any responsibility for the accuracy, completeness or sufficiency of any bid documents obtained from any source other than the source indicated in these documents. Obtaining these documents from any other source(s) may result in obtaining incomplete and inaccurate information. Obtaining these documents from any source other than directly from the source listed herein may also result in failure to receive any addenda, corrections, or other revisions to these documents that may be issued.

Bids must be submitted on the forms bound herein, must contain the names of every person or company interested therein, and shall be accompanied by either a Bid Guaranty and Contract Bond in the amount of 100% of the amount bid with satisfactory corporate surety, or by a certified check on a solvent bank in the amount of not less than 10% of the amount of the Bid, subject to conditions provided in the Instructions to Bidders. The successful bidder will be required to furnish satisfactory Performance Bond and Maintenance and Guarantee Bond in the amount of 100% of the Bid.

The Contractor shall be required to pay not less than the prevailing wage rates established by the federal Davis-Bacon Wage Determinations issued by the U.S. Department of Labor.

Any Bid may be withdrawn prior to the scheduled closing time for receipt of Bids, but no bidder shall withdraw his Bid within 90 days after the actual opening thereof.

This procurement is subject to the EPA policy of encouraging the participation of small business in rural areas (SBRAs). The Owner reserves the right to reject any or all Bids, waive irregularities in any Bid, and to accept any Bid which is deemed most favorable to the Owner.

This procurement is partially funded through loan and grant from the Ohio EPA DEFA WPCLF and the Ohio Publics Works Commission.

Jerry R. Greiner

President

To Newspaper:

Advertise: August 31, 2021

September 7, 2021

Furnish Affidavit

INSTRUCTIONS TO BIDDERS

ARTICLE 1 – DEFINED TERMS

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

A. Bidder - One who submits a Bid directly to Owner as distinct from a sub-bidder, who submits a bid to a Bidder.

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

C. Successful Bidder - The Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 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 authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

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

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

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

C. List of equipment suppliers to be used.

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

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

3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 *Site and Other Areas*

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

B. Easements and their conditions are listed in these documents.

4.02 *Existing Site Conditions*

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:

a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.

b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

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

d. Technical Data contained in such reports and drawings.

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

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

B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or adjacent to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

C. Adequacy of Data: 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 Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated

in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

4.03 *Site Visit and Testing by Bidders*

A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.

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

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

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

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

4.04 *Owner's Safety Program*

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

4.05 *Other Work at the Site*

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

ARTICLE 5 – BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;

B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;

E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding 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 Bidder; and (3) Bidder's safety precautions and programs;

F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and

J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – N/A

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions after the date established in the Instructions to Bidders may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 100 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

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

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

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

ARTICLE 9 – CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be substantially completed, and completed and ready for final payment, are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

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

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

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

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

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

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

12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.

12.03 The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the Work:

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

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

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form shall be completed in ink or printed format. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown. The corporate seal shall be affixed and attested by the corporate secretary or an assistant corporate secretary.

13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The partnership's address for receiving notices shall be shown.

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

13.05 A Bid by an individual shall show the Bidder's name and address for receiving notices.

13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture's address for receiving notices shall be shown.

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

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

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

13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID

14.01 N/A

14.02 *Unit Price*

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Owner or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. 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 sum thereof will be resolved in favor of the correct sum.

14.03 *Allowances*

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

ARTICLE 15 – SUBMITTAL OF BID

15.01 The Bidding Documents have been provided electronically, a Bidder is responsible for furnishing separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 7 of the Bid Form.

15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked package with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to 12560 Middleton Pike, Bowling Green, Ohio 43402.

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

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

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

16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.

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

ARTICLE 17 – OPENING OF BIDS

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

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid.

19.03 Evaluation of Bids

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

B. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

B.

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

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

ARTICLE 20 – BONDS AND INSURANCE

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

ARTICLE 21 – SIGNING OF AGREEMENT

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

ARTICLE 22 – SALES AND USE TAXES

22.01 Owner is exempt from Ohio state sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Bid. Refer to Paragraph SC-7.09 of the Supplementary Conditions for additional information.

ARTICLE 23 – N/A

ARTICLE 24 – RETAINAGE

24.01 Provisions concerning retainage are set forth in the Agreement.

ARTICLE 25 – WAGE RATES

25.01 The Bidder to whom the Contract is awarded will be required to pay as a minimum, the prevailing wage rates, current throughout the work, promulgated by the Davis-Bacon Act. Wage rates received for this project are included in the Exhibits of the Supplementary Conditions.

ARTICLE 26 – PROTEST

26.01 A protest based upon all alleged violation of the procurement requirements of 40 CFR Part 33 may be filed against the Owner's procurement action by a party with an adversely affected direct financial interest. The protest shall be filed with the Owner.

26.02 A protest shall be filed as early as possible during the procurement process but must be received by the OWNER no later than one week after the basis of the protest is known or should have been known, whichever is earlier. If the protest is mailed, the protester bears the risk of non-delivery within the required time period.

26.03 A protest must clearly present the procurement requirement being protested, the procurement regulation in alleged noncompliance, and the facts which support the protest, and any other information necessary to support the protest.

ARTICLE 27 – REQUIREMENTS FOR EQUAL EMPLOYMENT OPPORTUNITY (EEO)

27.01 This procurement is subject to the provisions of orders issued by the Secretary of Labor Section 204 of Executive Order 11246 pertaining to equal employment opportunity (EEO). The form Contractor Equal Employment Opportunity Certification in the Additional Supplemental Conditions shall be completed and submitted with the bid.

27.02 The provisions of the Ohio Administrative Code (OAC) 123:2-3-02 through 124:2-9 regarding Equal Employment Opportunity on State Construction Contracts and State-assisted Construction Contracts, and OAC 123:2-3-02 through 123:2-9 regarding Equal Employment Opportunity and Female Utilization Goals are applicable to this project, and each contractor will be required to comply in all aspects of these provisions.

ARTICLE 28 – CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

28.01 This procurement is subject to the provisions of Executive Order 12549 pertaining to the Certification Regarding Debarment, Suspension, and Other Responsibility Matters. The form Certification Regarding Debarment, Suspension, and Other Responsibility Matters in the Additional Supplemental Conditions shall be completed and submitted with the bid.

ARTICLE 29 – DISADVANTAGE BUSINESS ENTERPRISES (DBE) UTILIZATION

29.01 This procurement is subject to the USEPA program to encourage the participation of disadvantaged business enterprises. DBE Utilization is defined and explained in the Additional Supplemental Conditions. DBE program Forms 6100-3, 6100-4, and 6100-2 in the Additional Supplemental Conditions shall be completed and submitted with the bid.

ARTICLE 30 – AMERICAN IRON & STEEL REQUIREMENTS

30.01 This procurement is subject to the American Iron & Steel Requirements of PL 113-76, Consolidated Appropriations Act, 2014. The form titled American Iron & Steel Acknowledgement, found in the Additional Supplemental Conditions of all applicable materials shall be submitted by all Bidders.

30.02 Domestic steel use requirements as specified in Ohio Revised Code Section 153.011 apply to this project. Copies of §153.011 can be obtained from any of the offices of the department of administrative services or through http://codes.ohio.gov/orc/153.011.

ARTICLE 31 – REQUIREMENTS FOR UTILIZATION OF SMALL BUSINESS IN RURAL AREAS (SBRAS)

31.01 This procurement is subject to the EPA Policy of encouraging the participation of small businesses in rural areas. It is EPA Policy that recipients of EPA financial assistance awards utilize the services of small businesses in rural areas (SBRAs), to the maximum extent practical. The objective is to assure that such business entities are afforded the maximum practical opportunity to participate as subcontractors, suppliers, and otherwise in EPA-awarded financial assistance programs. This policy applies to all contracts and subcontracts for supplies, construction, and services under EPA grants or cooperative agreements. Small purchases are also subject to this policy.

ARTICLE 32 – UNRESOLVED FINDING FOR RECOVERY

32.01 The Contractor affirmatively represents to the local contracting authority that it is not subject to a finding for recovery under Ohio Revised Code §9.24, or that it has taken the appropriate remedial steps required under §9.24 or otherwise qualifies under that section. The Contractor agrees that if this representation is deemed to be false, the contract shall be void ab initio as between the parties to this contract, and any funds paid by the state hereunder shall be immediately repaid to the local contracting authority, or an action for recovery may be immediately commenced by the local government and/or for recovery of said funds.

ARTICLE 33 – OHIO WORKERS' COMPENSATION COVERAGE

33.01 The Contractor must secure and maintain valid Ohio workers' compensation coverage until the project has been finally accepted by the local contracting authority. A certificate of coverage evidencing valid workers' compensation coverage must be submitted to the local contracting authority before the contract is executed.

33.02 The Contractor must immediately notify the local contracting authority, in writing, if it or any subcontractor fails or refuses to renew their workers' compensation coverage. Furthermore, the Contractor must notify the local contracting authority, in writing, if its or any of its subcontractor's workers' compensation policies are canceled, terminated or lapse.

33.03 The failure to maintain valid workers' compensation coverage shall be considered a breach of contract which may result in the Contractor or subcontractor being removed from the project, withholding of pay estimates and/or termination of the contract.

ARTICLE 34 – DRUG-FREE WORKPLACE PROGRAM

34.01 In accordance with Ohio Revised Code §153.03 and during the life of this project, the Contractor and all its Subcontractors that provide labor on the Project site must be enrolled in and remain in good standing in the Ohio Bureau of Worker's Compensation ("OBWC") Drug-Free Workplace Program ("DFWP") or a comparable program approved by the OBWC.

ARTICLE 35 – OHIO PREFERENCE

35.01 In accordance with Ohio Revised Code §164.05 (A)(6), to the extent practicable, the Contractor and subcontractor shall use Ohio products, materials, services and labor in connection with this project.

ARTICLE 36 – OHIO ETHICS LAW

36.01 Contractor agrees that it is currently in compliance and will continue to adhere to the requirements of Ohio Ethics law as provided by Section 102.03 and 102.04 of the Ohio Revised Code.

ARTICLE 37 – FUNDING AGENCY BID REQUIREMENTS

37.01 This procurement is partially funded through loan and grant from the Ohio EPA DEFA WPCLF and the Ohio Public Works Commission.

37.02 Forms and documentation for the Ohio EPA DEFA WPCLF and the Ohio Public Works Commission programs are found in Exhibits 2 and 3 respectively.

37.03 All forms and documentation shall be provided with the Bid.

ARTICLE 38 – QUESTIONS REGARDING BID DOCUMENTS

38.01 All questions shall be submitted by e-mail to Theodore Bennett, P.E. at Jones & Henry Engineers, Ltd. at 3103 Executive Parkway, Suite 300, Toledo, OH 43606, tbennett@jheng.com, no later than 11:00 A.M on Friday October 1, 2021 in order to receive a response.

ARTICLE 39 – ENGINEER'S ESTIMATE

39.01 The Engineer's Opinion of Probable Construction costs is $2,100,000.00.

BID FORM

NORTHWESTERN WATER & SEWER DISTRICT

WILLOWBEND PUMP STATION IMPROVEMENTS

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

Northwestern Water & Sewer District

12560 Middleton Pike

Bowling Green, Ohio 43402

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum, Date
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding 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 Bidder; and (3) Bidder's safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
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 e execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for unit prices indicated on the following price(s):

UNIT PRICE BID

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Item No.	Description	Estimated Amount	Unit	Unit Cost in Numbers		Unit Price in Words	Total Estimated Cost of Item	
1	Mobilization and Demobilization	1	LS					
2	Bypass Pumping	14	WK					
3	Storm Water Pollution Prevention	1	LS					
4	Trench Rock Excavation (6-inches to 5-feet in depth)	1,625	LF					
5a	Willowbend Pump Station and Wet Well Demolition and Abandonment	1	LS					
5b	Willowbend Pump Station Wet Well, Controls Building, Site Improvements, Appurtenances and Accessories	1	LS					
6a	4-inch Drain, Type C	36	LF					
6b	8-inch Culvert, Type B	70	LF					
6c	12-inch Driveway Culvert, Type B	40	LF					
6d	10-inch Sanitary Sewer, Type B	10	LF					

Item No.	Description	Estimated Amount	Unit	Unit Cost in Numbers		Unit Price in Words	Total Estimated Cost of Item	
6e	15-inch Sanitary Sewer, Type B	45	LF					
6f	24-inch Culvert, Type B	35	LF					
6g	30-inch Culvert, Type B	35	LF					
6h	36-inch Culvert, Type B	45	LF					
6i	12-inch Sewer Removed	65	LF					
7a	8-inch Force Main, Type B	222	LF					
7b	10-inch Force Main, Type B	5	LF					
7c	12-inch Force Main, Type B	65	LF					
7d	12-inch Force Main, Type C	1,900	LF					
7e	12-inch Force Main, Trenchless	510	LF					
7f	20-inch Force Main, Type B	30	LF					
7g	20-inch Force Main, Type C	1,160	LF					
7h	Connection to Exiting Force Main	7	EA					

Item No.	Description	Estimated Amount	Unit	Unit Cost in Numbers		Unit Price in Words	Total Estimated Cost of Item	
7i	Manhole 4327 Modifications	1	EA					
7j	12-inch Connection to Existing Pipeline	2	EA					
7k	Force Main Termination and Abandonment, All Sizes	2	EA					
7l	Force Main Plugged	3	EA					
8a	Type I Sanitary Sewer Manhole	8	VLF					
8b	Type II Sanitary Sewer Manhole	15	VLF					
8c	Flow Meter Manhole	1	LS					
8d	Flow Meter / Bypass Manhole Conversion	1	LS					
9a	8-inch Gate Valve and Box	6	EA					
9b	8-inch Tapping Sleeve, Valve and Box	1	EA					
9c	10-inch Gate Valve and Box	2	EA					
9d	12-inch Gate Valve and Manhole	1	EA					
9e	12-inch Gate Valve and Box	1	EA					

Item No.	Description	Estimated Amount	Unit	Unit Cost in Numbers		Unit Price in Words	Total Estimated Cost of Item	
9f	12-inch Air Release Valve and Manhole	2	EA					
9g	20-inch Air Release Valve and Manhole	2	EA					
10a	ODOT Item 202 Pavement and Base Removed	330	SY					
10b	ODOT Item 254 Pavement Planing	110	SY					
11a	ODOT Item 203 Excavation	230	CY					
11b	ODOT Item 203 Embankment	310	CY					
11c	Access Roadway Repairs	800	SY					
11d	Access Roadway	1,340	SY					
11e	Temporary Access Roadway	1,740	SY					
11f	Asphalt Roadway Repairs - Full Depth	330	SY					
11g	Asphalt Roadway Repairs - Resurfacing	110	SY					
11h	Subgrade Support Material	1,340	SY					
11i	ODOT Item 304 - Backfill for Unsuitable Materials Removed	100	CY					

Item No.	Description	Estimated Amount	Unit	Unit Cost in Numbers		Unit Price in Words	Total Estimated Cost of Item	
12	Video Recording of the Zone of Influence	1	LS					
13	Maintenance of Traffic	1	LS					
14	Tree Removal, Clearing and Grubbing	1	LS					
15	Sheet Piling Retaining Wall	110	LF					
16	Dump Rock Fill, Type D	100	CY					
ALLOW	Telemetry Equipment and Programming	1	LS	$13,500	00	Thirteen Thousand Five Hundred Dollars and 00/100	$13,500	00
Total Bid Cost:								

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. Evidence of authority to do business in the state of the Project;

C. Required Bidder Qualification Statement with supporting data.

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

_____

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

_____

Telephone Number: _____

Email Address: _____

Contact Name: _____

_____

Bidder's License No.: _____
(where applicable)

PERSONAL PROPERTY TAX AFFIDAVIT

STATE OF OHIO)
)ss.
COUNTY OF _____)

_____, being first duly sworn, deposes and says as follows: answering whichever is applicable by placing an "X" before items 1 or 2.

1. ( ) We are not charged with any delinquent personal property taxes on the general tax list of personal property in _____ County, Ohio.

2. ( ) We are charged with delinquent personal property taxes on the general tax list of _____County, Ohio including unpaid penalties and interest in the amount of $_____.

_____
Bidder

By: _____

Title: _____

Sworn and subscribed before me this _____ day of _____ 20 _____.

_____
Notary Public in and for

_____ State

My Commission Expires:

_____ 20_____

BID GUARANTY AND CONTRACT BOND
(SECTION 153.571 OHIO REVISED CODE)

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____ _____as principal and _____ _____ as sureties, are hereby held and firmly bound unto Northwestern Water & Sewer District as OWNER in the penal sum of the dollar amount of the bid submitted by the principal to the OWNER on _____ _____ to undertake the project known as _____ _____.

The penal sum referred to herein shall be the dollar amount of the principal's bid to the OWNER incorporating any additive or deductive alternate proposals made by the principal on the date referred to above to the OWNER, which are accepted by the OWNER. In no case shall the penal sum exceed the amount of _____ _____dollars.

(If the foregoing blank is not filled in, the penal sum will be the full amount of the principal's bid, including alternates. Alternatively, if the blank is filled in, the amount stated must not be less than the full amount of the bid including alternates, in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above-named principal has submitted a bid on the above referred to project;

Now, therefore, if the OWNER accepts the bid of the principal and the principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, and bills of material; and in the event the principal pays to the OWNER the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid and such larger amount for which the OWNER may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event the OWNER does not award the contract to the next lowest bidder and resubmits the project for bidding, the principal pays to the OWNER the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing, new contract documents, required advertising, and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect; if the OWNER accepts the bid of the principal and the principal within fifteen days after the awarding of the contract enters into a proper contract in accordance with the bid, plans, details, specifications, and bills of material, which said Contract is made a part of this bond the same as though set forth herein.

Now also, if the said principal shall well and faithfully do and perform the things agreed to be done and performed according to the terms of said contract; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and material furnished in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the OWNER herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of the said contract or in or to the plans or specifications therefore shall in any way affect the obligations of said surety on its bond and does hereby waive notice of any such modifications, omissions, or additions to the terms of the contract or in or to the plans and specifications.

SIGNED AND SEALED this _____ day of _____, 20_____.

Principal:

_____

By: _____

Title: _____

Surety: Surety Company Address:

_____ _____
Street

By _____ _____
Attorney-in-Fact City State Zip

Surety Agent's Address:

_____
Agency Name

_____
Street

_____
City State Zip

NOTICE OF AWARD

Date of Issuance:

Owner:	Northwestern Water & Sewer District	Owner's Contract No.:
Engineer:	Jones & Henry Engineers, Ltd.	Engineer's Project No.: 796-7215.002
Project:	Willowbend Pump Station Improvements	Contract Name:

Bidder:

Bidder's Address:

TO BIDDER:

You are notified that Owner has accepted your Bid dated [_____] for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

_____ .

[describe Work, alternates, or sections of Work awarded]

The Contract Price of the awarded Contract is: $_____*[note if subject to unit prices, or cost-plus]*

[ ] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically. *[revise if multiple copies accompany the Notice of Award]*

☐ a set of the Drawings will be delivered separately from the other Contract Documents.

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

1. Deliver to Owner [____]counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

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 Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: Northwestern Water & Sewer District

Authorized Signature

By:

Title:

Copy: Engineer

AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between Northwestern Water & Sewer District ("Owner") and _____ ("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

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

A. In general, the work consists of construction of a new sanitary sewer pump station, 5,100-feet of 12-inch through 20-inch force main by open-cut and trenchless methods in Perrysburg Township in Wood County and Monclova Township in Lucas County. Also included in the project are interconnections of several force mains and the abandonment of the existing pump station.

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: Northwestern Water & Sewer District, Willowbend Pump Station Improvements.

ARTICLE 3 – ENGINEER

3.01 The part of the Project that pertains to the Work has been designed by Jones & Henry Engineers, Ltd..

3.02 The Owner has retained Jones & Henry Engineers, Ltd. ("Engineer") 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*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Days*

A. The Work will be substantially completed within 270 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 360 days after the date when the Contract Times commence to run.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

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 and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner $500.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.

2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $500.00 for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

4.04 *Special Damages*

A. In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

A. Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents.

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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 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 once each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract

a. 92 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. 92 percent of cost of materials and equipment not incorporated in the Work.

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 set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less amounts of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall not bear interest.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.

B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, 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.

C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the 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; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

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.

J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to ___, inclusive).
2. Bid Guarantee & Contract bond (pages ____to ___, inclusive).
3. Performance bond (pages ___ to ___, inclusive).
4. Labor and Maintenance bond (pages ___ to ___, inclusive).
5. Maintenance and Guarantee bond (pages ___ to ___, inclusive).
6. General Conditions (pages ___ to ___, inclusive).
7. Supplementary Conditions (pages ___ to ___, inclusive).
8. Specifications as listed in the table of contents of the Project Manual.
9. Drawings (not attached but incorporated by reference) consisting of ___ sheets with each sheet bearing the following general title: ___ **[or]** the Drawings listed on the attached sheet index.
10. Addenda (numbers ___ to ___, inclusive).
11. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid (pages ___ to ___, inclusive).
12. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.

B. The documents 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 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.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

10.02 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, 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, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

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

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*

A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

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

OWNER:	CONTRACTOR:
Northwestern Water & Sewer District	_____
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:
12560 Middleton Pike	_____
Bowling Green, OH 43402	_____
_____	_____
	License No.: _____ *(where applicable)*

CERTIFICATION OF FISCAL OFFICER

The undersigned, as _____ of _____ hereby certifies that funds sufficient to meet the requirement of this Contract have been lawfully appropriated for such purpose and are in the treasury, or in the process of collection.

By: _____

Title: _____

APPROVAL BY OWNER'S LEGAL OFFICER

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

By: _____

Title:

Date: _____

EJCDC® C-520 (Rev. 1), Agreement Between Owner and Contractor for Construction Contract (Stipulated Price).
Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies,
and American Society of Civil Engineers. All rights reserved.

NOTICE TO PROCEED

Owner:	Northwestern Water & Sewer District	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Jones & Henry Engineers, Ltd.	Engineer's Project No.:	796-7215.002
Project:	Willowbend Pump Station Improvements	Contract Name:	
		Effective Date of Contract:	

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [_____, 20__]. *[see Paragraph 4.01 of the General Conditions]*

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, [the date of Substantial Completion is _____, and the date of readiness for final payment is_____] ***or*** [the number of days to achieve Substantial Completion is _____, and the number of days to achieve readiness for final payment is _____].

Before starting any Work at the Site, Contractor must comply with the following:

Submit required documentation for funding sources and insurance in compliance with the Contract.

Owner**:** Northwestern Water & Sewer District

Authorized Signature

By:

Title:

Date Issued:

Copy: Engineer

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that _____ _____ Contractor, as Principal and_____ _____, as Surety, are held and firmly bound unto Northwestern Water & Sewer District, hereinafter called the Owner, in the penal sum of _____ dollars ($),good and lawful money of the United States of America to be paid to said Owner, its legal representatives and assigns, for which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, and each and every one of them jointly and severally, firmly by these presents.

WHEREAS, the above-named Principal has entered into a certain written Agreement with the Owner, dated the _____ day of _____ A.D. 2021, for construction of work entitled Willowbend Pump Station Improvements (hereinafter called the Contract) which Contract and Specifications for said work shall be deemed a part hereof as fully as if set out herein.

NOW THEREFORE, THE CONDITIONS OF THIS OBLIGATION IS SUCH, that if the said Principal shall well and faithfully do and perform the things agreed by him to be done and performed according to the terms of said Contract and shall pay all lawful claims of subcontractors, material suppliers, and laborers, for labor performed and materials furnished in carrying forward, performing or completing of the said Contract, we agreeing and assenting that this undertaking shall be for the benefit of any material supplier or laborer having a just claim as well as for the obligee herein, then this obligation shall be void, otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety, for value received, hereby stipulates and agrees that no charge, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the Specifications accompanying the same shall in any wise affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract or to the work of the Specifications.

WITNESS our hands and seals this _____ day of _____ A.D. 20 .

Witnesses:

Principal:

_____ _____
Printed Printed

_____ _____ (Seal)
Signature Principal Signature

_____ _____
Printed

_____ _____ (Seal)
Signature Surety Signature

I hereby approve the form and correctness of the foregoing Bond.

_____
Owner's Legal Officer

Date: _____

MAINTENANCE AND GUARANTEE BOND

KNOW ALL MEN BY THESE PRESENTS, that _____ _____ Contractor, as Principal and_____ _____, as Surety, are held and firmly bound unto Northwestern Water & Sewer District, hereinafter called the Owner, in the penal sum of _____ dollars ($),good and lawful money of the United States of America to be paid to said Owner, its legal representatives and assigns, for which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, and each and every one of them jointly and severally, firmly by these presents.

WHEREAS, the above-named Principal has entered into a certain written Agreement with the Owner, dated the _____ day of _____ A.D. 20___, for construction of work entitled Willowbend Pump Station Improvements (hereinafter called the Contract) which Contract and Specifications for said work shall be deemed a part hereof as fully as if set out herein.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH, that by and under said Contract, the above-named Principal has agreed with the Owner that for a period specified in paragraph 15.08. of the General Conditions, to keep in good order and repair any defect in all the work done under said Contract either by the Principal or his Subcontractors, or his material suppliers, that may develop during said period due to improper materials, defective equipment, workmanship or arrangements, and any other work affected in making good such imperfections, shall also be made good all without expense to the Owner, excepting only such part or parts of said work as may have been disturbed without the consent or approval of the Principal after the final acceptance of the work, and that whenever directed

so to do by the Owner by notice served in writing, either personally or by mail on the Principal at

_____

_____

OR _____

legal representatives, or successors, or on the Surety at _____

_____

WILL PROCEED at once to make such repairs as directed by said Owner; and in case of failure so to do within one week from the date of service of such notice, or within reasonable time not less than one week, as shall be fixed in said notice, then the Owner shall have the right to purchase such materials and employ such labor and equipment as may be necessary for the purpose, and to undertake, do and make such repairs, and charge the expense thereof, to and receive same from said Principal or Surety. If any repair is necessary to be made at once to protect life and property, then and in that case, the Owner may take immediate steps to repair or barricade such defects without notice to the Contractor. In such accounting, The Owner shall not be held to obtain the lowest figures for the doing of the work, or any part thereof, but all sums actually paid therefore shall be charged to the Principal or Surety. In this connection, the judgment of the Owner is final and conclusive. If the said Principal for a period specified in paragraph 13.12. of the General Conditions and, shall keep said work so constructed under said Contract in good order and repair, excepting only such part or parts of said work which may have been disturbed without the consent or approval of said Principal after the final acceptance of the same, and shall whenever notice is given as hereinbefore specified, at once proceed to make repair as in said notice directed, or shall reimburse said Owner for any expense incurred by making such repairs, should the Principal or Surety fail to do as hereinbefore specified, and shall fully indemnify, defend, and save harmless the Owner from all suits and actions for damages of every name and description brought or claimed against it for or on account of any injury or damage to person or property received or sustained by any party or parties, by or from any of the acts or omissions or through the negligence of said Principal, servants, agents, or employees, in the prosecution of the work included in said Contract, then the above obligation shall be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their respective authorized officers this _____ day of _____ A.D. 20___.

Signed, Sealed, and Delivered

In the Presence of:

Witnesses:

_____	_____
Printed	
_____	_____ (Seal)
Signature	Principal
_____	_____
Printed	
_____	_____ (Seal)
Signature	Surety

I hereby approve the form and correctness of the foregoing Bond.

_____
Owner's Legal Officer

Date: _____

OHIO WATER DEVELOPMENT AUTHORITY

CONTRACTOR'S ESTIMATE

TO OWNER:

APPLICATION NO: _____
PERIOD TO: _____
OWDA LOAN NO: _____

FROM CONTRACTOR:

FOR OWDA OFFICE USE ONLY

Fund: _____

Voucher: _____

OWDA Pay: _____

Date: _____

PROJECT:

1	ORIGINAL CONTRACT PRICE	
2	Net change by CHANGE ORDER	$0.00
3	CURRENT CONTRACT PRICE (Line 1 + 2)	$0.00
4	TOTAL COMPLETED & STORED TO DATE	
5	RETAINAGE	
	a. % of completed work	
	b. % of stored work	
	Total Retainage (Line 5a + 5b)	$0.00
6	TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 total)	$0.00
7	LESS PREVIOUS PAYMENTS (Line 6 from prior certificate)	
8	CURRENT PAYMENT DUE	$0.00

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Approved Change Orders through Change Order No: _____		
	NET CHANGES by Change Order	$0.00

CONTRACTOR'S CERTIFICATE

I hereby certify that the above materials and services have been furnished and performed in accordance with the conditions of the contract for the above work, and that payment has not been recevied and therefore is due and to be paid on said contract

CONTRACTOR:

BY: DATE:

ENGINEER: _____ By: _____ Date: _____

OWNER: _____ By: _____ Date: _____

OWDA: _____

Chief Engineer Executive Director

CONTRACTOR'S AFFIDAVIT
CURRENT ESTIMATE

STATE OF _____)
) ss
County of _____)

The undersigned, _____, hereby represents that on _____ it was awarded a contract by Northwestern Water & Sewer District, hereinafter called Owner, to construct Willowbend Pump Station Improvements, in accordance with terms and conditions of Contract No. _____; and the undersigned further represents that all progress payments heretofore received by the Contractor from the Owner on account of the Work have been applied by the Contractor to discharge in full all of the Contractor's obligations incurred in connection with the Work covered by all prior progress payments in accordance with the applicable subcontracts, except as follows:_____
_____
_____.

This affidavit is freely and voluntarily given with full knowledge of the facts, on this _____ day of ,
A.D. 20__.

_____Contractor

_____By
Title

Subscribed and sworn to before me this ____ day of _____, A.D. 20_____

_____
Notary Public

(Seal) My Commission Expires _____

CONTRACTOR'S AFFIDAVIT
WAIVER OF LIENS/FINAL ESTIMATE

STATE OF _____)
) ss
County of _____)

The undersigned, _____

hereby represents that on _____ it was awarded a contract by the Northwestern Water & Sewer District hereinafter called the OWNER, to construct Willowbend Pump Station Improvements in accordance with terms and conditions of Contract No. _____; and the undersigned further represents that the subject work has now been accomplished and the said Contract has now been completed.

The undersigned hereby warrants and certifies that all of its indebtedness arising by reason of the said Contract has been fully paid or satisfactorily secured; and that all claims from Subcontractors and others for labor and material used in accomplishing the said project, as well as all other claims arising from the performance of the said Contract, have been fully paid or satisfactorily settled. The undersigned further agrees that, if any such claim should hereafter arise, he (it) shall assume responsibility for the same immediately upon request to do so by the OWNER.

The undersigned, for a valuable consideration, the receipt of which is hereby acknowledged, does further hereby waive, release and relinquish any and all claims or right of lien which the undersigned now has or may hereafter acquire upon the subject premises for labor and material used in accomplishing said project owned by the OWNER.

This affidavit is freely and voluntarily given with full knowledge of the facts, on this day of_____, A.D. 20___.

By _____
CONTRACTOR

Title _____

Subscribed and sworn to before me this _____ day of _____, A.D. 20___.

_____
Notary Public

(Seal) My Commission Expires _____

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Northwestern Water & Sewer District	Owner's Contract No.:	
Contractor:		Contractor's Project No.:	
Engineer:	Jones & Henry Engineers, Ltd.	Engineer's Project No.:	796-7215.002
Project:	Willowbend Pump Station Improvements	Contract Name:	

This [preliminary] [final] Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

_____

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities: ☐ None
☐ As follows

Amendments to Contractor's responsibilities: ☐ None
☐ As follows:

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

EXECUTED BY ENGINEER:	RECEIVED:	RECEIVED:
By: _____	By: _____	By: _____
(Authorized signature)	Owner (Authorized Signature)	Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

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 Before Starting Construction 7
2.04 Preconstruction Conference; Designation of Authorized Representatives 7
2.05 Initial Acceptance of Schedules 7
2.06 Electronic Transmittals 8
ARTICLE 3 – Documents: Intent, Requirements, Reuse 8
3.01 Intent 8
3.02 Reference Standards 8
3.03 Reporting and Resolving Discrepancies 9
3.04 Requirements of the Contract Documents 10
3.05 Reuse of Documents 10
ARTICLE 4 – Commencement and Progress of the Work 11
4.01 Commencement of Contract Times; Notice to Proceed 11
4.02 Starting the Work 11
4.03 Reference Points 11
4.04 Progress Schedule 11
4.05 Delays in Contractor's Progress 11
ARTICLE 5 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions 12
5.01 Availability of Lands 12
5.02 Use of Site and Other Areas 13
5.03 Subsurface and Physical Conditions 14

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

5.04 Differing Subsurface or Physical Conditions 14
5.05 Underground Facilities 16
~~5.06 Hazardous Environmental Conditions at Site~~ 18
ARTICLE 6 – Bonds and Insurance 20
6.01 Performance, Payment, and Other Bonds 20
6.02 Insurance—General Provisions 20
6.03 Contractor's Insurance 22
6.04 Owner's Liability Insurance 24
6.05 Property Insurance 24
6.06 Waiver of Rights 26
6.07 Receipt and Application of Property Insurance Proceeds 27
ARTICLE 7 – Contractor's Responsibilities 27
7.01 Supervision and Superintendence 27
7.02 Labor; Working Hours 28
7.03 Services, Materials, and Equipment 28
7.04 "Or Equals" 28
7.05 Substitutes 29
7.06 Concerning Subcontractors, Suppliers, and Others 31
7.07 Patent Fees and Royalties 33
7.08 Permits 33
7.09 Taxes 33
7.10 Laws and Regulations 33
7.11 Record Documents 34
7.12 Safety and Protection 34
7.13 Safety Representative 35
7.14 Hazard Communication Programs 35
7.15 Emergencies 36
7.16 Shop Drawings, Samples, and Other Submittals 36
7.17 Contractor's General Warranty and Guarantee 38
7.18 Indemnification 39
7.19 Delegation of Professional Design Services 39
ARTICLE 8 – Other Work at the Site 40
8.01 Other Work 40

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

8.02 Coordination 41
8.03 Legal Relationships 41
ARTICLE 9 – Owner's Responsibilities 42
9.01 Communications to Contractor 42
9.02 Replacement of Engineer 42
9.03 Furnish Data 42
9.04 Pay When Due 42
9.05 Lands and Easements; Reports, Tests, and Drawings 43
9.06 Insurance 43
9.07 Change Orders 43
9.08 Inspections, Tests, and Approvals 43
9.09 Limitations on Owner's Responsibilities 43
9.10 Undisclosed Hazardous Environmental Condition 43
9.11 Evidence of Financial Arrangements 43
9.12 Safety Programs 43
ARTICLE 10 – Engineer's Status During Construction 44
10.01 Owner's Representative 44
10.02 Visits to Site 44
10.03 Project Representative 44
10.04 Rejecting Defective Work 44
10.05 Shop Drawings, Change Orders and Payments 44
10.06 Determinations for Unit Price Work 45
10.07 Decisions on Requirements of Contract Documents and Acceptability of Work 45
10.08 Limitations on Engineer's Authority and Responsibilities 45
10.09 Compliance with Safety Program 46
ARTICLE 11 – Amending the Contract Documents; Changes in the Work 46
11.01 Amending and Supplementing Contract Documents 46
11.02 Owner-Authorized Changes in the Work 47
11.03 Unauthorized Changes in the Work 47
11.04 Change of Contract Price 47
11.05 Change of Contract Times 48
11.06 Change Proposals 48
11.07 Execution of Change Orders 49

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

11.08 Notification to Surety 50
ARTICLE 12 – Claims 50
12.01 Claims 50
ARTICLE 13 – Cost of the Work; Allowances; Unit Price Work 51
13.01 Cost of the Work 51
13.02 Allowances 54
13.03 Unit Price Work 54
ARTICLE 14 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work 55
14.01 Access to Work 55
14.02 Tests, Inspections, and Approvals 55
14.03 Defective Work 56
14.04 Acceptance of Defective Work 56
14.05 Uncovering Work 57
14.06 Owner May Stop the Work 57
14.07 Owner May Correct Defective Work 57
ARTICLE 15 – Payments to Contractor; Set-Offs; Completion; Correction Period 58
15.01 Progress Payments 58
15.02 Contractor's Warranty of Title 61
15.03 Substantial Completion 61
15.04 Partial Use or Occupancy 62
15.05 Final Inspection 63
15.06 Final Payment 63
15.07 Waiver of Claims 64
15.08 Correction Period 65
ARTICLE 16 – Suspension of Work and Termination 65
16.01 Owner May Suspend Work 65
16.02 Owner May Terminate for Cause 66
16.03 Owner May Terminate For Convenience 67
16.04 Contractor May Stop Work or Terminate 67
ARTICLE 17 – Final Resolution of Disputes 68
17.01 Methods and Procedures 68
ARTICLE 18 – Miscellaneous 68

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

18.01 Giving Notice 68
18.02 Computation of Times 68
18.03 Cumulative Remedies 68
18.04 Limitation of Damages 69
18.05 No Waiver 69
18.06 Survival of Obligations 69
18.07 Controlling Law 69
18.08 Headings 69

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The 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. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *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.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

35. *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.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *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.

40. *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.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *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 a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *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 but not limited to those that convey

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs 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 Article 10 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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

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 15.03 or 15.04).

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. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. 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. *Bonds*: 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 Contractor's Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner's Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *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 2.03.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.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, 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.

~~C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.~~

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, 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 part of the Contract Documents prepared by or for Engineer. 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 part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. ~~The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier~~.

4.02 *Starting the Work*

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

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. 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.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. 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. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
2. abnormal weather conditions;
3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *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.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris 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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

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

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; 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.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site 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 5.03 is materially inaccurate; or
2. is of such a nature as to require a change in the Drawings or Specifications; or
3. differs materially from that shown or indicated in the Contract Documents; or

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

   b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

   c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

   a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent 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 do not warrant or guarantee 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 information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

   b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

   c. 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; and

   d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

~~5.06 *Hazardous Environmental Conditions at Site*~~

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

~~1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and~~

~~2. Technical Data contained in such reports and drawings.~~

~~B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:~~

~~1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; 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 removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. 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 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then 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 bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).
4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
2. claims for damages insured by reasonably available personal injury liability coverage.
3. 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.

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:
   a. Such insurance shall be maintained for three years after final payment.
   b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
3. Broad form property damage coverage.
4. Severability of interest.
5. Underground, explosion, and collapse coverage.
6. Personal injury coverage.
7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against 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. The automobile liability policy shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; 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 (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

~~I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:~~

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

~~3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice,~~

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

~~Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.~~

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that 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.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

~~A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, 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.~~

B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable 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 Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

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; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; 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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
6. extend to cover damage or loss to insured property while in transit.
7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
8. allow for the waiver of the insurer's subrogation rights, as set forth below.
9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
10. not include a co-insurance clause.
11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
12. include performance/hot testing and start-up.
13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, 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 insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. 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 or Contractor as trustee or fiduciary, 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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

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 occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.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, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

responsible for the means, methods, techniques, sequences, and procedures of construction.

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.

7.02 *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, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *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, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work 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.

7.04 *"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 Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1. If Engineer in its sole discretion determines that 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, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, 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;

        3) it has a proven record of performance and availability of responsive service; and

        4) it is not objectionable to Owner.

    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.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

   a. shall certify that the proposed substitute item will:

      1) perform adequately the functions and achieve the results called for by the general design,

      2) be similar in substance to that specified, and

      3) be suited to the same use as that specified.

   b. will state:

      1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

      2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

      3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

   c. will identify:

      1) all variations of the proposed substitute item from that specified, and

      2) available engineering, sales, maintenance, repair, and replacement services.

   d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be 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.

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. 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.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. 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 money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

7.07 *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.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, 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 the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *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.

7.10 *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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

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 or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

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

7.12 *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, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

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 Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

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 7.12.A.2 or 7.12.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 at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection 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 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *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.

7.14 *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.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent 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.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the 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 and equipment 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 of that submittal, and that Contractor approves the 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 set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples*:

   a. Contractor shall submit the number of Samples required in the Specifications.

   b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

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 or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample 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 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

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.

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on 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;

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

6. the issuance of a notice of acceptability by Engineer;
7. any inspection, test, or approval by others; or
8. any correction of defective Work by Owner.

D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from 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 7.18.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 7.18.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.

7.19 *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,

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

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, 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, 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 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. 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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

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.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, 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.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
2. an itemization of the specific matters to be covered by such authority and responsibility; and
3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

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

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. 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.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. 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, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, 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 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

10.09 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee*: When applicable, 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:

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.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 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost 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 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. 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;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

11.08 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work 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 13.01.C, 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, and vacation and holiday pay applicable

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

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 13.01.

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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), 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 communication 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 that Contractor is required by the Contract Documents to purchase and maintain.

C. *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, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. 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 Paragraph 13.01.B.

D. *Contractor's Fee*: When the Work as a whole 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, Change Proposal, Claim, set-off, or other 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 11.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, 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.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: 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.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

~~E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price 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;~~

~~2. there is no corresponding adjustment with respect to any other item of Work; and~~

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

~~3. Contractor believes that it 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 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction 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.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

~~B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.~~

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
3. by manufacturers of equipment furnished under the Contract Documents;
4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, 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, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work 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.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, 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, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work 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, a warehouse bond, 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.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work, 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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

d. to make any examination to ascertain how or for what purposes Contractor has used the money 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 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*:

1. Thirty days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. the Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. the Contract Price has been reduced by Change Orders;

i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents;

b. consent of the surety, if any, to final payment;

c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

d. a list of all disputes that Contractor believes are unsettled; and

e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material,

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of 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 have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. 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 15.07. 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. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the 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 Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;
2. correct such defective Work;
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 to 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. 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 repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

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, 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 are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *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; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

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

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 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 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 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 are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
2. agree with the other party to submit the dispute to another dispute resolution process; or
3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *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, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Headings*

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

Copyright © 2013 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 2 – PRELIMINARY MATTERS

SC-2.02 Copies of Documents

SC-2.02 Add the following new paragraphs following Paragraph 2.02.B

C. The Engineer can provide electronic drawing files to assist the Contractor with layout and construction staking of the improvements. The Engineer will require the Contractor sign an electronic release prior to providing the files to the Contractor. The wording of the release shall be as follows:

"These electronic files are provided to you for your convenience. Because electronic files can deteriorate or be damaged or be modified inadvertently or information from the electronic documents may be presented to you on your system differently than the original because of your software or system setup, these files may not be accurate. Any conclusion or information obtained or derived from such electronic files will be at your sole risk.

Information contained in the electronic documents is for information and reference in connection with this project only. The information is not intended or represented to be suitable for reuse on extensions of the original project or on any other project.

You should perform an acceptance test of the electronic documents immediately and inform us of any problems with the electronic documents. Jones & Henry will not be responsible for providing additional copies of these electronic files to you after 60 days from the date the documents are provided to you."

D. Files will be provided in the Engineer's CAD software format. The Contractor's surveyor will be responsible for making any required conversions necessary to permit the surveyor to use the files for layout or staking.

E. The Contractor's surveyor should check horizontal and vertical control points to confirm there has been no shift in the electronic drawing file during the staking operation.

SC2.06 Electronic Submittals

SC-2.06 Add the following new paragraphs immediately after Paragraph 2.06 C.

D. Electronic files are provided to you for your convenience. Because electronic files can deteriorate or be damaged or be modified inadvertently or information from the electronic documents may be presented to you on your system differently than the original because of your software or system setup, these files may not be accurate. Any conclusion or information obtained or derived from such electronic files will be at your sole risk.

E. Information contained in the electronic documents is for information and reference in connection with this project only. The information is not intended or represented to be suitable for reuse on extensions of the original project or on any other project.

F. You should perform an acceptance test of the electronic documents immediately and inform us of any problems with the electronic documents. Jones & Henry will not be responsible for providing additional copies of these electronic files to you after 60 days from the date the documents are provided to you.

ARTICLE 3 – DOCUMENTS; INTENT, REQUIREMENTS, REUSE

SC3.01 Intent

SC-3.01.C Delete Paragraph 3.01.C in its entirety and insert the following new paragraph in its place:

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version, as printed by Engineer, shall govern.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

SC4.01 *Commencement of Contract Times; Notice to Proceed*

SC 4.01 Delete Paragraph 4.01.A and substitute the following in its place:

A. The Contract Times will commence to run on the date listed on the Notice to Proceed.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 Subsurface and Physical Conditions

SC 5.03 Add Paragraph 5.03.A.4 immediately after Paragraph 5.03.A.3.

4. No reports of explorations or tests of subsurface conditions at or adjacent to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.

SC-5.03 Subsurface and Physical Conditions

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.B:

C. The following reports of explorations and tests of subsurface conditions at or adjacent to the Site are known to Owner:

1. Soil Probings

   a. The soils investigation involved hand probings carried to a depth of 6-feet below grade or refusal, whichever occurring first.

   b. Refusal indicated on the plans may not necessarily indicate rock or bedrock material. The material encountered at refusal was too hard for the probe to penetrate or advance past.

   c. These probings are provided for the information of the Contractor and the Contractor is encouraged to make their own investigation.

2. Soils Investigation – Boring Marked SB-1A

   a. Soil Exploration; Proposed Willowbend Pump Station Replacement, West River Road and Willlowbend Road, Northwestern Water & Sewer District – July 2020.

   b. This report is available at: https://bit.ly/WBSB2020

D. The following drawings of physical conditions relating to existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities) are known to Owner:

1. Buckeye Partners, L.P., (1929 – 1952). Inventory Drawing Lucas Co. Ohio, Monclova Twp., Town 1, T.D. 38 / Wood County, Ohio, Perrysburg, Twp., Town 1 – US 12 Mile Reserve, Page 5. NWWSD Record Plan Database.

2. Farnham, Moores & Wirries. (1975). West River Road Sanitary Sewer, Willowbend Pump Station and Force Main, SS307. Toledo, Ohio. NWWSD Record Plan Database.

3. Farnham, Moores & Wirries. (1975). Jerome Road Force Main, Sanitary Sewer No. 532-A. Toledo, Ohio. NWWSD Record Plan Database.

4. Ulrich-Ch'ang & Associates (1998). Saddlebrook Plat 1, Sanitary Sewer No. 390. Toledo, Ohio. NWWSD Record Plan Database.

5. Poggemeyer Design Group (2004). NWWSD – Lucas County Area Sanitary Force Main, SS-393. Bowling Green, Ohio. NWWSD Record Plan Database.

6. Poggemeyer Design Group (2005). NWWSD – Willowbend Pump Station Improvements, SS-307. Bowling Green, Ohio. NWWSD Record Plan Database.

7. Poggemeyer Design Group (2005). NWWSD – Riverbend Lakes Subdivision, Offsite Sanitary Sewer SS-392A. Bowling Green, Ohio. NWWSD Record Plan Database.

8. Poggemeyer Design Group (2005). NWWSD – Riverbend Lakes Subdivision, Pump Station, SS-392A. Bowling Green, Ohio. NWWSD Record Plan Database.

9. Poggemeyer Design Group (2005). NWWSD – Lucas County Area Sanitary Force Main, SS-393. Bowling Green, Ohio. NWWSD Record Plan Database.

E. Contractor may request copies of reports and drawings identified in SC 5.03.C and SC 5.03.D that were not included with the Bidding Documents from Engineer.

SC-5.06 Hazardous Environmental Conditions

SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following new paragraphs in their place:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

ARTICLE 6 – BONDS AND INSURANCE

SC-6.01 Performance, Payment, and Other Bonds

SC 6.01 Add the following new paragraph immediately after Paragraph 6.01.F:

G. The Contractor shall furnish a Performance Bond and a Maintenance and Guarantee Bond, each in the amount of at least 100% of the Contract Price as security for the faithful performance and payment of all Contractor's obligations.

SC-6.03 Contractor's Insurance

SC 6.03 Delete Paragraph 6.03.I of the General Conditions and substitute the following in its place:

I. General provisions: The policies of insurance required by these Paragraphs 6.03, 6.04 and 6.05 shall:

SC 6.03 Delete Paragraph 6.03.I.3 of the General Conditions and substitute the following in its place:

3. 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 Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:		**Statutory**
Federal, if applicable (e.g., Longshoreman's):		Statutory
Jones Act coverage, if applicable:		
Bodily injury by accident, each accident	$	1,000,000
Bodily injury by disease, aggregate	$	1,000,000
Employer's Liability:		
Bodily injury, each accident	$	1,000,000
Bodily injury by disease, each employee	$	1,000,000
Bodily injury/disease aggregate	$	1,000,000
For work performed in monopolistic states, stop-gap liability coverage shall be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:		Statutory
Foreign voluntary worker compensation		Statutory

2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	$	1,000,000
Products - Completed Operations Aggregate	$	1,000,000
Personal and Advertising Injury	$	1,000,000
Each Occurrence (Bodily Injury and Property Damage)	$	1,000,000

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Bodily Injury:		
Each person	$	1,000,000
Each accident	$	1,000,000

Property Damage:

Each accident $ 1,000,000

[or]

Combined Single Limit of $ 1,000,000

4. Excess or Umbrella Liability:

Per Occurrence $ 5,000,000

General Aggregate $ 5,000,000

5. Contractor's Pollution Liability:

Each Occurrence $ 1,000,000

General Aggregate $ 1,000,000

☐ If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract

6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following: NONE

SC-6.04 Owner's Liability Insurance

SC-6.04 Delete Paragraph 6.04.A and B of the General Conditions and substitute the following in its place:

A. The Contractor shall purchase and maintain during the entire term of this Contract one separate policy providing Owner's and Contractor's Protective Liability coverages. The named insured on this policy shall be:

1. The Owner; and
2. The Engineer - Jones & Henry Engineers, Ltd.; and
3. Others if specifically required by special provision in the Contract Documents.

B. The policy shall be provided on a form commonly referred to in the insurance industry as an "occurrence" type of policy form. (Claims made policy forms are not acceptable.)

C. This insurance policy shall be a separate policy in addition to the coverage required in 6.03. No other insurance policy may substitute for or contribute to the coverage or limits afforded by this insurance policy, except a separate excess Owner's and Contractor's Protective Policy.

D. This policy shall cover the total project and include explosion, collapse, and underground coverages for the entire Work provided by the Contractor and Subcontractors.

E. The policy shall stipulate that the "designated Contractor" includes the Contractor and all Sub-contractors engaged in the Work.

F. The original policy shall be submitted to and filed with the Owner or its designated representative.

SC-6.05 Property Insurance

SC-6.05. Add the following new paragraphs immediately before 6.05.A. and continue on the numbering sequentially.

A. Contractor shall provide either property insurance in the form of Builder's Risk or installation floater as appropriate for the work as required herein.

B. Contractor shall provide and maintain installation floater insurance for property under the care, custody, or control of Contractor. The installation floater insurance shall be a broad form or "all risk" policy providing coverage for all materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work. Coverage under the Contractor's installation floater will include:

1. any loss to property while in transit,
2. any loss at the Site, and
3. any loss while in storage, both on-site and off-site.

Coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable. The Contractor will be solely responsible for any deductible carried under this coverage and claims on materials, supplies, machinery, fixture, and equipment that will be incorporated into the Work while in transit or in storage. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

SC-6.05.A.1 Add the following new subparagraph after subparagraph 6.05.A.1:

a. In addition to Owner, Contractor, and all Subcontractors, include as insureds the following:

1) Engineer

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

SC-7.09 Taxes

SC 7.09 Add a new paragraph immediately after Paragraph 7.09.A:

B. Owner is exempt from payment of sales and compensating use taxes of the State of Ohio and of cities and counties thereof on all materials to be incorporated into the Work.

1. Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.
2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

SC-7.12 Safety and Protection

SC-7.12 Insert the following after the second sentence of Paragraph 7.12.C:

The Owner's Safety Program is applicable to the Work.

A copy of the Safety Program requirements may be obtained from the Owner.

ARTICLE 9 – OWNER'S RESPONSIBLITIES

SC-9.11 Evidence of Financial Arrangements

SC-9.11 Add the following new paragraph immediately after Paragraph 9.11.A:

B. The Owner has funded this project with the assistance of Funding Agencies. The requirements of the funding agency are listed in the Exhibits to the Supplementary Conditions and are made a part of the Contract Documents. Contractor shall comply with the requirements of the funding agencies, when there is a conflict between the funding agency requirements and any part of the Contract Documents the funding agency requirements shall take precedence, without voiding any requirement of the Contract Documents.

SC-9.13 Owner's Site Representative

SC-9.13 Add the following new paragraph immediately after Paragraph 9.12 of the General Conditions:

SC-9.13 The Owner may furnish an Owner's Site Representative to represent the Owner at the site to observe progress and quality of the work. The Owner's Site Representative is not the Engineer's Consultant, agent or employee, but will possess the same authority over the work as defined for the RPR in Section SC10.03.B.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.03 Project Representative

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.A:

B. The Resident Project Representative (RPR), if provided, will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall

generally communicate with Owner only with the knowledge of and under the direction of Engineer.

2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.

3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.

4. Liaison:

    a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

    b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

    c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.

5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. Shop Drawings and Samples:

    a. Record date of receipt of Samples and Contractor-approved Shop Drawings.

    b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

    c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.

7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

8. Review of Work and Rejection of Defective Work:

    a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.

    b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the

integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:

   a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

   b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

10. Records:

   a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

   b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

   c. Maintain records for use in preparing Project documentation.

11. Reports:

   a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

   b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

   c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the

payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

14. Completion:

    a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.

    b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.

    c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.

5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

8. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC-13.01 Cost of the Work

SC 13.01.B.5.c Delete Paragraph 13.01.B.5.c in its entirety and insert the following in its place:

c. Construction Equipment and Machinery:

1) Rentals of all construction equipment and machinery, and the parts thereof, 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.

2) Costs for equipment and machinery owned by Contractor will be paid at a rate shown for such equipment in the Rate Book appropriate for the Project. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs. Costs will include the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, shall cease to accrue when the use thereof is no longer necessary for the changed Work. Equipment or machinery with a value of less than $1,000 will be considered small tools.

SC-13.03 Unit Price Work

SC 13.03.E Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment under the following conditions:

1. if the extended price of a particular item of Unit Price Work amounts to 5 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and

2. if there is no corresponding adjustment with respect to any other item of Work; and

3. if Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may submit a Change Proposal, or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner may make a Claim, seeking an adjustment in the Contract Price.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.02 Tests, Inspections and Approvals

SC 14.02.B Delete Paragraph 14.02.B in its entirety and insert the following in its place:

B. Contactor shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Contractor, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.01 Progress Payments

SC 15.01.A Add the following new subparagraph to Paragraph 15.01.A:

1. Mobilization for Contractor and any tier of subcontractor(s) shall be considered collectively and shall not exceed 5 percent of the Contract Price. Mobilization shall be those costs associated with the initiation of the project and site work, including but not limited to, transporting of personnel, equipment, materials, supplies, incidental items; establishment of the field offices, temporary facilities necessary for the project, bonds and insurances, submittal requirements, permits, field supervision, final cleanup and demobilization. Mobilization does not include such items as, contract negotiations and bid preparation.

   a. Where the work is covered by unit price and no item has been included for mobilization as defined in Section 01010., then this work is considered incidental to the work and will not be paid separately.

   b. Where the work is covered by unit prices, and item(s) for mobilization, as described in Section 01010 have been included, the maximum allowable amount shall be ten percent of the aggregate of all items excluding mobilization. Where mobilization is included as multiple items, then the aggregate amount of all mobilization items shall not exceed the allowable 5 percent.

2. Costs for submittal requirements, field office and supervision, where identified separately in the schedule of values shall be considered for payment monthly. When the cost is a lump sum as submitted in accordance with 2.6, the monthly cost shall be established by dividing the lump sum by the number of monthly estimates based on the original contract time. No adjustments shall be made for any contract time extensions.

3. Mobilization shall be included in the progress payments, in accordance with the schedule of values and unit prices. When the work, excluding mobilization and inventory, has progressed to an amount equal to five percent or more of the contract price, then an amount of not more than 50 percent of the mobilization cost will be considered for inclusion in the progress payment. Prior to the established five percent, Owner may consider payment on invoices for bonds and insurances and permits; this amount shall be subtracted for the total amount from mobilization.

   Up to an additional 40 percent of the mobilization cost will be considered for inclusion in the progress payments once the work, excluding mobilization and inventory, has progressed to an amount equal to 50 percent of the Contract Price. The remaining mobilization payment will be paid as part of the final payment.

15.03 Substantial Completion

SC 15.03.B Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

END OF SECTION

EXHIBIT 1

DAVIS BACON WAGE RATES
(TO BE PROVIDED BY ADDENDUM)

EXHIBIT 2

OPWC DOCUMENTS

STATE OF OHIO EQUAL EMPLOYMENT OPPORTUNITY

REQUIREMENTS AND BID CONDITIONS FOR

OPWC-ASSISTED CONSTRUCTION PROJECTS

The following materials are provided for use by local subdivisions in receipt of financial assistance from the Ohio Public Works Commission for the development or redevelopment of capital infrastructure improvements. The materials relate to the State of Ohio's equal employment opportunity requirements for contractors when they participate in State-assisted construction projects.

These materials must be inserted into the contracting subdivision's bidding documents for such State-assisted projects, and must be regarded as an integral component of the bidder's response. The bidder must, as a part of its bid response: elect one of the two Bidder's Affirmative Action Requirements, adopt the Bidder's EEO Covenants, and complete the Bidder's Certification. Failure to complete the required sections may cause the bidder's proposal to be rejected as being non-responsive to the State's Equal Employment Opportunity Requirements and in non-compliance with the State Equal Employment Opportunity Bid Conditions. In addition, the bidder must submit a copy of a valid Certificate of Compliance for Equal Employment Opportunity purposes prior to the execution of a contract.

Should there be any questions regarding the use or meaning of any portion of these materials, questions should be directed to the Equal Opportunity Division at 30 East Broad Street, 18th floor, Columbus, Ohio 43266-0408.

STATE OF OHIO EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS

NOTICE TO CONTRACTORS:

The provisions of the Ohio Administrative Code (OAC) 123:2-3-02 through 124:2-9 regarding Equal Employment Opportunity on State Construction Contracts and State-assisted Construction Contracts, and OAC 123:2-3-02 through 123:2-9 regarding Equal Employment Opportunity and Female Utilization Goals are applicable to this project, and each contractor will be required to comply in all aspects of these provisions.

CERTIFICATE OF COMPLIANCE FOR EEO PURPOSES:

All prime contractors must secure a valid Certificate of Compliance from the Department of Administrative Services, Equal Opportunity Division, prior to execution of a construction contract.

See http://www.das.ohio.gov/Divisions/EqualOpportunity/CertificateofCompliance/tabid/129/Default.aspx for instructions for electronic filing.

>>> Does this bidder have a valid Certificate of Compliance? ____Yes ____No

>>> If "No" to the above, will this bidder be able to obtain a valid Certificate of Compliance prior to the execution of a contract? ____Yes ____No

Bidder must provide a "Yes" answer to one or the other of the above questions.

BIDDER'S AFFIRMATIVE ACTION REQUIREMENTS:

Each prime contract bidder must submit an affirmative action program regarding equal employment opportunity to and receive approval from the State Equal Employment Opportunity (EEO) Coordinator prior to the bid opening, **OR** the prime contract bidder must have evidence within its bid adoption of the minority and female utilization work hour utilization goals and the specific affirmative action steps set forth in 123:2-3 through 123:2-9 of the Ohio Administrative Code.

>>> Has the prime contract bidder prepared and submitted an Affirmative Action Program to the State Equal Employment Opportunity Coordinator and that program has been approved by the State Equal Employment Opportunity Coordinator prior to the bid opening ? ____Yes ____No

>>>If “no”, with this bid response, the prime contract bidder hereby adopts the minority and female work hour utilization goals and the specific affirmative action steps set forth in 123:2-3 through 123:2-9 of the Ohio Administrative Code.

BIDDER'S EEO COVENANTS:

Throughout its performance of any contract awarded to it on this State-assisted project, the prime contract bidder agrees to the following covenants:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, ancestry or sex. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, national origin, ancestry or sex. Such action shall include, but is not limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will in all solicitations or advertisements for employees placed by or on behalf of the prime contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, ancestry or sex.

(3) The contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided by the State Administering Agency advising the said labor union or workers' representatives of the contractor's

commitments under this covenant and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of the Ohio Department of Administrative Services, Equal Opportunity Division and with the implementing rules, regulations and applicable orders of the State Equal Employment Opportunity Coordinator.

(5) The contractor agrees to fully cooperate with the State Administering Agency, the State Equal Employment Opportunity Coordinator and with any other official or agency, or the State or Federal government which seeks to eliminate unlawful employment discrimination, and with all other State and Federal efforts to assure equal employment practices under its contract and the contractor shall comply promptly with all requests and directions from the State Administering Agency, the State Equal Employment Opportunity Coordinator and any of the State of Ohio officials and agencies in this regard, both before and during construction.

(6) Full cooperation as expressed in clause (5), above, shall include, but not be limited to, being a witness and permitting employees to be witnesses and complainants in any proceeding involving questions of unlawful employment practices, furnishing all information and monthly utilization work hour reports required by the OAC 123: 2-9-01 and by the rules, regulations and orders of the State Equal Employment Opportunity Coordinator pursuant thereto, and permitting access to its books, records, and accounts by the State Administering Agency and the State Equal Employment Opportunity Coordinator for purposes of investigation to ascertain compliance with such rules, regulations and orders. Specifically, contractors will submit workforce utilization reports to the State Equal Opportunity Coordinator by the 10th of each month. The monthly reports must be electronically submitted through the following website: http://das.ohio.gov/EOD/CCInputForm29.htm

(7) In the event of the contractor's noncompliance with the nondiscrimination clauses of its contract or with any of the said rules, regulations, or orders, its contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further State Contracts or State-assisted Construction Contracts in accordance with procedures authorized in OAC 123:2-3 through 2-9 and such other sanctions may be instituted and remedies invoked, as provided in OAC 123:2-3 through 2-9 or by regulation, or order of the State Equal Employment Opportunity Coordinator, or as otherwise provided by law.

In the event that its contract is terminated for a material breach of OAC 123:2-3 through 2-9 the contractor shall become liable for any and all damages which shall accrue to the State Administering Agency and Applicant and the State of Ohio as a result of said breach.

(8) The contractor will require the inclusion of language reflecting these same eight covenants within every subcontract or purchase order it executes in the performance of its contract unless exempted by rules, regulations or orders of the State Equal Employment Opportunity Coordinator issued pursuant to O.A.C. 123:2-3-02 so that these provisions will be binding upon each subcontractor or vendor. The contractor will take such actions as the Administering Agency may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided, however, that in any litigation with a subcontractor, vendor or other party as a result of such direction by the State Administering Agency, the contractor may be requested to protect the interests of the State.

>>>The prime contract bidder hereby adopts the foregoing covenants ? ___Yes ____No

BIDDER'S CERTIFICATION:

The undersigned, being a duly authorized officer of the prime contract bidder, does hereby certify to and agree with the foregoing statements and covenants regarding its subscription to the State's Equal Employment Opportunity Requirements for State-assisted Construction Contracts.

_____ ___/____/___
Signature of Authorized Officer Date

_____
Title

>>> PLEASE NOTE: Only a bidder possessing a valid certificate will be awarded a contract pursuant to Chapter 153 of the Revised Code by an owner referred to in section 153.01 of the Revised Code. Application shall be made at least ten working days prior to the date that the bidder expects to receive the certificate. The bidder's failure to elect one of the two Bidder's Affirmative Action Requirements, adopt the Bidder's EEO Covenants, and complete the foregoing certification may cause the bidder's proposal to be rejected as being non-responsive to the State's Equal Employment Opportunity Requirements and in non-compliance with the State Equal Employment Opportunity Bid Conditions. In addition, the bidder must, prior to the execution of a contract, submit to the local subdivision a valid Certificate of Compliance for Equal Employment Opportunity purposes.

"APPENDIX A" OF THE STATE EEO BID CONDITIONS

MINORITY MANPOWER UTILIZATION GOALS AND TIMETABLES

The following minority goals listed are expressed in terms of percentages of work hours for each trade to be used by the contractor in a designated area. Designated areas are defined as Ohio's Standard Metropolitan Statistical Areas (SMSA). They are: Akron, Cincinnati, Cleveland, Columbus, Dayton, Toledo and Youngstown-Warren. In cases where the project is not located in a designated area, the contractor may adopt minority utilization goals of the near/nearest designated area.

AKRON	
All Trades	10%

COLUMBUS	
All Trades	10%

DAYTON	
All Trades	11%

TOLEDO	
All Trades	9%

YOUNGSTOWN	
All Trades	9%

CINCINNATI	
Trade	
Asbestos Workers	9%
Boilermakers	9 %
Carpenters	10%
Elevator Constructors	11%
Floor Layers	10%
Glaziers	10%
Lathers	10%
Marble, Tile, Terrazzo	8%
Millwright	10%
Operating Engineers	11%
Painters	11%
Pipefitters	11%
Plasterers	10%
Plumbers	11%
Sheet Metal Workers	11%
Other Trades	11%

CLEVELAND	
Trade	
Asbestos Workers	17%
Boilermakers	10%
Carpenters	16%
Electricians	20%
Elevator Constructors	20%
Floor Layers	11%
Glaziers	17%
Ironworkers	13%
Operating Engineers	17%
Painters	17%
Pipefitters	17%
Plasterers	20%
Plumbers	17%
Roofers	17%
Other Trades	17%

"APPENDIX B" OF THE STATE EEO BID CONDITIONS

SPECIFIC AFFIRMATIVE ACTION STEPS

The following Affirmative Action steps are directed at increasing minority utilization:

(1) The contractor should maintain a file of the names and addresses of each minority and female referred to it by any individual or organization and what action was taken with respect to each such referred individual, and if the individual was not employed by the contractor, and the reasons therefore. If such individual was sent to the union hiring hall for referral and not referred back by the union or if referred back by the union or if referred, not employed by the contractor, the file should document this and the reason therefore.

To Demonstrate Compliance: Maintain a file of the names, addresses, telephone numbers, and craft of each minority and female applicant showing (a) the date of contact and whether the person was hired; if not, the reason, (b) if the person was sent to a union for referral, and the results (c) follow-up contacts when the contractor was hiring.

(2) The contractor should promptly notify the State Contracting Agency when the Union or Unions with which the contractor has collective bargaining agreements does not refer to the contractor a minority or female worker referred (to the union) by the contractor, or when the contractor has information that the union referral process has impeded efforts to meet its goals.

To Demonstrate Compliance: Have a copy of letters sent, or do not claim the union is impeding the contractors' efforts to comply.

(3) The contractor should disseminate its Equal Employment Opportunity policy within its organization by including it in any company newsletters and annual reports; by advertising at reasonable intervals in union publications; by posting of the policy; by specific review of the policy with minority and female employees; and by conducting staff meetings to explain and discuss the policy.

To Demonstrate Compliance: Have a written EEO policy which includes the name and how to contact the contractor's EEO Officer and (a) include the policy in any company policy manuals, (b) post a copy of the Policy on all company bulletin boards (in the office and on all job sites), (c) records, such as reports or diaries, etc., that each minority and female employee is aware of the Policy and that it has been discussed with them, (d) that the policy has been discussed regularly at staff meetings and (3) copies of newsletters and annual reports which include the Policy.

(4) The contractor should continually monitor all personnel activities to ensure that its EEO policy is being carried out, including the evaluation of minority and female employees for promotional opportunities on a quarterly basis and the encouragement of such employees to seek those opportunities.

To Demonstrate Compliance: Have records that the company EEO Officer reviews all: (a) monthly workforce reports, (b) hiring and terminations, (c) training provided on-the-job, (d) minority and female employees quarterly for promotion and encourages them to prepare for and seek promotion. The records should be the EEO Officer's job description, reports, memos, personnel files, etc., documenting the activities for possible discriminatory patterns.

(5) The contractor should disseminate its EEO policy externally by informing and discussing it with all recruiting sources; by advertising it in news media, specifically including minority and female news media; and by notifying and discussing it with all subcontractors.

To Demonstrate Compliance: Have copies of (a) letters sent, at least six months or at the start of each new major contract, to all recruiting sources (including labor unions) requiring compliance with the Policy, (b) advertising, which has the EEO "tagline" on the bottom, and (c) purchase order and subcontract agreement forms will include or make reference to the State EEO Covenant, Appendix A or B of the Ohio Administrative Code 123:2-3-02.

(6) The contractor should make specific and reasonably recurrent oral and written recruitment efforts directed at minority and women's organizations, and training organizations with the contractor's recruitment area.

To Demonstrate Compliance: Have a record either in a follow-up file for each organization or on the reverse of the notification letter sent under Item 1, above, of the dates, individuals contacted and the results of the contract from telephone calls or personal meetings with the individuals or groups notified under Item 1.

(7) The contractor, where reasonable, should develop on-the-job training opportunities and participate and assist in all Department of Labor funded and/or approved training programs (including Apprenticeship) Programs relevant to the contractor's employee needs consistent with its obligations in the Bid Conditions.

To Demonstrate Compliance: Have records of contributions in cash, equipment supplied and/or contractor personnel provided as instructors for Bureau of Apprenticeship and Training approved or Department of Labor funded training programs and records of the hiring and training of minorities and females referred to Company by such programs.

(8) The contractor should solicit bids for subcontracts (and joint ventures) from available minority and female subcontractors engaged in the trades covered by the Bid Conditions, including circulation of minority and female contractors associations.

To Demonstrate Compliance: Have copies of letters or other direct solicitation of bids for subcontracts/joint ventures from minority/female contractors with a record of the specific response and any follow-up the contractor has done to obtain a price quotation or to assist a minority/female contractor in preparing or reducing a price quotation; have a list of all minority/female subcontracts awarded or joint ventures participated in with dollar amounts, etc.

EXPLANATION OF AN ACCEPTABLE AFFIRMATIVE ACTION PROGRAM:

An Affirmative Action Program is a set of specific and result-oriented procedures to which a Contractor shall apply every good faith effort. The objective of those procedures and efforts is to assure equal employment opportunity. An acceptable Affirmative Action Program will include an analysis of all trades employed by the Contractor within the last year with an explanation of whether Minorities are currently being under-utilized in any one or more trades. A necessary prerequisite to the development of a satisfactory Affirmative Action Program is the identification and analysis of problem areas inherent in Minority employment and an evaluation of opportunities for utilization of Minority group personnel.

Part I - Basic Contents of an Affirmative Action Program:

1. Development or reaffirmation of the contractor's EEO policy in all personnel actions.

2. Formal internal and external dissemination of contractor's EEO policy.

3. Establishment of responsibilities for implementation of the contractor's affirmative action program.

4. Identification of problem areas (deficiencies) by organizational units and job classification.

5. Establishment of goals and objectives by organizational units and job classification, including timetables for completion.

6. Development and execution of action oriented programs designed to eliminate problems and further designed to attain established goals and objectives.

7. Design and implementation of internal audit and reporting systems to measure effectiveness of the total programs.

8. Compliance of personnel policies and practices with Federal sex discrimination guidelines (41 CFR Part 60-20).

9. Active support of local and national community action programs and community service programs, designed to improve the employment opportunities of minorities.

10. Consideration of ethnic minorities and women not currently in the work force having requisite skills who can be recruited through affirmative action measures.

11. Summary data on applicant flow, hires, terminations and promotions, and training for the last twelve months or the last one hundred applicants, hires, etc., whichever is less.

Part II - Analysis of Individual Trades

1. The minority population of the labor area surrounding (contractor's) projects.

2. The size of the minority unemployment force in the labor area surrounding (the contractor's) projects.

3. The percentage of minority work force as compared with the total work force in the immediate labor area.

4. The general availability of minorities having requisite skills in the immediate labor area.

5. The availability of minorities having requisite skills in the area in which the contractor can reasonably recruit.

6. The availability of promotable minority employees within the contractor's organization.

7. The anticipated expansion, contraction, and turnover of an in the work force.

8. The existence of training institutions capable of training minorities in the requisite skills.

9. The degree of training which the contractor is reasonably able to undertake as a means of making all job classes available to minorities.

Goals, timetables and affirmative action commitments must be designed to correct any identifiable deficiencies. Where deficiencies exist and where numbers or percentages are relevant in developing corrective action, the contractor shall establish and set forth specific goals and timetables. Such goals and timetables, with supporting data and the analysis thereof shall be a part of the contractor's written affirmative action program. Where the contractor has not established a goal, its written affirmative action program must specifically analyze each of the factors listed above, and must detail its reason for a lack of a goal. The goals and timetables should be attainable in terms of the contractor's analysis of its deficiencies and its entire action. Thus, in establishing its

goals and timetables, the contractor should consider the results which could be reasonably expected from its good faith efforts to make its overall affirmative action program work. If the contractor does not meet its goals and timetables, the contractor's good faith efforts shall be judged as to whether the contractor is following its program and attempting to make the program work toward the attainment of its goals.

Support data for the above analysis and program shall be compiled and maintained as part of the contractor's affirmative action program. This data should include applicant flow data and applicant rejection ratios indicating minority status.

Compliance Status: No State Contractor's compliance status shall be judged alone by whether or not he reaches his goals and meets his timetables. Rather each Contractor's compliance posture shall be reviewed and determined by reviewing the contents of his program, the extent of his adherence to his program and his good faith efforts to make his program work toward the realization of the program's goals within the timetables set for completion.

"APPENDIX C" OF THE STATE EEO BID CONDITIONS

FEMALE UTILIZATION GOALS

OAC 123:2-3-05 Required utilization analysis and goals

(A) Each state-involved contractor shall include in his/her affirmative action program the information and analysis required pursuant to part IV 401-C of appendix A of rule 123:2-1-01 of the Administrative Code, in addition to female utilization requirements pursuant to the governor's "Executive Order 84-9" and this rule.

(B) As required by the governor's "Executive Order 84-9", the utilization of women shall be, at a minimum, that currently in use by the federal government as of February 15, 1984. This requirement stated at C.F.R. part 60-4 is 6.9 percent utilization of women. This requirement shall remain at 6.9 percent unless further amended by the governor in a subsequent order. This requirement shall be met by a determination of work hours utilized in the same manner as minority utilization hours are calculated.

EXHIBIT 3

WPCLF DOCUMENTS

EPA PROCUREMENT RULES AND REGULATIONS

Ohio Environmental Protection Agency Regulations require that a copy of Sub agreement Provisions and other provisions be included in the bidding documents.

The Contractor's attention is called to the following sections which contain binding requirements:

Contractor Equal Opportunity Certification

Certification Regarding Debarment, Suspension and other Matters

Disadvantaged Business Enterprises Utilization

American Iron and Steel Acknowledgement

Violating Facilities Clause

Utilization of Small Business in Rural Areas

Equal Employment Opportunity (EEO) Requirements

(Required Contract Provision)

The Contractor's EEO Certification Form provided on the following page must be:

(1) included in the contract documents and

(2) referenced in the Instructions to Bidders, informing bidders that the form must be completed and submitted with their bid.

NOTE: If the loan applicant has its own EEO requirements, local procedures and forms may be substituted for the EPA form.

Contractor Equal Employment Opportunity Certification

During the performance of this contract, the undersigned agrees as follows:

1. The undersigned will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The undersigned will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The undersigned agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this equal opportunity (federally assisted construction) clause.

2. The undersigned will, in all solicitations or advertisements for employees placed by or on behalf of the undersigned, state the all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

3. The undersigned will send to each labor union or representative of workers, with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representative of the undersigned's commitment under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The undersigned will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The undersigned will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and relevant orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and accounts by the administering agency of the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of the undersigned's non-compliance with the equal opportunity (federally assisted construction) clause of this contract of with any of the said rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part, and the undersigned may be declared ineligible for further Government contracts of federally assisted construction contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No 11246 of September 24, 1965, or by rules, regulations, or order of the Secretary of Labor, or as provided by law.

7. The undersigned will include this equal opportunity (federally assisted construction) clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order No 11246 of September 24, 1965, so that such provision will be binding upon each subcontract or vender. The undersigned will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for non compliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor, as a result of such direction by the administering agency the undersigned may request the United States to enter into such litigation to protect the interest of the United States.

_____

(Signature) (Date)

_____

(Name and Title of Signer, Please type)

_____

(Firm Name)

Debarment Requirements

(Required Contract Provision)

The Certification Regarding Debarment, Suspension, and Other Responsibility Matters form included on the following page must be:

(1) included in the contract documents and

(2) referenced in the Instructions to Bidders, informing bidders that the form must be completed and submitted with their bid.

Certification Regarding Debarment, Suspension, and Other Responsibility Matters
INSTRUCTIONS

Under Executive Order 12549 an individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program or a subagreement thereunder for $25,000 or more.

Accordingly, each prospective recipient of an EPA grant, loan, or cooperative agreement and any contract or subagreement participant thereunder must complete the attached certification provide an explanation why they cannot. For further details, see the regulation 40 CFR 32.510, Participants' responsibilities.

Go to www.epls.gov to access the Excluded Parties List System (EPLS). The EPLS includes information regarding entities debarred, suspended, proposed for debarment, excluded or disqualified under the nonprocurement common rule, or otherwise declared ineligible from receiving Federal contracts, certain subcontracts, and certain Federal assistance and benefits. This information may include names, addresses, DUNS numbers, Social Security Numbers, Employer Identification Numbers or other Taxpayer Identification Numbers, if available and deemed appropriate and permissible to publish by the agency taking the action.

Where To Submit

The prospective EPA grant, loan, or cooperative agreement recipient must return the signed certification or explanation with its application to Ohio EPA.

A prospective prime contractor must submit a complete certification or explanation to the individual or organization awarding the contract.

Each prospective subcontractor must submit a complete certification or explanation to the prime contractor for the project.

Applicants may reproduce these materials as needed and provide them to their prospective prime contractor, who, in turn, may reproduce and provide them to prospective subcontractors.

Additional copies / assistance may be requested from:

Ohio EPA
Division of Environmental and Financial Assistance
P.O. Box 1049
Columbus, Ohio 43216-1049
(614) 644-2798
www.epa.state.oh.us/defa/

Certification Regarding Debarment, Suspension, and Other Responsibility Matters

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal of State antitrust statues or commission if embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (b) of this certification;

(d) Have not within a three year period preceding this application / proposal had one or more public transactions (Federal, State, or local) terminated for cause or default; and

(e) Will not utilize a subcontractor or supplier who is unable to certify (a) through (d) above.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

_____

Type Name & Title of Authorized Representative

_____

Signature of Authorized Representative

_____

Date

☐ I am unable to certify to the above statements. My explanation is attached.

Disadvantaged Business Enterprises (DBE) Utilization

(Required Contract Provision)

USEPA has a program to encourage the participation of disadvantaged businesses in the construction activities funded by the Clean Water and Drinking Water SRF's. "DBE" is an all inclusive term that includes Minority Business Enterprises (MBE), Women Business Enterprises (WBE), Small Business Enterprises (SBE), Small Business in Rural Areas (SBRA), HUBZone Small Business, Labor Surplus Area Firms (LSAF), and other entities defined as socially and/or economically disadvantaged. While the WPCLF and WSRLA strongly encourage participation by all disadvantaged groups, specific participation goals are negotiated with USEPA only for Minority Business Enterprises and Women's Business Enterprises.

Goals

As a condition of receiving capitalization grants from U.S. EPA for the Water Pollution Control Loan Fund (WPCLF) and the Water Supply Revolving Loan Account (WSRLA), the Ohio EPA negotiates "fair share" Disadvantaged Business Enterprises (DBE) objectives with U.S. EPA. The current negotiated goals for construction related activities are 1.3% of all contracts to MBEs and 1.0% of all contracts to WBEs.

DBE Certification

Under the DBE program, qualified DBE's are those that have been certified as an MBE or WBE. Certifications can be obtained from a federal agency such as the Small Business Administration or the Department of Transportation or by an approved State agency. The Unified Certification Program (UCP) administered by the Ohio Department of Transportation (ODOT) can provide the necessary DBE certifications. Information on the UCP can be found at www.ohioucp.org as well as the ODOT website www.dot.state.oh.us/divisions/equalopportunity/pages/dbe.aspx. Applications for certification by EPA can be found on EPA's Small Business Programs website at www.epa.gov/osbp under the Disadvantaged Business Enterprise Program link. Any questions regarding EPA's certification process should be directed to Teree Henderson of EPA at 202-566-2222.

DBE Qualifications

To qualify for MBE certification, businesses must be 51 percent owned and controlled by a U.S. citizen and Ohio resident belonging to an African American, Native American, Hispanic, or Asian American ethnic group. In addition, the business must be in operation for at least one year prior to submitting an application. For DBE status, a business must be at least 51 percent owned by a socially and economically disadvantaged person who participates in the daily operations of the business. This person must be a woman or of African-American, Hispanic, Native American, Asian American ethnicity.

Program Requirements

To comply with DBE program requirements the WPCLF/WSRLA loan recipient must do the following:

1. Create and maintain a bidder's list (see description below)

2. Include contract conditions applicable to the DBE program in all procurement contracts entered into by the Borrower for all WPCLF and WSRLA projects. These conditions are listed below.
3. Follow, document, and maintain documentation of good faith efforts on the part of prime contractors to ensure that Disadvantaged Business Enterprises (DBEs) have the opportunity to participate in the project.
4. Review the Form 6100-3 and 6100-4 submittals provided by bidders on the project for completeness and obtain any additional information necessary to verify the certification status of all proposed subcontractors.
5. Obtain documentation of the good faith efforts of the prime contractor if the prime contractor does not meet the MBE or WBE goal.
6. Obtain a written confirmation from any prime contractor states that they will not meet the MBE and WBE goals because they will not be entering into any agreements for goods or services with any company, firm, joint venture, or individual.
7. Submit the following to the Ohio EPA/DEFA as part of the bid package upon which the WPCLF/WSRLA loan amount is determined:
   - Form 6100-3 from each subcontractor
   - Form 6100-4 from each prime contractor
   - a copy of the Good Faith Efforts documentation from any prime contractors that will not meet the MBE and WBE goals,
   - if any of the prime contractors will not meet the MBE and WBE goals because they will not be entering into any agreements for goods or services with any company, firm, joint venture, or individual, a copy of the written confirmation from that prime contractor
8. Report MBE/WBE accomplishments on Form 5700-52A annually (within 15 days after October 1st).

NOTE: It is up to the WPCLF/WSRLA loan recipient whether or not to require completion and submission of Forms 6100-3 and 6100-4 from all bidders with the bid proposal or to accept completion and submission from the successful bidder(s) only at some time after bids are received. Regardless of whether the forms are completed and submitted with the bids or at some later time once the successful bidders are identified, completed forms are to be submitted to Ohio EPA with the bid package.

To comply with DBE program requirements all prime contractors must do the following:

1. Follow, document, and maintain documentation of their good faith efforts.
2. Complete and submit **Form 6100-4 DBE Subcontractor Utilization Summary** as part of the bid proposal package to the loan recipient.
3. Have its Disadvantaged Business Enterprise subcontractors complete **Form 6100-3 DBE Subcontractor Proposed Performance Form** and submit those as part of the bid proposal package to the loan recipient.
4. Provide **Form 6100-2 DBE Subcontractor Actual Participation Form** to all of its Disadvantaged Business Enterprise subcontractors for completion at the end of the work.
5. During construction, provide the data necessary so that the loan recipient can report MBE/WBE accomplishments on Form 5700-52A annually (within 15 days after October 1st).

Bidders List

The Borrower must create, maintain, and use a bidders list for purposes of soliciting both MBE/WBEs and non-MBE/WBEs during procurement of construction, equipment, supplies, and services. This list shall include:

1. Entity's name with point of contact;
2. Entity's mailing address, telephone number, and e-mail 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.

Borrowers that receive less than $250,000 or less in any one fiscal year can be exempt from maintaining a Bidders List.

The Bidders List shall be maintained until the project period has expired and the Borrower is no longer receiving EPA funding. The Bidders List must include all firms that bid on the prime contracts, or bid or gave a quote on subcontracts, including both MBE/WBEs and non-MBE/WBEs.

Required Contract Conditions

The DBE Specification language and instructions to the bidders and Forms 6100-2, 6100-3 and 6100-4 must be included in the contract documents and referenced in the Instructions to Bidders, informing bidders that the forms must be completed and submitted with their bid for all WPCLF and WSRLA projects:

1. The prime contractor must pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the owner.
2. The prime contractor must notify the owner in writing prior to the termination of any Disadvantage Business Enterprise subcontractor for convenience by the prime contractor.
3. If a Disadvantage Business Enterprise contractor fails to complete work under the subcontract for any reason, the prime contractor must employ the six Good Faith Efforts (listed below) if soliciting a replacement contractor.
4. The prime contractor must employ the six Good Faith Efforts even if the prime contractor has achieved its fair share objectives.
5. An owner must ensure that each procurement contract it awards contains the following terms and conditions:

    The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR Part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

Good Faith Efforts

Borrowers and their prime contractors must follow, document, and maintain documentation of their good faith efforts as listed below to ensure that Disadvantaged Business Enterprises (DBEs) have the opportunity to participate in the project by increasing DBE awareness of procurement efforts and outreach.

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities; including DBEs on solicitation lists and soliciting them whenever they are potential sources.
2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.
3. Consider in the contracting process whether firms competing for large contracts could be subcontracted with DBEs. This will include dividing total requirements when economically feasible into smaller tasks or quantities to permit participation by DBEs in the competitive process.
4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
5. Use the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce.
6. If the prime contractor awards subcontracts, require the prime contractor to take the steps in numbers 1 through 5 above.

DBE Forms

Form 6100-3 – Each prime contractor must have its DBE subcontractors complete **Form 6100-3 DBE Subcontractor Proposed Performance Form**. This form gives the DBE subcontractor the opportunity to report the scope and cost of the subcontract and it should be forwarded to the Prime Contractor along with the DBE's quote. Each subcontractor completes one Form 6100-3. The Borrower must submit all Form 6100-3 forms to the Ohio EPA/DEFA as part of the bid package upon which the WPCLF/WSRLA loan amount is determined.

Form 6100-4 – Each prime contractor must complete and submit **Form 6100-4 DBE Subcontractor Utilization Summary** as part of the prime contractor's bid proposal package to the Borrower. This form summarizes the Prime Contractor's intended use of identified DBE(s) and the estimated dollar amount of each subcontract. Only one Form 6100-4 form is required from each Prime Contractor. The Borrower must submit this form to the Ohio EPA/DEFA as part of the bid package upon which the WPCLF/WSRLA loan amount is determined.

Form 6100-2 - The prime contractor must provide **Form 6100-2 DBE Subcontractor Actual Participation Form** to all of its Disadvantaged Business Enterprise subcontractors.

This form gives the DBE subcontractor the opportunity to describe the work the DBE received from the Prime Contractor, how much the DBE was paid and any other concerns the DBE might have. Disadvantaged Business Enterprise subcontractors must send completed Form 6100-2 directly to the Region 5 DBE Coordinator:

Adrianne M. Callahan, Region 5 MBE/WBE Coordinator
USEPA, Acquisition and Assistance Branch
77 West Jackson Boulevard (MC-10J)
Chicago, IL 60604

This form is completed after the work by the subcontractor is done, and is NOT submitted with the bid package to Ohio EPA.

Reporting During Construction – Form 5700-52A

The purpose of MBE/WBE reporting is to monitor the grant recipient's accomplishments in utilizing MBEs and WBEs; and adherence to the good faith efforts (i.e., outreach to MBEs, WBEs, and other DBEs); and progress in achieving MBE and WBE Goals. During the progress of the construction project, the loan recipient must complete & submit Form 5700-52A annually (**within 15 days after October 1st**). If there were no MBEs or WBEs utilized, or no procurement expenditures of any kind were made during the reporting period, a "negative report" is still required.

Reports are to be sent to:

Becky McKinney Ohio EPA – DEFA
P.O. Box 1049
Columbus, OH 43216-1049
E-mail address: Rebecca.McKinney@epa.ohio.gov
Phone: (614) 644-3636
Fax: (614) 644-3687

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

This form is intended to capture the DBE[1] subcontractor's[2] description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name	Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.	Email Address	
Prime Contractor Name	Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services , Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: ___DOT ___SBA ___Other: _____	Meets/ exceeds EPA certification standards? ___YES___NO___Unknown	

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	**Print Name**
Title	**Date**

Subcontractor Signature	**Print Name**
Title	**Date**

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE[1] subcontractors[2] and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.	Email Address	
Issuing/Funding Entity:		

I have identified potential DBE certified subcontractors	___YES	___NO
If yes, please complete the table below. If no, please explain:		

Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt.	Currently DBE Certified?
	Continue on back if needed		

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	**Print Name**
Title	**Date**

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE[1] subcontractor[2] the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.	Email Address	
Prime Contractor Name	Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services , Equipment or Supplies	Amount Received by Prime Contractor

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	**Date**

OMB CONTROL NO. 2030-0020
APPROVED: 06/30/2014
APPROVAL EXPIRES: 06/30/2017

U.S. ENVIRONMENTAL PROTECTION AGENCY
MBE/WBE UTILIZATION UNDER FEDERAL GRANTS AND COOPERATIVE AGREEMENTS

PART I. (Reports are required even if no procurements are made during the reporting period.)

1A. FEDERAL FISCAL YEAR (Oct. 1-Sep 30) 20_____	1B. REPORTING PERIOD (Check ALL appropriate boxes) ☐ 1st (Oct-Dec) ☐ 2nd (Jan-Mar) ☐ 3rd (Apr-Jun) ☐ 4th (Jul-Sep) ☐ Semi-Annual (Oct-Mar) ☐ Semi-Annual (Apr-Sep) ☐ Annual ☐ Check if this is the last report for the project (Project completed).
1C. REVISION OF A PRIOR REPORT? Y or N Year: _____ Quarter: _____	BRIEFLY DESCRIBE THE REVISIONS YOU ARE MAKING:

2A. EPA FINANCIAL ASSISTANCE OFFICE ADDRESS (ATTN: DBE Coordinator)		3A. RECIPIENT NAME AND ADDRESS	
2B. EPA DBE COORDINATOR Name: E-mail:	2C. PHONE: Fax:	3B. RECIPIENT REPORTING CONTACT: Name: E-mail:	3C. PHONE: Fax:
4A. FINANCIAL ASSISTANCE AGREEMENT ID NUMBER (SRF State Recipients, refer to Instructions for Completion of blocks 4A, 5A and 5C.)		4B. FEDERAL FINANCIAL ASSISTANCE PROGRAM TITLE or CFDA NUMBER:	

5A. TOTAL ASSISTANCE AGREEMENT AMOUNT (SRF State Recipients, refer to Instructions for Completion of blocks 4A, 5A and 5C.) EPA Share: $ _____ Recipient Share: $_____	5B. If NO procurement and NO accomplishments were made this reporting period (by the recipients, sub-recipients, loan recipients, and prime contractors), **CHECK** and **SKIP** to Block No. 7. (Procurements are all expenditures through contract, order, purchase, lease or barter of supplies, equipment, construction, or services needed to complete Federal assistance programs. Accomplishments, in this context, are procurements made with MBEs and/or WBEs. ☐

5C. Total Procurements This Reporting Period
(Only include amount not reported in any prior reporting period)

Total Procurement Amount $_____(Include total dollar values awarded by recipient, sub-recipients and SRF loan recipients, **including MBE/WBE expenditures.**)

5D.
Were sub-awards issued under this assistance agreement? Yes ☐ No ☐ Were contracts issued under this assistance agreement ? Yes ☐ No ☐

5E. MBE/WBE Accomplishments This Reporting Period

Actual MBE/WBE Procurement Accomplished:
(Include total dollar values awarded by recipient, sub-recipients, SRF loan recipients and Prime Contractors.)

	Construction	Equipment	Services	Supplies	Total
$MBE:	_____	_____	_____	_____	_____
$WBE:	_____	_____	_____	_____	_____

6. COMMENTS: (If no MBE/WBE procurements were accomplished during the reporting period, please explain what steps you are taking to achieve the MBE/WBE Program requirements specified in the terms and conditions of the Assistance Agreement.)

7. NAME OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	TITLE
8. SIGNATURE OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	DATE

PART II. **MBE/WBE PROCUREMENTS MADE DURING REPORTING PERIOD**

EPA Financial Assistance Agreement Number: _____

1. Procurement Made By			2. Business Enterprise		3. $ Value of Procurement	4. Date of Procurement MM/DD/YY	5. Type of Product or Services[A] (Enter Code)	6. Name/Address/Phone Number of MBE/WBE Contractor or Vendor
Recipient	Sub-Recipient and/or SRF Loan Recipient	Prime	Minority	Women				

Type of product or service codes:

1 = Construction 2 = Supplies 3 = Services 4 = Equipment

Note: Refer to Terms and conditions of your Assistance Agreement to determine the frequency of reporting. Recipients are required to submit MBE/WBE reports to EPA beginning with the Federal fiscal year quarter the recipients receive the award, continuing until the project is completed.

Instructions:

A. General Instructions:

MBE/WBE utilization is based on 40 CFR Part 33. EPA Form 5700-52A must be completed by recipients of Federal grants, cooperative agreements, or other Federal financial assistance which involve procurement of supplies, equipment, construction or services to accomplish Federal assistance programs.

Recipients are required to report 30 days after the end of each federal fiscal quarter, semiannually, or annually, per the terms and conditions of the financial assistance agreement.

	Quarterly Reporting Due Date	Semiannual Reporting Due Date	Annual Reporting Due Date
Agreements awarded prior to May 27, 2008	January 30, April 30, July 30, October 30	N/A	October 30
Agreements awarded on or after May 27, 2008	N/A	April 30, October 30	October 30

MBE/WBE program requirements, including reporting, are material terms and conditions of the financial assistance agreement.

B. Definitions:

Procurement is the acquisition through contract, order, purchase, lease or barter of supplies, equipment, construction or services needed to accomplish Federal assistance programs.

A ***contract*** is a written agreement between an EPA recipient and another party (also considered "prime contracts") and any lower tier agreement (also considered "subcontracts") for equipment, services, supplies, or construction necessary to complete the project. This definition excludes written agreements with another public agency. This definition includes personal and professional services, agreements with consultants, and purchase orders.

A ***minority business enterprise*** **(MBE)** is a business concern that is (1) at least 51 percent owned by one or more minority individuals, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority individuals; and (2) whose daily business operations are managed and directed by one or more of the minority owners. In order to qualify and participate as an MBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

U.S. citizenship is required. Recipients shall presume that minority individuals include Black Americans, Hispanic Americans, Native Americans, Asian Pacific Americans, or other groups whose members are found to be disadvantaged by the Small Business Act or by the Secretary of Commerce under section 5 of Executive order 11625. The reporting contact at EPA can provide additional information.

A ***woman business enterprise*** **(WBE)** is a business concern that is, (1) at least 51 percent owned by one or more women, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more women and (2) whose daily business operations are managed and directed by one or more of the women owners. In order to qualify and participate as a WBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

Business firms which are 51 percent owned by minorities or women, but are in fact managed and operated by non-minority individuals do not qualify for meeting MBE/WBE procurement goals. U.S. Citizenship is required.

Good Faith Efforts

A recipient is required to make the following good faith efforts whenever procuring construction, equipment, services, and supplies under an EPA financial assistance agreement. These good faith efforts for utilizing MBEs and WBEs must be documented. Such documentation is subject to EPA review upon request:

1. Include of MBEs/WBEs on solicitation lists.
2. Assure that MBEs/WBEs are solicited once they are identified.
3. Divide total requirements into smaller tasks to permit maximum MBE/WBE participation, where feasible.
4. Establish delivery schedules which will encourage MBE/WBE participation, where feasible.
5. Encourage use of the services of the U.S. Department of Commerce's Minority Business Development Agency (MBDA) and the U.S. Small Business Administration to identify MBEs/WBEs.

6. Require that each party to a subgrant, subagreement, or contract award take the good faith efforts outlined here.

C. Instructions for Part I:

1a. Specify Federal fiscal year this report covers. The Federal fiscal year runs from October 1st through September 30th (**e.g. November 29, 2010 falls within Federal fiscal year 2011**)

1b. Check applicable reporting box, quarterly, semiannually, or annually. Also indicate if this is the last report for the project.

1c. Indicate if this is a revision to a previous year, half-year, or quarter, and provide a brief description of the revision you are making.

2a-c. Please refer to your financial assistance agreement for the mailing address of the EPA financial assistance office for your agreement.

The "EPA DBE Reporting Contact" is the DBE Coordinator for the EPA Region from which your financial assistance agreement was originated. For a list of DBE Coordinators please refer to the EPA OSBP website at www.epa.gov/osbp. Click on "Regional Contacts" for the name of your coordinator.

3a-c. Identify the agency, state authority, university or other organization which is the recipient of the Federal financial assistance and the person to contact concerning this report.

4a. Provide the Assistance Agreement number assigned by EPA. A separate report must be submitted for each Assistance Agreement.

***For SRF recipients**: In box 4a list numbers for ALL OPEN Assistance Agreements being reported on this form. Please note that although the New DBE Rule (which took effect May 27, 2008) revised the reporting frequency requirements from quarterly to semiannually, that change only applies to agreements awarded AFTER the New DBE Rule took effect. Therefore, SRF recipients may either continue to report activity for all Agreements on one form on a quarterly basis until the last award that was made prior to the New DBE Rule has been closed out; OR, the recipient may split the submission of SRF reports into quarterly reports for Agreements awarded prior the New DBE Rule, and semiannually for the awards made after the New DBE Rule.

4b. Refer back to Assistance Agreement document for this information.

5a. Provide the total amount of the Assistance Agreement which includes Federal funds plus recipient matching funds and funds from other sources.

***For SRF recipients only**: SRF recipients will not enter an amount in 5a. Please leave 5a blank.

5b. Self-explanatory.

5c. Provide the total dollar amount of **ALL** procurements awarded this reporting period by the recipient, sub-recipients, and SRF loan recipients, **including** MBE/WBE expenditures. For example: Actual dollars for procurement from the procuring office; actual contracts let from the contracts office; actual goods, services, supplies, etc., from other sources including the central purchasing/ procurement centers).

***NOTE**: To prevent double counting on line 5C, if any amount on 5E is for a subcontract and the prime contract has already been included on Line 5C in a prior reporting period, then report the amount going to MBE or WBE subcontractor on line 5E, but exclude the amount from Line 5C. To include the amount on 5C again would result in double counting because the prime contract, which includes the subcontract, would have already been reported.

5d. State whether or not sub-awards and/or subcontracts have been issued under the assistance agreement by indicating "yes" or "no".

5e. Where requested, also provide the total dollar amount of all MBE/WBE procurement awarded during this reporting period by the recipient, sub-recipients, SRF loan recipients, and prime contractors in the categories of construction, equipment, services and supplies. These amounts include Federal funds plus recipient matching funds and funds from other sources.

***For SRF recipients only**: In 5c please enter the total procurement amount for the quarter, or semiannual period, under all of your SRF Assistance Agreements. The figure reported in this section is **not** directly tied to an individual Assistance Agreement identification number. **(SRF state recipients report state procurements in this section)**

6. If there were no MBE/WBE accomplishments this reporting period, please briefly explain what

specific steps you are taking to achieve the MBE/WBE requirements specified in the terms and conditions of the Assistance Agreement.

7. Name and title of official administrator or designated reporting official.

8. Signature, month, day, and year report submitted.

D. Instructions for Part II:

For each MBE/WBE procurement made under this assistance agreement during the reporting period, provide the following information:

1. Check whether this procurement was made by the recipient, sub-recipient/SRF loan recipient, or the prime contractor.

2. Check either the MBE or WBE column. If a firm is both an MBE and WBE, the recipient may choose to count the entire procurement towards EITHER its MBE or WBE accomplishments. The recipient may also divide the total amount of the procurement (using any ratio it so chooses) and count those divided amounts toward its MBE and WBE accomplishments. If the recipient chooses to divide the procurement amount and count portions toward its MBE and WBE accomplishments, please state the appropriate amounts under the MBE and WBE columns on the form. **The combined MBE and WBE amounts for that MBE/WBE contractor must not exceed the "Value of the Procurement" reported in column #3**

3. Dollar value of procurement.

4. Date of procurement, shown as month, day, year. Date of procurement is defined as the date the contract or procurement was awarded, **not** the date the contractor received payment under the awarded contract or procurement, unless payment occurred on the date of award. **(Where direct purchasing is the procurement method, the date of procurement is the date the purchase was made)**

5. Using codes at the bottom of the form, identify type of product or service acquired through this procurement (e.g., enter 1 if construction, 2 if supplies, etc).

6. Name, address, and telephone number of MBE/WBE firm.

**This data is requested to comply with provisions mandated by: statute or regulations and 33); OMB Circulars; or added by EPA to ensure sound and effective assistance management. Accurate, complete data are required to obtain funding, while no pledge of confidentiality is provided.

The public reporting and recording burden for this collection of information is estimated to average l hour per response annually. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclosure or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, OPPE Regulatory Information Division, U.S. Environmental Protection Agency (2136), 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB Control number in any correspondence. Do not send the completed form to this address.

AMERICAN IRON AND STEEL ACKNOWLEDGEMENT

The Contractor acknowledges to and for the benefit of Northwestern Water & Sewer District ("Purchaser") and the State of Ohio (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

_____ _____

Signature Date

_____

Name and Title of Authorized Signatory, Please Print or Type

_____

Bidder's Firm

☐ Check here if the WPCLF or WSRLA applicant will be requesting an individual waiver for non-American made iron and steel products. Please note that the waiver box does not need to be marked for nationwide waivers.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 20 2014

OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014

FROM: Andrew D. Sawyers, Director
Office of Wastewater Management (4201M)

Peter C. Grevatt, Director
Office of Ground Water and Drinking Water (4601M)

TO: Water Management Division Directors
Regions I - X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

Violating Facilities Clause

(Required Contract Provision)

Language prohibiting this use of equipment or services from anyone on the EPA List of Violating Facilities must be included in the contract documents.

Violating Facilities:

The Contractor agrees to comply with all applicable standards, orders or requirements under Section 306 of the Clean Air Act, 42 USC 1857 (h), Section 508 of the Clean Water Act, 33 USC 1368, Executive Order 11738, and EPA regulations, 40 CFR Part 32, which prohibits the use under non-exempt Federal contracts, grants, or loans of facilities included on the EPA List of Violating Facilities.

NOTE: THE CONTRACT LANGUAGE SAMPLES PROVIDED HEREIN ARE EXAMPLES OF WHAT COULD BE INCLUDED IN ALL CONTRACTS THAT USE WPCLF OR WSRLA FUNDS. OHIO EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THESE CLAUSES WITH RESPECT TO STATE OR LOCAL LAW. IT IS IMPERATIVE THAT ANY PARTY INSERTING THESE CLAUSES INTO A CONTRACT VERIFY THAT THEY ARE LEGAL AND ENFORCEABLE ACCORDING TO STATE AND LOCAL LAWS, REGULATIONS, AND ORDINANCES.

Requirement For Utilization Of Small Businesses In Rural Areas (SBRA)

(Required Contract Provision)

The following policy should be added to the "Instructions to Bidders" section and referenced in the Table of Contents for the contract documents:

> This procurement is subject to the EPA policy of encouraging the participation of small businesses in rural areas. It is EPA policy that recipients of EPA financial assistance awards utilize the services of small businesses in rural areas (SBRAs), to the maximum extent practicable. The objective is to assure that such small business entities are afforded the maximum practicable opportunity to participate as subcontractors, suppliers and otherwise in EPA-awarded financial assistance programs. This policy applies to all contracts and subcontracts for supplies, construction, and services under EPA grants or cooperative agreements. Small purchases are also subject to this policy.

If possible, also add the following language to the "Advertisement for Bids":

> This procurement is subject to the EPA policy of encouraging the participation of small business in rural areas (SBRAs).

NOTE: THE CONTRACT LANGUAGE SAMPLES PROVIDED HEREIN ARE EXAMPLES OF WHAT COULD BE INCLUDED IN ALL CONTRACTS THAT USE WPCLF OR WSRLA FUNDS. OHIO EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THESE CLAUSES WITH RESPECT TO STATE OR LOCAL LAW. IT IS IMPERATIVE THAT ANY PARTY INSERTING THESE CLAUSES INTO A CONTRACT VERIFY THAT THEY ARE LEGAL AND ENFORCEABLE ACCORDING TO STATE AND LOCAL LAWS, REGULATIONS, AND ORDINANCES.

State of Ohio

WATER POLLUTION CONTROL LOAN FUND (WPCLF/SRF)

CONTRACT CHANGE ORDER

RECIPIENT_____ CHANGE ORDER NBR _____

LOAN NUMBER_____ CONTRACT _____

OWDA PROJECT No. _____ DATE _____

Description of Change:

RECOMMENDED BY: _____ DATE: _____
(Engineer)

APPROVED BY: _____ DATE: _____
(Recipient)

ACCEPTED BY: _____ DATE: _____
(Contractor)

_____
(Company)

Original Contract Amt		
Previous Changes (+ / --)		
This Change (+ / --)		
Adjusted Contract Amt		

OWDA APPROVAL

The above proposal is hereby accepted and I recommend that it be approved and made a part of the contract noted above. The approval does not constitute an increase in the total loan amount, but represents approval for the work.

Ohio EPA Acceptance	Chief Engineer
Date	Date

CHANGE ORDER INSTRUCTIONS:

All Change Orders for this work, regardless of costs and whether Water Pollution Control Loan Fund (WPCLF) or Water Supply Revolving Loan Account (WSRLA) funding will be used to finance the changes, must be submitted to Ohio EPA for review.

Changes Requiring Prior Approval

Any change which substantially modifies the Project Facilities as specified in the Ohio EPA approved Facilities Plan and Final Permit to Install or Final Plan Approval (when applicable) or alters the direct or indirect impact of the Project Facilities upon the environment must be incorporated into a Change Order. One copy of the Change Order prior to execution is to be submitted to Ohio EPA for review and prior approval of the acceptability of the change. "Prior to execution" means before the Change Order is signed by the Owner.

Ohio EPA will review the Change Order and inform the Owner of the technical, environmental and operational acceptability of the change, and give the Owner permission to proceed with the proposed work.

All Other Changes

Change Orders not requiring prior approval as described above must be submitted to Ohio EPA within one (1) month of the time at which they are approved by the Owner. Change Orders for WPCLF projects should be submitted to the Division of Environmental and Financial Assistance (DEFA) while Change Orders for WSRLA projects should be submitted to the Division of Drinking and Ground Water (DDAGW) in central office.

Change Order Approval Process

After the Change Order is executed, one (1) copy of the Change Order, including the supporting documentation, is to be sent to Ohio EPA for final review. The WPCLF/WSRLA Change Order forms must have original signatures.

Communities have the option to submit hard copies of the project Change Orders via mail to Ohio EPA or to send PDF Change Order forms and supporting documentation electronically. With either hard copy or electronic submittals, the WPCLF Change Orders should be submitted to DEFA and WSRLA Change Orders should be submitted to DDAGW - Central Office.

The dedicated e-mail address for the electronic submittal of WPCLF Change Orders is EPAWPCLFCO@epa.ohio.gov.

The dedicated e-mail address for the electronic submittal of WSRLA Change Orders is EPAWSRLACO@epa.ohio.gov.

After the Change Order is accepted and eligible costs determined, Ohio EPA will issue a letter informing the Owner and authorizing OWDA to disburse funds from Project Contingency for the work. The OEPA letter will be sent electronically. OWDA will return a PDF of the WPCLF/WSRLA Change Order form which will be signed by all parties including Ohio EPA and OWDA.

Please notify Ohio EPA if the community prefers a hard copy of change order approval documentation and then Ohio EPA and OWDA will send hard copies of approval documentation through the mail.

Payments for Change Order Work

The Owner is precluded from submitting to the OWDA payment requests for Eligible Project Costs associated with the Change Orders until such time as the Ohio EPA's approval of the Change Orders has been obtained.

EXHIBIT 4

ELECTRONIC DOCUMENT RELEASE

M E M O R A N D U M

To: _____

Subject: Northwestern Water & Sewer District
Willowbend Pump Station Improvements
Electronic Document Release
AutoCAD File for Base Drawing
796-7215.002

From: Ted Bennett, P.E. Date: _____

In reference to your request for electronic CAD files for the project, we will provide the requested base drawing electronic file upon your signature below indicating agreement with our electronic document release policy.

These electronic files are provided to you for your convenience and the Owner's Benefit. Because electronic files can deteriorate or be damaged or be modified inadvertently or information from the electronic documents may be presented to you on your system differently than the original because of your software or system setup, these files may not be accurate. Any conclusion or information obtained or derived from such electronic files will be at your sole risk.

Information contained in the electronic documents is for information and reference in connection with this project only. The information is not intended or represented to be suitable for reuse on extensions of the original project or on any other project.

You should perform an acceptance test of the electronic documents immediately and inform us of any problems with the electronic documents. Jones & Henry will not be responsible for providing additional copies of these electronic files to you after 60 days from the date the documents are provided to you.

Additional conditions relative to Use of Documents may be in the Agreement between Jones & Henry and our client and should be reviewed before you attempt to use the documents.

_____ accepts the conditions of the above statement.
(FIRM NAME)

Authorized Signature

_____ _____
DATE

c: Project Distribution via eComm

SECTION 01010
DEFINITION OF CONTRACT ITEMS

ITEM 0 GENERAL

0.01 FOREWORD

A. This Section describes the various Contract Items listed in the Bid.

0.02 WORK INCLUDED

A. Under each Item the Contractor shall furnish all labor, materials, tools, plant equipment, supplies, maintenance of equipment, heating, lighting and power, insurance and bonds, coordination, and all Work and in accordance with the Specifications Parts A, B, and Divisions 1 through 16 of Part C and necessary to complete the Work in accordance with the obvious or expressed intent of the Contract Documents.

0.03 WORKMANSHIP AND MERIALS

A. The quality of workmanship and materials entering into any and all of the Items and the Work included shall conform to pertinent sections, paragraphs, sentences, and clauses, both directly and indirectly applicable thereto, contained in the Contract Documents, whether or not direct reference to such occurs under each Item in this Section.

0.04 PAYMENT

A. The lump sum and unit prices stated in the Bid shall be payment in full for the completion of all Work specified and described or required to be included in the Contract, complete, and ready for use.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

PART 4 SPECIAL PROVISIONS

4.01 CONTRACT ITEMS

A. The contract items are defined on the following pages.

ITEM 1
MOBILIZATION AND DEMOBILIZATION

1.01 DESCRIPTION

A. This Item is intended to pay non-recurring cost to the Contractor not recovered under other pay Items of the Contract.

B. This Item shall include, but not be limited to, the cost for moving equipment in and out, performance and payment bonds, insurance, permits, utility connection cost, and other expenses associated with preparation for construction in accordance with the requirements of the Contract Documents.

C. This item is intended to be in accordance with the Supplemental Conditions SC 15.01A.

1.02 WORK NOT INCLUDED

A. Any Work specifically included under other Bid Items.

1.03 DEFINITION OF ITEM

A. Item 1 - Mobilization and Demobilization.

1.04 MEASUREMENT

A. The lump sum stated in the Bid shall be full compensation for all Work required under Item 1.

B. The Contractor is reminded of the requirements of Supplemental Conditions Section 15.01A regarding Mobilization and Demobilization costs as a percentage of the total project cost.

1.05 PAYMENT

A. Payment shall be in accordance with Supplemental Conditions SC 15.01A The Engineer may reduce the amount to be paid under Item 1 if the percentage requested is not represented by the actual amount performed.

ITEM 2
BYPASS PUMPING

2.01 DESCRIPTION

A. Under this Item, the Contractor shall include materials, equipment and labor required to maintain sanitary sewer service during periods when the existing pump stations or new equipment are not in service as needed to complete the scope of work identified for the Contractor in the Contract Documents including; all pumping equipment, piping, accessories, maintenance and controls.

B. Maintaining existing sewers in operation and temporary flow stoppage, diversions and sewer flow by-pass connections shall be included under this Item.

C. This item shall include the cost of mobilizing and demobilizing bypass pumping equipment to the site.

2.02 DEFINITION OF ITEM

A. Item 2 - Bypass Pumping.

2.03 MEASUREMENT & PAYMENT

A. The quantity to be paid for under Item 2 shall be measured per week that the bypass pumping equipment is on site and functioning. No payment will be paid for periods when the equipment is on site, but not functional. A week shall be defined as 7 working days.

B. Payment for periods less than 7-days shall be measured as a percentage of a week.

ITEM 3
STORM WATER POLLUTION PREVENTION

3.01 DESCRIPTION

A. This Item shall include all Work specified in the SWPPP including preparation of a Storm Water Pollution Prevention Plan, installation, maintenance, and removal of all Storm Water Pollution Prevention measures.

B. The weekly inspection and reporting of all Storm Water Pollution Prevention measures shall be included under this item.

C. Obtaining permits and co-permittee coverage specified shall be included under this item.

3.02 WORK NOT INCLUDED

Not used.

3.03 DEFINITION OF ITEM

A. Item 3 - Storm Water Pollution Prevention.

3.04 MEASUREMENT & PAYMENT

B. The lump sum stated in the Bid shall be full compensation for all Work required under Item 3.

C. Payment shall be made in the amount of 20% of the lump sum Bid price for Item 3 for the first monthly estimate and 5% for each monthly estimate thereafter until the lump sum Bid amount for Item 3 has been paid.

D. The Engineer may reduce the amount to be paid under Item 3 if the percentage requested is not represented by the actual amount performed.

ITEM 4
ROCK EXCAVATION

4.01 DESCRIPTION

A. Under this Item, the Contractor shall excavate rock from trenches and excavations for structures included in the Work for pipeline construction as scheduled, shown on the Drawings required and specified herein.

B. This Item is intended to compensate the Contractor for the removal of rock material in trenches and excavations for structures but is not intended to compensate the Contractor for the removal of rock fragments, boulders, cobbles or rock material that may be encountered in trenches. Rock for the purpose of measurement is defined as a formation beginning at the intact surface of rock material an extending 3-feet or more downward from the rock surface through a rock layer consisting of similar rock material.

C. For the purpose of estimating the bid quantity of rock excavation, the Engineer used the information gathered from probings made as described in SC-5.03.

4.02 DEFINITION OF ITEM

A. Item 4 – Trench Rock Excavation (6-inches to 5-feet in depth).

4.03 MEASUREMENT

A. The quantities to be paid under this Item shall be the volume of rock quantity removed, measured in place within the limits as defined below, and scheduled on the Drawings, unless otherwise authorized by the Engineer; in which case, measurement will be made to the authorized limits:

1. Depth

   a. The depth of the rock removal shall be used for determining when measuring payment will be made for this item.

   b. For the purpose of measurement, the depth of the rock removal shall be the defined as the distance from the original surface of the top of the rock face to the bottom of the specified trench to provide the specified bedding depth) as indicated on the plans.

   c. Extra depth removed for convenience of the Contractor shall not be measured for payment)

2. Length

   a. Pipe Trenches - The actual length ordered. The length of rock removal is intended to be measured in addition to the footage of pipe installed.

   b. Structures – See Width section.

3. Width

   a. Pipe Trenches - Rock shall be removed to the limits shown in the Drawings to achieve the specified trench widths (a maximum of 1-foot each side of pipe as measured from the spring line and to the depths required for pipe bedding as shown on the plans).

   b. Structures - Rock shall be removed to the limits shown in the Drawings to achieve the specified widths (a maximum of 2-feet each side of structures and 1-foot below the structure).

   c. If additional width is required to be removed to accommodate the Contractor's shoring system that removal shall be included in the cost for the construction of shoring that as included in other Items.

4. If less than 6-inches of rock is removed as part of the excavation operation, this item will not be measured for payment.

4.04 PAYMENT

A. The quantity to be paid under Item 4 shall be full compensation for each linear foot of trench rock removed for the construction of pipes within the limits defined above.

ITEM 5
SANITARY SEWER PUMP STATION ABANDONMENT AND NEW CONSTRUCTION INCLUDING ACCESSORIES AND APPURTENANCES

5.01 DESCRIPTION

A. These Items includes all work shown on the Drawings and in accordance with the Specifications, Divisions 1 through 16 unless identified in other Items. The summary of items listed below is not intended to be an exhaustive list, instead the list is provided to highlight major work components and to differentiate what work is not included in the other Items provided.

B. Under these Items, the Contractor shall demolish and abandon the existing steel can dry well and wet well as shown on the Drawings and according to the relevant sections of the Specifications. The removal and salvaging of existing equipment as shown on the Drawings or Specified shall be included under this Item. These items shall include above grade and below grade removals. The backfilling of the existing pump station structure as specified is included under these Items.

C. Under these items, the Contractor shall include materials, equipment, electrical and controls, piping and valves, labor, supervision, coordination, overhead, and profit as specified, shown on the Drawings, or otherwise required to complete and place in operation the new pump station wet well and control building, including all specified accessories, and appurtenances with the expectation of a fully functional project at completion.

D. The provision of new electrical equipment and electrical work as required on the customer side of the electric meter is included in these Items.

E. These items include all excavation of materials not included for payment under other Items, including hauling excess spoil material from Site and the placement and compaction of backfill in excavated areas.

F. These items include the construction of shoring and earth retaining systems as required for the excavations included in the Work.

G. These items include the maintenance of trenches and excavations including temporary pavement, dewatering and others measures to maintain open excavations necessary for work included under these items.

H. Modifications to existing structures as shown on the plan are included under these items.

I. The furnishing and placing of special backfill in areas excavated for this work included under these Items

J. The temporary support of utilities as required to complete the Work, shall be included under these Items. All repairs to existing utilities damaged, as a result of construction, are included under these Items.

K. These items include all site improvements including site lighting and pipe bollards.

L. Restoration of landscape surface improvements including seeding, mulching, and fertilizing all disturbed lawn areas shall be included under these items.

5.02 WORK NOT INCLUDED

A. The excavation of rock is included in other Items.

B. Pavement replacement within the Contract limits is included under other Items.

5.03 DEFINITION OF ITEM

A. Item 5a – Willowbend Pump Station and Wet Well Demolition and Abandonment.

B. Item 5b – Willowbend Pump Station Wet Well, Controls Building, Site Improvements, Appurtenances and Accessories.

5.04 MEASUREMENT & PAYMENT

A. The quantities to be paid for under Items 5a through 5b shall be lump sum for the identified scope of work in accordance with the Specifications and Drawings.

ITEM 6
SEWER PIPE

6.01 DESCRIPTION

A. Under these Items, the Contractor shall furnish and perform all Work necessary for the installation of the sewer pipe as scheduled, shown on the Drawings and specified, in conformance with relevant sections of the Specifications.

B. These Items shall include all Work to install gravity sewers, including but not limited to the following: excavation; hauling excess spoil material from the Site; bedding; pipe materials; fittings; connections to existing sewers; backfill; compaction; construction maintenance and related Work such as performing material testing; deflection and infiltration tests.

C. Connections of new sewers to: new and existing manholes or new and existing sewers shall be included under these Items, unless specifically included under other items.

D. Sewer tap connection, for existing or new sewer pipe, to the new sewer shall be included under these Items.

E. All Work required to dewater trenches is included under these Items.

F. Temporary supporting existing utilities, locating of existing utilities, exploratory excavation and backfill required by the utility owner for existing utilities encountered during sewer construction is included under these Items.

G. The removal of existing sewer manholes along the alignment of new sewers shall be included under these Items.

H. The furnishing and placing of special backfill in areas excavated for this work included under these Items is included in these Items.

I. Restoration of landscape surface improvements including seeding, mulching, and fertilizing all disturbed lawn areas shall be included under these Items, unless specifically included under other items.

J. No addition compensation shall be considered for sewers installed within 2 feet of the elevation shown on the Drawings.

K. The placement, compaction and grading of fill required for backfilling drainage ways enclosed in pipes is included under this Item.

6.02 WORK NOT INCLUDED

A. The excavation of rock is included in other Items.

B. Pavement replacement within the Contract limits is included under other Items.

C. Closed circuit television inspection of new sewers 8-inches in diameter and larger installed as part of the Work are included under other Items.

D. Sewers installed to convey sewage around or through the Work during construction will not be measured for payment.

6.03 DEFINITION OF ITEMS

A. Item 6a – 4-inch Drain, Type C.

B. Item 6b – 8-inch Culvert, Type B.

C. Item 6c – 12-inch Driveway Culvert, Type B.

D. Item 6d - 10-inch Sanitary Sewer, Type B.

E. Item 6e - 15-inch Sanitary Sewer, Type B.

F. Item 6f – 24-inch Culvert, Type B.

G. Item 6g – 30-inch Culvert, Type B.

H. Item 6h – 36-inch Culvert, Type B.

I. Item 6i – 12-inch Sewer Removed

6.04 MEASUREMENT & PAYMENT

A. The quantities to be paid under Items 6a through 6i shall be the horizontal length of pipe measured parallel to the axis of the line along the surface of the ground, with no deduction for laying length of fittings for the specified sizes and trench detail. The depth of the pipe shall be the average depth below the original ground surface of the pipe along a section between manholes.

B. Measurement will be to the center of existing and new manholes and the inside face of chambers. No deduction will be made for precast manholes on lines of the same size. Where branches or lines of different diameters enter such manholes, each will be measured to the center thereof.

ITEM 7
FORCE MAIN

7.01 DESCRIPTION

A. Under these Items, the Contractor shall provide all materials, equipment, labor, supervision and coordination as necessary for the installation of the force main pipe by open-cut or trenchless methods as scheduled, as shown on the Drawings.

B. These Items shall include all Work to install the force mains by open-cut methods, including but not limited to the following: excavation;; backfill; compaction; bedding; pipe materials; fittings; thrust blocking, special trench details as provided herein, maintenance of trenches; temporary pavement; connections to existing force mains.

C. These Items shall include all Work to install the force mains by trenchless methods including, but are not limited to, the following: excavation; backfill; compaction; bedding; pipe materials; fittings; excavation of launching and receiving pits; drilling equipment; backfill; compaction; mud mixing; obtaining water and hauling; spoils extraction; tracer wire installation; and utility marker installation.

D. These Items shall include all related Work and materials such as blowoffs testing, flushing, performing pressure tests as shown on the Drawings and specified in conformance with relevant Sections of the Specifications

E. These Items shall also include connections to existing manholes sewers and force mains including the removal of concrete or steel encasements.

F. These Items includes providing all bends as shown on the Drawings, as Specified, and as Directed or required for the installation of the force main.

G. Replacement or repair of existing sewers or field drainage tiles removed or damaged as a result of construction are included in these Items.

H. The furnishing and placing of special backfill in areas excavated for this work included under these Items is included in these Items.

I. The location, excavation, verification of pipe diameters and removal of concrete encasement as needed to perform connections to existing pipes or pipelines is included in these Items.

J. The coring of existing manholes and pipes as needed to accommodate new connections is included under these Items.

K. No distinction is made for bore or receiving pits placed in pavements and the Contractor is expected to include the placement of the specified fill in the bore and receiving pits in unit pricing for trenchless work.

L. All Work required to dewater trenches and excavation is included under these Items.

M. Restoration of landscape surface improvements including seeding, mulching, and fertilizing all disturbed lawn areas shall be included in these Items.

N. The construction of new manhole sections on existing manhole sections is included under this Item.

O. The grading improvements shown on the plans for Manhole 4327 are included in these Items.

7.02 WORK NOT INCLUDED

A. Work specifically included for payment under other Items.

B. Damage to property outside the easements shall be restored or repair at Contractors expense.

7.03 DEFINITION OF ITEMS

A. Item 7a - 8-inch Force Main, Type B.

B. Item 7b - 10-inch Force Main, Type B.

C. Item 7c - 12-inch Force Main, Type B.

D. Item 7d - 12-inch Force Main, Type C.

E. Item 7e - 12-inch Force Main, Trenchless.

F. Item 7f – 20-inch Force Main, Type B.

G. Item 7g – 20-inch Force Main, Type C.

H. Item 7h - Connection to Existing Force Main.

I. Item 7i–Manhole 4327 Modifications

J. Item 7j – 12-inch Connection to Existing Pipeline.

K. Item 7k – Force Main Termination and Abandonment, All Sizes.

L. Item 7l – Force Main Plugged

7.04 MEASUREMENT & PAYMENT

A. The quantities to be paid under Items 7a through 7g shall be the horizontal length of pipe measured parallel to the axis of the line along the surface of the ground, with no deduction for laying length of fittings for the specified sizes and trench detail.

B. The quantities to be paid under Items 7h through 7l shall be the full compensation for each connection the existing structures or pipelines, plug or termination and abandonment of existing force mains furnished and installed in accordance with the Specifications and Drawings.

C. No deduction will be made for valves or air and vacuum release manholes on lines of the same size. Where branches or lines of different diameters are joined, they will be measured to the center point of transition fittings.

ITEM 8
MANHOLES

8.01 DESCRIPTION

A. Under these Items, the Contractor shall construct manholes and drops in locations and of types shown and scheduled on the Drawings and in accordance with the Contract Documents.

B. The modification and connection of existing drop sewers to connect new sewers to existing manholes shall be included under these Items.

C. Work beyond the specified pay limits for the pipe trench, but necessary for the placement of the manholes, shall be included under this Item. Such Work shall include excavation of any material encountered, special backfill material, and pavement replacement.

D. The temporary support of utilities as required to complete the Work, shall be included under these Items.

E. All accessories and appurtenances required for the structures shown on the plans are included in these Items.

F. The furnishing and placing of special backfill in areas excavated for this work included under these Items is included in these Items.

G. Restoration of landscape surface improvements including seeding, mulching, and fertilizing all disturbed lawn areas shall be included under these Items.

8.02 WORK NOT INCLUDED

A. The excavation of rock is included in other Items.

B. Pavement replacement within the Contract limits is included under other Items.

C. Replacement of existing manholes or catch basins removed or damaged for Contractor convenience of construction and which were not planned to be removed shall be done at the Contractor's expense.

D. Pipe connections to manholes shall be included under other Items.

E. These Items include the preparation of Manhole 2 for use as bypass pumping wet well and the conversion of Manhole 2 to a conventional manhole.

8.03 DEFINITION OF ITEMS

A. Item 8a - Type I Sanitary Sewer Manhole.

B. Item 8b –Type II Sanitary Sewer Manhole.

C. Item 8c – Flow Meter Manhole.

D. Item 8d – Flow Meter / Bypass Manhole Conversion

8.04 MEASUREMENT & PAYMENT

A. The quantities to be paid for under Items 8a and 8b, shall be the measured height of manholes, as built, measured from the invert of the deepest pipe to the top of the manhole casting.

B. The quantities to be paid under Items 8c and 8 d shall be lump sump for the flow meter manhole and bypass manhole conversion as shown on the Drawings.

ITEM 9
VALVES & VALVE STRUCTURES

9.01 DESCRIPTION

A. Under these Items, the Contractor shall furnish and perform all Work necessary for the installation of the valves and accessories as shown on the Drawings and specified in conformance with relevant Sections of the Specifications.

B. Valve boxes and manhole structures as required or shown in the Drawings shall be included under these Items.

C. These Items shall include all Work to install new valves and valve structures including but not limited to the following: excavation; hauling excess spoil material from Site; backfill; compaction; bedding; materials; fittings and pipe connections; and related Work such as performing material testing.

D. The furnishing and placing of special backfill in areas excavated for this work included under these Items is included in these Items.

9.02 WORK NOT INCLUDED

A. The excavation of rock is included in other Items.

B. Pavement replacement within the Contract limits is included under other Items.

9.03 DEFINITION OF ITEMS

A. Item 9a - 8-inch Gate Valve and Box.

B. Item 9b – 8-inch Tapping Sleeve, Valve and Box

C. Item 9c – 10-inch Gate Valve and Box

D. Item 9d - 12-inch Gate Valve and Manhole.

E. Item 9e – 12-inch Gate Valve and Box

F. Item 9f – 12-inch Air Release Valve and Manhole.

G. Item 9g – 20-inch Air Release Valve and Manhole.

H. Item 9h – 20-inch Plug Valve and Box

9.04 MEASUREMENT & PAYMENT

A. The quantities to be paid under Items 9a through 9h shall be full compensation for each valve and box or manhole provided in accordance with the Specifications and Drawings.

ITEM 10
PAVEMENT REMOVAL

10.01 DESCRIPTION

A. Under these Items, the Contractor shall remove existing pavement material including flexible or rigid pavement, roadway base material, intermediate or surfaces courses, sidewalk or pavement base for pipeline construction as scheduled, shown on the Drawings and specified herein.

B. Under these Items, the Contractor shall excavate existing materials as necessary to construct new roadways as shown on the plans.

C. The saw-cutting and preparation of the trench excavation both prior to the removal pavement for trench construction and for new pavement placement is included in these Items.

D. The removal of pavement by milling or planing is included in these Items.

E. The disposal of debris generated by work performed under these Items is included in these Items.

10.02 WORK NOT INCLUDED

A. Pavement replacement required beyond specified pay limits for construction of manholes and chambers is included for payment under other Items.

B. Pavement restoration is included in other sections.

10.03 DEFINITION OF ITEMS

A. Item 10a - ODOT Item 202 Pavement and Base Removed.

B. Item 10b – ODOT Item 254 Pavement Planing.

10.04 MEASUREMENT

A. Quantities to be paid for under these Items shall be the actual quantity constructed, measured in place within the limits as defined below, and scheduled on the Drawings, unless otherwise authorized by the Engineer; in which case, measurement will be made to the authorized limits. When uniform courses are specified, the volume to be paid for shall not exceed the quantity calculated from plan lines and dimensions. Bituminous materials will be measured in gallons at 60 degrees F applied at the specified rates and within the pay limits.

B. Pay Limits:

1. Depth - As specified, scheduled, or directed by the Engineer in the event that soft or unsuitable materials are discovered during the work.

2. Length - The actual length measured.

3. Width:

a. Except as otherwise scheduled on the Drawings, the width of replacement over pipe trenches shall not exceed the nominal diameter of the pipe plus 2-1/2 feet on each side for trench depths of 16 feet and less; and 4 feet on each side for trench depths greater than 16 feet. No additional width will be allowed for precast manholes or manhole chamber construction.

10.05 PAYMENT

A. The unit prices stated in the Bid for Items 10a and 10b shall be full compensation for each square yard of pavement removed within the prescribed limits as specified, so measured.

ITEM 11
PAVEMENT CONSTRUCTION

11.01 DESCRIPTION

A. Under these Items, the Contractor shall construct aggregate base, flexible pavement base and surface courses for new roadways or to replace pavement removed for pipeline construction as scheduled, shown on the Drawings and specified herein.

B. The placement of embankment material in areas shown for fill in included under these Items.

C. The preparation of subgrade material prior to the placement of roadway base is included in these Items.

D. The provision of a subgrade support material at the direction of the engineer is included in these Items.

E. The provision of the specified compaction testing is included in these Items.

F. Tack coat as specified is included in these Items.

G. The hauling of spoil material from the site is included in these Items.

H. The construction of a temporary access roadway to the work area is included in these Items. At the completion of the work, the temporary access roadway shall be removed with grades restored to those which existed prior to the work.

I. The provision of temporary pavement to maintain traffic is included in these Items.

11.02 WORK NOT INCLUDED

A. The removal of pavement is included under other items.

11.03 DEFINITION OF ITEMS

A. Item 11a – ODOT Item 203 Excavation.

B. Item 11b – ODOT Item 203 Embankment.

C. Item 11c – Access Roadway Repairs.

D. Item 11d – Access Roadway.

E. Item 11e – Temporary Access Roadway.

F. Item 11f – Asphalt Roadway Repairs – Full Depth.

G. Item 11g – Asphalt Roadway Repairs – Resurfacing.

H. Item 11h – Subgrade Support Material.

I. Item 11i – ODOT Item 304 – Backfill for Unsuitable Materials Removed.

11.03 MEASUREMENT

A. Quantities to be paid for under these Items shall be the actual quantity constructed, measured in place within the limits as defined below, and scheduled on the Drawings, unless otherwise authorized by the Engineer; in which case, measurement will be made to the authorized limits. When uniform courses are specified, the volume to be paid for shall not exceed the quantity calculated from plan lines and dimensions. Bituminous materials will be measured in gallons at 60-degrees F applied at the specified rates and within the pay limits.

B. Pay Limits:

1. Depth - As specified, scheduled, or directed by the Engineer. To differentiate from special backfill material provided to backfill pipes and appurtenance excavations, aggregate base shall only be measured for the thickness shown on the Drawings or directed by the Engineer.

2. Length - The actual length measured.

3. Width:

a. Except as otherwise scheduled on the Drawings, the width of replacement over pipe trenches shall not exceed the nominal diameter of the pipe plus 2-1/2 feet on each side for trench depths of 16 feet and less; and 4 feet on each side for trench depths greater than 16 feet. No additional width will be allowed for precast manholes or manhole chamber construction.

4. Trench depth as used herein shall mean the distance from the original surface of the pavement to the invert grade of the main line pipe.

11.04 PAYMENT

A. The unit prices for Items 11a and 11b shall be full compensation for each cubic yard of excavation or embankment placed for the purpose of new access roadway construction. Item 11a shall also include excavation of areas of unsuitable subgrade as directed by the Engineer.

B. The unit prices for Items 11c through 11h shall be full compensation for each square yard of roadway or driveway repaired or constructed with in accordance with the typical sections provided including all specified pavement materials down to the bottom of the aggregate base course and with lift thicknesses specified, so measured.

C. The unit price for the Item 11e includes the removal of the temporary access road at the completion of the work.

D. The unit prices for Item 11i shall be full compensation for each cubic yard of aggregate base provided to backfill unsuitable subgrade excavated.

ITEM 12
VIDEO RECORDING

12.01 DESCRIPTION

A. Under this Item, the Contractor shall produce and deliver to the Owner, color video recordings of existing topography within the zone of influence along all sewer routes and video recordings of designated buildings and dwellings as specified and directed.

12.02 DEFINITION OF ITEM

A. Item 12 - Video Recording of the Zone of Influence.

12.03 MEASUREMENT & PAYMENT

A. The quantities to be paid for under Item 12 shall be a lump sum for video recording of the defined zone of influence along specified routes.

ITEM 13
MAINTENANCE OF TRAFFIC

13.01 DESCRIPTION

A. This Item shall include the furnishing and maintaining of measures required to maintain traffic through or around the proposed Work.

B. This Item shall include detour routes as specified in the Contract Documents.

13.02 DEFINITION OF ITEM

A. Item 13 - Maintenance of Traffic.

13.03 MEASUREMENT & PAYMEN

A. The quantities to be paid for under Item 13 shall be lump sum for all maintenance of traffic measures.

ITEM 14
CLEARING AND GRUBBING

14.01 DESCRIPTION

A. This Item shall include all clearing and grubbing of lands required to complete the Work as specified, shown in the Contract Documents and as directed by the Engineer.

B. This Work shall include, but not limited to, the complete removal of all vegetation including plants, shrubs, sod, agricultural crop residue, trimming and cutting of trees, removal of tree cuttings and stumps, scalping and the removal and disposal of all debris generated by the clearing and grubbing operation as specified and shown on the Drawings.

14.02 WORK NOT INCLUDED

A. Any Work specifically included under other Bid Items.

14.03 DEFINITION OF ITEM

A. Item 14 - Tree Removal, Clearing and Grubbing.

14.04 MEASUREMENT & PAYMENT

A. The lump sum stated in the Bid shall be full compensation for all Work required under Item 14.

ITEM 15
RETAINING WALL

15.01 DESCRIPTION

A. This Item shall include the construction of the retaining wall as specified, shown in the Contract Documents and as directed by the Engineer.

B. This Work shall include, the installation of sheet piling along with any earth restoration required for the work and shown on the Drawings.

15.02 WORK NOT INCLUDED

A. Any Work specifically included under other Bid Items.

15.03 DEFINITION OF ITEM

A. Item 15 – Sheet Piling Retaining Wall.

15.04 MEASUREMENT & PAYMENT

A. The quantities to be paid under Item 15 shall be the horizontal length of retaining wall measured parallel to the axis of the line along the surface of the top of the wall.

ITEM 16
DUMP ROCK FILL

16.01 DESCRIPTION

A. Under this Item, the Contractor shall place dump rock fill material to construct a riprap zone at the end of the culvert extension and prevent stream channel erosion as scheduled, shown on the Drawings and specified herein.

16.02 WORK NOT INCLUDED

Not used.

16.03 DEFINITION OF ITEM

A. Item 16 - Dump Rock Fill, Type D.

16.04 MEASUREMENT & PAYMENT

A. Quantities to be paid for under Item 16 shall be the actual quantity constructed, measured in place within the limits as scheduled on the Drawings, unless otherwise authorized by the Engineer; in which case, measurement will be made to the authorized limits.

B. The unit prices stated in the Bid for Item 16 shall be full compensation for each cubic yard of dump rock placed within the prescribed limits and specified, so measured.

SECTION 01021
ALLOWANCES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the allowances which are to be furnished by the Contractor per Paragraph GC-13.02. of the General Conditions.

B. The Contractor shall include in the Contract Price all allowances stated in the Contract Documents. These allowances shall cover the net cost of the materials and equipment delivered and unloaded at the Site, and all applicable taxes.

C. The Contractor's handling costs on the Site, labor installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Price and not in the allowance.

D. The Contractor shall cause the Work covered by these allowances to be performed for such amounts and by such persons as the Engineer may direct, but he will not be required to employ persons against whom he makes a reasonable objection.

E. If the cost, when determined, is more than or less than the allowance, the Contract Price shall be adjusted accordingly by Change Order.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Contractor shall prepare and submit proposals for the Owner to select the items included in allowance.

2. Information for the Record:

   a. Operation and maintenance manuals as may be required for items included in allowance.

   b. Invoices and delivery slips, for items provided under the allowance, shall be submitted to the resident project representative or Engineer.

1.03 PRODUCT HANDLING

A. The Contractor shall provide all labor, material and equipment to ensure the safe delivery, handling and storage of goods until acceptance by Owner and Engineer.

1.04 GUARANTEE

A. Contractor shall provide manufacturer's warranties to the Owner for all goods provided.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 COORDINATION

A. Contractor shall advise Owner and Engineer of, and include in the schedule, the timing of the selection, Shop Drawing review and procurement of the goods or services required in the allowance.

B. Contractor shall be responsible for the coordination, of all allowance item(s) provided, with the remainder of the contract work.

3.02 ERECTION, INSTALLATION AND APPLICATION

A. Contractor shall assemble, install or apply all goods as may be required to complete the requirements of the allowance.

3.03 PROTECTION

A. Contractor shall examine all goods on delivery. All damaged or defective goods shall be returned to the manufacturer for replacement.

PART 4 SPECIAL PROVISIONS

4.01 LIST OF ALLOWANCES

		Allowance Amount
A.	Telemetry Equipment and Programming	$13,500.00

4.02 DEFINITION OF ALLOWANCE

A. Telemetry Equipment and Programming:

1. This Item is intended to permit District's communications consultant to provide required programming to interface alarm and status signals into the District's SCADA system.
2. A copy of the proposal received from the District's communications consultant, WD Automation, is included following this specification section.
3. WD Automation's scope of work includes the following:
   a. Provision of a new telemetry cabinet and antenna.

b. Termination of signal wires into the telemetry cabinet

c. Installation and provision of signal wires from the telemetry cabinet to the antenna unit.

d. Programming the existing PLC to incorporate new signals, alarms and equipment status or data ranges for the new pump station.

e. Programming of the District's Operations Facility as needed to accept signals, alarms and equipment status or data ranges.

4. Signal Information:

a. The following signals shall be transmitted to the Northwestern Water & Sewer District Master Telemetry Unit (MTU).

1) Wet Well High-Level Alarm

2) Wet Well Low-Level Alarm

3) Backup Level System Active

4) Pump 1 Running Status

5) Pump 2 Running Status

6) Pump 1 VFD Fault

7) Pump 2 VFD Fault

8) Pump 1 – In Auto

9) Pump 2 – In Auto

10) Pump 1 Trouble – Thermal / Moisture

11) Pump 2 Trouble – Thermal / Moisture

12) Phase Failure

13) Power Failure

14) Backup Generator Active

15) Backup Generator Fault

16) Transfer Switch Fault

17) Entry Alarm

18) Flow Meter Reading (gpm) – Analog

19) Wet Well Level (ft) – Analog (Transducer by Contractor)

5. An invoice from WD Automation will be required to be submitted to substantiate payment amounts claimed under this allowance item.

July 30, 2021

WD Automation, Inc.
3000 Broadway Suite 2B
Mt. Vernon, IL 62864
Phone: 618-315-6558
Fax: 618-315-6559

Attention: All Bidding contractors
Customer: NWWSD
12560 Middleton Pike
Bowling Green, Ohio 44847
jrossow@nwwsd.org
Phone: (419) 354-9090

Proposal # 15015-42.rev1

Proposal

Item #1: Provide a new RTU control panel for replacing the existing Willowbend Lift Station site RTU#25 for the NWWSD.

A new Stainless Steel RTU panel for the Willowbend LS will be provided by WD Automation, Inc. Conduits, wire, and shielded control wire will be installed from the control panel to the LS by the contractor. PLC logic will be added to the NWWSD Office site sewer PLC program to communicate from the LS to the NWWSD office site by internet communication VIA a cellular modem (activation provided by NWWSD). The screens will be modified on the Sewer SCADA computer to display the LS status. Additional alarms will be added to the alarm dialer software. The owner will provide a sierra Wireless cellular modem to provide the internet service into the RTU panel with a static IP address. Digital and analog signals will be landed and wired from the LS devices to the RTU by the contractor. A serial cable from the RTU to the Sparling Tigermag for flow totalizer reading will be provided and installed by the contractor.

Major items to include:

- Hoffman 316 stainless steel RTU panel 30x24x10;
- Allen Bradley 1400 Micrologic PLC;
- Allen Bradley analog input card;
- Microtik Router;
- Terra wave omni-directional antenna;
- Lightning arrestor;
- APC 650 vA UPS.

Notes:

- Installation is not included.
- Analog Transducers and external switches provided by contractor.
- Startup is included.
- Price includes a one year warranty on parts and labor being provided.

Total Net Price for all options (less taxes): $13,500.00

July 30, 2021

WD Automation, Inc. is pleased to submit our proposal for your project. If you have any additional questions or need any additional information please contact:

Mr. Tim DeJournett
3000 Broadway Suite 2B
Mt. Vernon, IL 62864
Phone: 618-315-6558
Fax: 618-315-6559
Cell: 618-246-0628
tim@wdautomation.net

Payment Terms:

Net 30 days from date of invoice
*1% Discount given if payment is received within 10 days of invoice

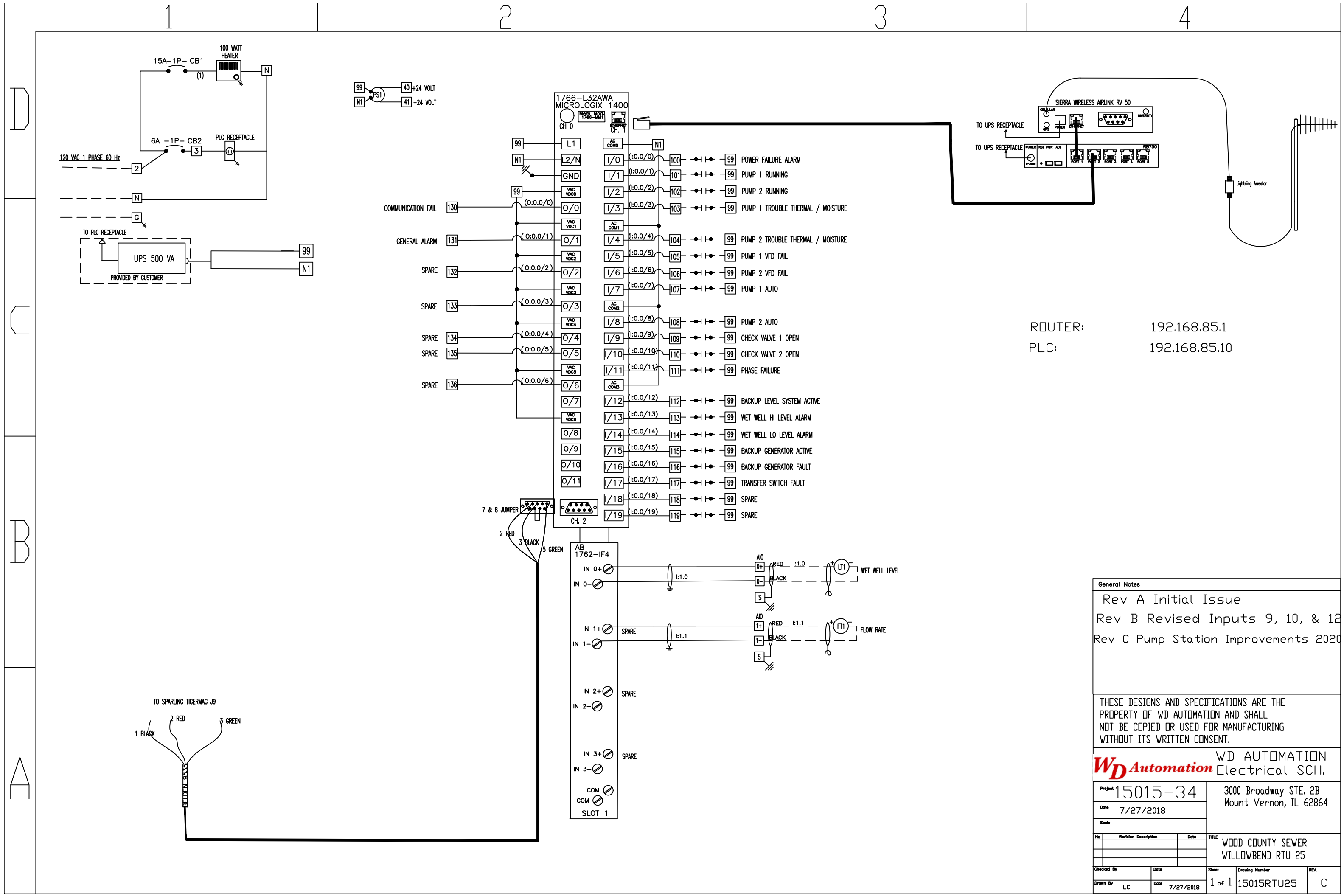
Price is valid for 30 days from date of this quotation.
Prices do not include any applicable Sales Taxes.

_____
Company

_____ _____
Accepted By Date

_____
Name and Title

Tim DeJournett
_____
WD Automation, Inc.



General Notes

Rev A Initial Issue

Rev B Revised Inputs 9, 10, & 12

Rev C Pump Station Improvements 2020

THESE DESIGNS AND SPECIFICATIONS ARE THE PROPERTY OF WD AUTOMATION AND SHALL NOT BE COPIED OR USED FOR MANUFACTURING WITHOUT ITS WRITTEN CONSENT.

WD Automation

WD AUTOMATION
Electrical SCH.

3000 Broadway STE. 2B
Mount Vernon, IL 62864

Project	15015-34
Date	7/27/2018
Scale	

No	Revision Description	Date

TITLE: WOOD COUNTY SEWER WILLOWBEND RTU 25

Checked By	Date	Sheet	Drawing Number	REV.
Drawn By LC	Date 7/27/2018	1 of 1	15015RTU25	C

SECTION 01043
COORDINATION AND CONTROL OF THE WORK

PART 1 GENERAL

1.01 SCOPE

A. This section includes coordination and control of the Work.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Information for the Record:

a. Bypass Pumping plan and procedures.

b. Haul routes to and from Site.

c. Plan and procedures for any shutdowns and bypass pumping.

d. Coordination drawings shall include, but not be limited to, all process piping including, but not limited to, bill of material, laying length, embedded conduit runs, and embedded plumbing lines.

1.03 LINES AND GRADES

A. All Work under this Contract shall be built in accordance with the lines and grades shown on the Drawings or as altered or modified by authority of the Owner and Engineer.

1.04 EXISTING STRUCTURES SHOWN ON DRAWINGS

A. Where underground and surface structures are shown on the Drawings, the location, depth, and dimensions of such structures are believed to be reasonably correct but are not guaranteed.

B. Such structures are shown for the information of the Contractor, but information so given is not to be construed as a representation that such structures will in all cases be found or encountered just where shown, or that they represent all the structures which may be encountered.

1.05 COOPERATION OF CONTRACTOR

A. The Contractor shall conduct his operations so as to interfere as little as possible with those of the Owner, other contractors, utilities, or any public authority on or near the Work.

B. The Owner reserves the right to perform other Work by contract or otherwise, and to permit other public bodies, public utility companies, and others to do Work on or near the project during progress of the Work. If a conflict arises, the Owner will determine when and how the Work shall proceed.

C. Claims for delay or inconvenience due to operations of such other parties on Work specified, shown on the Drawings, as directed or which can be reasonably expected to be encountered by the nature and location of the Work will not be considered.

D. Operations entailing the use of construction equipment and lights outside the hours or 8:00 am and 5:00 pm or outside the hours allowed for construction by local ordinances or regulations shall be approved by the Owner.

E. Closing off clear access to any public alley, street, road, avenue or boulevard without the prior consent of municipal officials and the Engineer is prohibited.

F. Contractor and subcontractors are required under Ohio Revised Code Section 149.53 to Notify the Ohio Historical society and the Ohio Historic Site Preservation Board of archeological discoveries located in the project area and to cooperate with these entities in archeological and historical surveys.

1.06 MAINTENANCE OF SANITARY SYSTEM DURING CONSTRUCTION

A. All construction which requires interruption of existing sanitary system flow shall be executed during periods designated by the Owner.

B. Bypassing of untreated sanitary wastewater to any stream or body of water is prohibited.

C. Additional requirements for bypass pumping are included in Part 4.

1.07 PERMANENT PAVEMENT AND FINAL RESTORATION

A. When construction is being done between April 15 and November 15, the final pavement restoration work shall be completed by November 15. When work is being performed between November 15 and April 15, temporary pavement as specified shall be provided. Final restoration of paved areas shall be completed within 30 days of the opening of asphalt plants for the season. The dates listed are intended to loosely define the period of operation of asphalt plants. Concrete pavement construction may continue beyond the dates listed with proper thermal protection as approved by the Owner.

B. Pavement restoration shall include, but not limited to, replacement of pavement, driveways, and sidewalks.

C. The fine grading, topsoil, and seeding operation shall be completed within 30 days of pavement restoration, unless weather conditions prevent such work from being completed.

D. If at any time the pavement restoration and the fine grading, topsoil, and seeding operation does not meet the above conditions, no further mainline pipe construction

will be permitted until the Contractor has completed restoration work to the satisfaction of the Engineer and Owner.

E. In order to comply with the above conditions, the Contractor shall complete the pipeline and all appurtenances including, but not limited to, testing, in order to begin final pavement restoration and the fine grading, topsoil, and seeding operation.

1.08 TEMPORARY PAVEMENT RESTORATION

A. The Contractor shall provide and maintain temporary pavement for all roads in which construction occurs. Temporary pavement shall be in accordance with Section 01565 and as shown on the drawings.

1.09 TEMPORARY STAGING AND PARKING FACILITIES

A. No parking or staging area has been identified for this Work. The Contractor is expected to locate and obtain permission from private property owners for construction staging and parking.

B. Parking spaces for the Contractor's personnel shall be provided and maintained in usable condition by the Contractor at all times. Provisions shall be made so that sediment is not tracked onto paved roadways from the vehicles operated by the Contractor's personnel.

1.10 TEMPORARY WATER, HEATING, LIGHTING AND POWER

A. The Contractor shall provide all water, heat, lighting, and power required to construct and protect the Work until Final Completion.

B. The source for temporary power shall be from the electric utility or portable power source.

C. The source for temporary water can be from the District. The District shall furnish a meter and all backflow prevention devices with a deposit paid by the Contractor.

D. There will be no charge for water used for the work and for the initial filling of the force main for testing.

E. The installation for electric power shall meet the requirements of federal, state, and local authorities and regulatory agencies.

1.11 DISPOSAL OF DEBRIS

A. All debris resulting from construction operations, i.e., packaging, waste materials, damaged equipment, etc., shall be removed from the Site by the Contractor and disposed of at spoil sites.

B. The Contractor shall police the hauling of debris to ensure that all spillage from haul trucks is promptly and completely removed from public or private rights-of-way.

C. All debris shall be disposed of in accordance with federal, state, and local laws and regulations.

1.12 CONTROL OF NOISE

A. The Contractor shall eliminate noise to as great an extent as possible at all times. Air compressors shall be equipped with silencers and the exhaust of all gasoline motors and other power equipment shall be provided with mufflers

B. The Contractor shall require strict observances of all pertinent ordinances and regulations.

1.13 DUST DEBRIS AND SMOKE PREVENTION

A. Strict compliance with all ordinances regulating the production and emission of smoke will be required.

B. Contractor shall control debris and dust in accordance with Section 01568.

C. The Owner may require additional dust control measures during dry weather.

D. The Contractor shall accept full responsibility for all damage that may occur to property as a result of negligence in providing required control.

1.14 SANITARY REGULATIONS

A. The Contractor shall provide all necessary housing accommodations for the workers for changing clothes and for protection during inclement weather. Toilet accommodations shall also be maintained for the use of the employees on the Work. The accommodations shall be in approved locations, properly screened from public observance and shall be maintained in a strictly sanitary manner.

B. The Contractor shall obey and enforce all other sanitary regulations and orders; shall take precautions against infectious diseases and the spread of same; and shall maintain at all times satisfactory sanitary conditions around all shanties, tool and supply houses, and on all other parts of the Work.

1.15 USE OF EXPLOSIVES

A. The use of explosives on this project is prohibited.

1.16 EMERGENCY MAINTENANCE SUPERVISOR

A. The Contractor shall submit to the Engineer the names, addresses, and telephone numbers of two employees responsible for performing emergency maintenance and repairs when the Contractor is not working, See GC 2.04 and 7.01. These employees shall be designated in writing by the Contractor to act as his representative and shall have full authority to act on his behalf.

B. Contractor shall post at job Site, in a conspicuous location, the emergency numbers for the project.

C. Contractor shall be responsible for contacting the local fire, police, and emergency response personnel and organizations in advance of the Work. The Contractor shall be responsible for the coordination and compliance with emergency response plans, whether developed by the governing agency, laws, or the Contractor for the project.

D. At least one of the designated employees shall be available for a telephone call any time an emergency arises.

1.17 PUBLIC SERVICE STRUCTURES

A. Public service structures shall be understood to include all poles, tracks, pipes, wires, conduits, house-service connections, vaults, manholes, and other appurtenances, whether owned or controlled by the Owner or other public bodies or by privately-owned corporations, used to supply the public with transportation, heating, electric, telephone, gas, water, sewer, or other services.

B. At least a week in advance of breaking ground, the Contractor shall notify the registered underground protection service, all public bodies, and other owners of such facilities of the proposed location of his operations, advising them that their property may be affected and that such measures as they may deem necessary should be promptly taken to protect, adjust, remove, or build them.

C. In developed residential and commercial areas, the Contractor shall assume each building and dwelling has water and sewer services and that they shall be protected and repaired as needed as part of the pipeline installation. No additional payment will be made for Work associated with supporting or repairs of such services.

D. Three conditions which may be encountered will be dealt with as follows:

1. Structures which are adjacent to but not included within the limits of an excavation required for performance of the Work shall be protected, supported, and maintained in service by the Contractor at his expense.

2. Structures within the limits of the Work which can be satisfactorily supported and maintained in service and which do not require removal and rebuilding in the judgment of the Engineer shall be thus supported by the Contractor at his expense, including cost of repair of damage incident to his operations.

a. Supports for water and gas mains, sewers, conduits, and similar structures shall be constructed of timber or other acceptable materials; shall be supported from undisturbed foundations, and shall be sufficiently substantial to ensure against settlement when pipe trenches or other excavations are backfilled. In all cases where permits or inspection fees are required by utilities in connection with changes to or temporary support of their conduits, the Contractor shall secure such permits and pay all permit and inspection fees.

b. The Contractor shall assume full responsibility for maintaining all public service structures in service and shall support and protect, or remove and rebuild them at his own expense. Such services shall not be interrupted without permission of the owner of the public service structure.

3. In case relocation of pipelines or other utility structures is required because of direct interference, as determined jointly by the Owner, Engineer, and Contractor, with the installation of the Work, the Contractor shall notify the Owners of the utility structure involved.

a. The Contractor will not be reimbursed for the cost of the relocation if the interference is shown on the Drawings, described in the Specifications, apparent on visual inspection, or specifically included in the Work to be performed by the Contractor.

b. The Contractor will not be paid for time lost because of such direct interference. Where it is the policy of any utility owner to perform such Work with his own forces, the Contractor shall cooperate to the fullest extent with such utility owner.

1.18 UNAUTHORIZED WORK

A. Work done beyond the lines shown on the Drawings or ordered, Work done without required inspection, except as herein provided, or any extra work done without authority will be considered as unauthorized and will not be paid for under the provisions of the Contract. Work so done may be ordered removed at the Contractor's expense.

B. Work completed not in accordance to the lines and grades given in the Drawings shall be considered as unauthorized and subject to rejection.

1.19 DRAINING OF TANKS AND PIPELINES

A. Unless otherwise indicated, tanks, pipelines, and other similar structures that are to be removed from service, to complete the Work will be initially drained by the Owner.

B. Draining will be by gravity or by a permanently installed pump, if available.

C. After the tank has been drained by the Owner to the lowest level possible with existing means for drainage, the Contractor shall remove and dispose of remaining liquid and accumulated solids, as required to complete the Work.

D. Additional requirements for tanks (wet wells) and pipelines are included in Part 4 of this Section.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

PART 4 SPECIAL PROVISIONS

4.01 POTENTIALLY HAZARDOUS ENVIRONMENT

A. The environment in portions of the Site is rated as Class I Division 1 or 2 or some areas of the Site are designated as permitted Confined Spaces. As a minimum, whenever the Contractor is performing Work in these areas, the Contractor shall provide Factory Mutual- and UL-approved continuous monitoring of the atmosphere for the presence of hydrogen sulfides, of low oxygen concentration, and of explosive gases (both lighter and heavier than air).

B. The Contractor shall evacuate all personnel from the areas whenever the detection system registers hydrogen sulfide levels of greater than 20 ppm, oxygen levels less than 19.5% or combustible gas levels of greater than 10% of the LEL.

C. In addition, whenever the Contractor is using tools producing open flames or sparks, such as cutting torches, saws, and grinders, the Contractor shall provide for the forced air exhaust ducted from the immediate area of the Work.

4.02 MAINTAINING FLOW IN EXISTING SEWERS

A. Flow in existing storm, sanitary and private sewers shall be maintained at all times during construction of this project. The Contractor shall furnish and install all necessary temporary facilities required to maintain the flow in existing sewers including bulkheads, plugs, stop planks, flumes, coffer dams, pumping equipment, valves, etc.

B. Bypass Pumping Requirements – Willowbend Pump Station

1. The Contractor shall provide a minimum of two pumps each with the firm pumping capacity outlined herein.

2. The pumps shall be operated by a power source supplied by the Contractor.

3. The pumps shall be provided with a level monitoring system with automatic dialing capabilities to notify the Contractor of pump failure or high levels in the bypass manhole.

4. A manhole (MH2) has been oversized and provided with extra sump depth to serve as a wet well for the bypass pumping operation.

5. To accommodate space limitations at the site, submersible pumping units are expected to be used for the bypass operation to permit work to be performed above the manhole (MH2) provided for bypass pumping.

6. Variable speed operation is recommended for the work to achieve the varying conditions listed.

7. Performance Requirements

   i. The bypass pumping system should be designed to meet the following operating conditions with one pump:

      1. The average dry weather flow to the Willowbend Pump Station is 200 gpm. A minimum cleansing velocity of 3 feet per second shall be maintained in all of the Owner's pipes used for the bypass operation.

      2. The bypass shall be capable of achieving a discharge of 950 gpm to prevent an SSO upstream of the pump station during wet weather events.

      3. Water in the manhole provided for bypassing shall not be permitted to rise above elevation 615 due to existing basements with floor elevations of roughly 620. Adequate alarms shall be provided below the maximum water elevation to alert the Contractor of trouble with the pumps or a need to increase pumping capacity.

      4. These calculations assume water at an elevation of 611 in the bypass manhole (MH2).

      5. The C-factors given for the existing force mains are as derived from field testing. Nominal diameters may be used for computations as the combination of diameters and C-factors were used to develop existing system curves and the guidance provided herein.

   ii. The Contractor is expected to use the either of following force mains for conveying wastewater away from the work area as specified in the sequence of construction. The following describes the key design considerations for each option.

      1. Existing Willowbend Force Main

         a. The high point is believed to be 835 (same datum as design plans). Air Release valves exist at intermediate high points.

         b. The minimum pumping capacity shall be 600 gpm at a maximum total dynamic head of 84-feet (Discharge Hydraulic Grade of 694).

         c. The 8-inch force main consists of the following segments

i. West River Road
    1. 1290-feet of 8-inch cast iron pipe.
    2. Hazen-Williams C factor of 100.
    3. High Point of 635 at the downstream end of this pipe.

ii. River Crossing Repurposed Petroleum Pipeline
    1. 2310-feet of 8-inch steel pipe.
    2. Hazen-Williams C factor of 80.
    3. This pipe is below the high points noted in segments i and ii.

iii. North River Road Jerome Road
    1. 1580-feet of 12-inch PVC pipe.
    2. Hazen-Williams C factor of 120.
    3. High Point of 635 at the downstream end of this pipe.

d. The 8-inch force main shares the 12-inch Force Main on Jerome Road with two other pump stations. In order to avoid unduly restricting flow at the other two pump stations, the maximum head delivered by the bypass pump meet the following:

    i. The bypass pump shall generate no more than 20 psi at the location where the pipes joint on Jerome Road (Hydraulic Grade Line of 647) at 1,000 gpm.

    ii. An HGL of 647 equates to a maximum discharge head for the bypass pump of 180-feet (Discharge Hydraulic Grade Line of 788) at 1,000 gpm.

    iii. The maximum discharge head listed does not include headloss in the bypass piping configuration.

2. The new 12-inch and 20-inch force main constructed as part of the project. The following describes the key design considerations for this option.

    a. The minimum pumping capacity shall be 1,100 gpm to generate the required cleansing velocity in the force main pipe.

    b. The C-factor for the new force main is planned to be 130.

c. The new force main high point and lengths are as shown on the design plans.

8. The Contractor shall assume bypass pumping will be required for a period of not less than 10-weeks total for the project. Costs associated with longer duration bypass pumping resulting from delays beyond the Contractor's control shall be negotiated as a change order.

9. The Contractor shall submit a bypass pumping plan for review by the Engineer. The bypass pumping plan shall include any details required to connect to the existing force main as well as measures required to block flow in gravity sewers and piping proposed for discharging flow into existing manholes. The plan shall show the proposed locations for pumping equipment. The bypass pumping plan provided shall be considered the minimum requirements.

10. Bypass pumping discharge piping shall be provided with check valves and air release capabilities as needed.

11. The Contractor is expected to provide bypass pumping equipment will level sensing and autodialer capabilities to alert 24-hour contacts of trouble with the bypass pumping equipment.

4.03 SEQUENCE OF CONSTRUCTION

A. The following is a suggested sequence of construction to complete the pump station improvements while maintaining reliable pumping capabilities.

B. The Contractor may modify this sequence but will still be responsible for meeting the contract complete dates outline in the Contract.

C. This sequence of construction was developed with the intention of placing all of the deep excavation work early in the project but requires bypass pumping to be deployed until the new pump station is functional. Work items not on the critical path of the project are not included.

1. Deploy bypass pumping equipment to the site.

2. Construct the new bypass and drain connection to the 8-inch force main.

3. Construct Manhole 2 and new sewer to Manhole 1.

4. Replace Manhole 1 and direct flow to the deepened Manhole 2. Manhole 2 with the deepened sump and additional diameter will serve as a wet well during the Work.

5. Activate bypass pumping equipment. Either the 8-inch force main or new 12-inch force main (if installed and tested) may be used for the bypass pumping outlet.

6. Remove and abandon the existing wet well and dry wells along with pipes on the Willowbend Pump Station Site.

7. Construction startup and testing of the new pump station.
8. Fill Manhole 2 with grout fill up to the invert of the incoming and existing sewer pipes.
9. Construction of the force main connections.

4.04 CONNECTIONS TO EXISTING FORCE MAINS

A. The Owner wishes to connect the force mains to existing force mains by closing valves and turning off pump stations upstream of the Work.

B. The Contractor is asked to provide a minimum of 2 weeks' notice to the owner in advance of all shutdowns, to permit the District to check valve operation and plan the shutdown of pump stations.

C. The Owner cannot guarantee that the shutdown will be complete, and some water should be expected to leak at existing valves. The Contractor should be prepared to manage sewage draining from the pipe or leaking past existing valves to perform the work. Estimated volume of sewage expected to drain from the pipe at each connection point is provided. The volume of sewage is provided under the assumption that existing shutoff valves on existing force mains are not functional.

1. 8-inch Force Main Connection at West River Road.
   a. Minimal volume is expected as the connection is located at the high point in this force main.
2. 10-inch Force Main Connection at West River Road
   a. Estimated volume of sewage is 23,500 gallons.
3. 8-inch Force Main Connection at Willowbend Pump Station Site
   a. No drainage is expected given the planned use of a tapping sleeve and valve.
   b. Estimated volume of sewage is 3,500 gallons should the tapping process require shutdown of the main.
   c. No shutdown of for this connection is planned.
4. 12-inch Force Main Connection at North River Road
   a. Estimated volume of sewage is 12,000 gallons.

D. The Owner can provide a 4-hour shutdown of each location starting at the time when the pipe is cut by the Contractor. For the work listed in items 2a and 3a above, two separate 4 hour periods will be provided.

E. Weather conditions may require the connection work to be performed during periods of low flow and dry weather.

4.05 WET WEATHER CONDITIONS

A. The sanitary sewer collection system is prone to elevated flow rates and surcharged conditions during wet weather events. The duration of elevated flows and surcharged conditions is dependent upon the nature of weather conditions during the work.

B. The Contractor shall make provisions to suspend the work during periods of elevated flow rates and surcharged conditions. The Owner will not provide temporary pumping measures to lower the level of flow in the sanitary sewer to permit the work to continue during wet weather. The occurrence of elevated wet weather flows and surcharge conditions shall not be justification for a delay claim.

4.06 REQUIRED SAFETY DOCUMENTATION TO BE SUBMITTED

A. On all projects that require the Contractor's or subcontractor's personnel to occupy permitted confined spaces and/or hazardous atmospheres on the Site, the Contractor shall submit to the Owner, a written proposed safety program.

B. The Contractor shall be expected to perform the work in accordance with the requirements of the Northwestern Water & Sewer Districts Safety Program. The safety program documentation is included attached to this Section.

4.07 UTILITY STRUCTURES AND POLES

A. The Contractor shall be responsible for the cost and coordination required for the temporary support required for all utility poles or utility structures above or below grade inside the work limits.

4.08 PRIVATE PROPERTY

A. The Contractor shall coordinate with the Owner for work on private property prior to commencement of work.

B. The Owner has notified property owners in the area of the Work of this project.

4.09 SUBGRADE INVESTIGATION

A. The Contractor shall be aware that a detail subgrade investigation has not been performed for the entire project limits prior to the work.

B. The subgrade investigation performed prior to this work is described in SC 5.03C.

C. The Contractor is expected to make the necessary investigations additional to the information provide sufficient for the Contractor to submit a bid for the work.

4.10 COORDINATION WITH OUTSIDE ENTITIES

A. The Contractor shall contact emergency services, schools, and trash collection to coordinate access to the work area.

B. The Contractor shall provide a door hanger notice to residents and businesses of the status of the work ahead of the work.

4.11 LUCAS COUNTY WRRF AND SANITARY ENGINEER

A. The Contractor is to coordinate work at the Lucas County WRRF with the Lucas County Sanitary Engineer's Office.

B. The work on the Lucas County WRRF Site is to be constructed along a drainage path used for sanitary sewer overflows (SSOs)from the WRRF. The occurrence and duration of SSOs at the WRRF cannot be predicted and will occur relative to weather conditions. Wet weather events may require the Contractor to suspend work on this portion of the force main for a period of time.

C. The occurrence of SSOs will not solely be justification for delay claims for the Contractor.

4.12 LUCAS COUNTY ENGINEER – NORTH RIVER ROAD

A. The work along North River Road shall be coordinated with the Lucas County Engineer.

B. Plans for the work along North River Road were submitted to the Lucas County Engineer as part of the design phase of the work.

C. The Contractor shall obtain a permit from the Lucas County Engineer one-week in advance of the work.

D. All work shall be performed in accordance with the Lucas County Engineer's Special Flood Hazard Area Development Permit Application. A copy of the permit is attached to this section.

4.13 SPILL PREVENTION & CHEMICAL / EQUIPMENT STORAGE

A. The Contractor shall develop and submit a Spill Prevention Countermeasure and Contingency Plan (SPCC) in the event of a spill or break in an equipment hydraulic line, which may discharge into waters of the state.

B. All spills must be reported to the Ohio Spill Line (1-800-282-9378) in accordance with OAC 3750.06.

C. Idle equipment, petrochemicals and toxic/hazardous materials should not be stored in the floodplain or near any drainage ways, ditches or streams that could convey such materials to the Maumee State Recreational River or any of its tributaries. Petrochemicals and toxic/hazardous materials should not be discharged into the Maumee State Recreational River, its floodplains or any of its tributary drainage ways, ditches or streams. Refueling of equipment should not occur in floodplains or near any tributary drainage ways, ditches or streams.

4.14 OHIO SCENIC RIVERS

A. The Northwest Assistant Regional Scenic Rivers Manager shall be invited to a pre-construction meeting with the contractor present and be notified of the project start date one week prior to the commencement of work. Periodic inspections of the project shall take place to ensure Scenic River requirements are being met.

B. The Northwest Assistant Regional Scenic Rivers Manager shall also be contacted one week prior to completion of the project to conduct a final site inspection. The final site inspection shall be scheduled while the contractor is present to ensure that final site stabilization has been achieved.

C. Contact: Christina Kuchle, Christina.kuchle@dnr.ohio.gov, 419-348-5073

4.15 ENVIRONMENTAL PERMITING

A. The environmental permitting, including Ohio EPA's NOI and the US Army Corps of Engineers NWP 12 permits for this project are currently under review by the respective agencies at the time of bidding.

B. Any new requirements for the project will be included in the project either through Addendum or Change Order negotiated with the Contractor.

END OF SECTION

NORTHWESTERN THE DISTRICT WATER & SEWER

P.O Box 348
12560 Middleton Pike
Bowling Green, Ohio 43402
(419) 354-9090

CHECK LIST FOR CONTRACTORS

The purpose of this check list is to assist District personnel in assessing contractor compliance to District, State and Federal regulations that address occupational and environmental safety. In addition, this check list is designed to assist contractors in developing a safety strategy for District projects.

YES / NO

Trenching and Excavation Work

___/___ 1. Does the contractor have a Trenching/Shoring policy in accordance with OSHA requirements?

___/___ 2. Does the contractor have a soil competent person on staff?

___/___ 3. Does the contractor have the equipment necessary to safely excavate/trench and shore?

___/___ 4. Is the contractor prepared to secure any trenches or excavations that may need to be left open over night/weekend?

5. ***List Excavation Competent Person(s):*** _____

6. ***List Water Containment Method(s):*** _____

Confined Space Entry

___/___ 7. Permit required confined space?

___/___ 8. Does the contractor have a formal CSE program in accordance with OSHA requirements?

___/___ 9. Does the contractor have the necessary equipment to safely enter the space?

___/___ 10. Has the District supplied information on the hazards associated with the space(s)?

11. ***List Confined Space Competent Person(s):*** _____

Fall Protection

___/___ 12. Does the contractor have a formal fall protection program in accordance with OSHA requirements?

___/___ 13. Does the contractor have the necessary fall protection equipment to safely perform the tasks?

Lockout/Tagout

___/___ 14. Does the contractor have a written LOTO Program that they can provide to the District?

___/___ 15. Are the contractors employees provided with locks and tags?

___/___ 16. Will the District's employees need to lockout energy sources in conjunction with the contractor? **(If Yes- then the District must provide the contractor with a copy of our LOTO Program and notify all parties involved that LOTO will occur.)**

Chemicals

___/___ 17. Does the contractor plan to use ANY products on District property?

___/___ 18. Has the contractor provided the District with the Material Safety Data Sheet(s)?

ARC FLASH(AF)

___/___ 17. Does the contractor have and ARC Flash/Electrical safety policy?

___/___ 18. Does the contractor poses the appropriate AF PPE?

List Emergency Contact Numbers:

1.

2.

3.

Identify First-Aid Location:

_____
Printed Name of Company President or Representative

_____
Signature of Company President or Representative

SECTION 01090
REFERENCE STANDARDS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes reference standards.

1.02 DESIGNATION OF ASSOCIATIONS, INSTITUTIONS, SOCIETIES AND STANDARDS

A. Whenever in these Specifications reference is made to Associations, Institutions, Societies, or Standards, they will be designated as follows:

AA	-	Aluminum Association
AAMA	-	Architectural Aluminum Manufacturers Association
AASHTO	-	American Association of State Highway and Transportation Officials
ACI	-	American Concrete Institute
ADAAG	-	Americans with Disabilities Act Accessibility Guidelines
AFBMA	-	Anti-Friction Bearing Manufacturers Association
AFI	-	Air Filter Institute
AGA	-	American Gas Association
AGMA	-	American Gear Manufacturers Association
AIHA	-	American Industrial Hygiene Association
AISC	-	American Institute of Steel Construction
AISI	-	American Iron & Steel Institute
AITC	-	American Institute of Timber Construction
AMCA	-	Air Moving and Conditioning Association
ANSI	-	American National Standards Institute
API	-	American Petroleum Institute
ARI	-	Air Conditioning and Refrigeration Institute
ASA	-	American Standards Association
ASHRAE	-	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society for Testing Materials
AWPB	-	American Wood Preservers Bureau
AWS	-	American Welding Society
AWWA	-	American Water Works Association
BLS	-	Bureau of Labor Standards
CISPI	-	Cast Iron Soil Pipe Institute
FM	-	Factory Mutual
FS	-	Federal Specifications
IBR	-	Institute of Boiler and Radiator Manufacturers
IEEE	-	Institute of Electrical and Electronic Engineers

INETA	-	International Electrical Testing Association
ISA	-	Instrument Society of America
JIC	-	Joint Industrial Council
ODOT	-	Ohio Department of Transportation
NBS	-	National Bureau of Standards
NEC	-	National Electrical Code
NEMA	-	National Electrical Manufacturers Association
NFPA	-	National Fire Protection Association
NICET	-	National Institute for Certification in Engineering Technologies
NSF	-	National Sanitation Foundation
NRTL	-	Nationally Recognized Testing Laboratory
OSHA	-	Occupational Safety and Health Act
SMACNA	-	Sheet Metal and Air Conditioning Contractors National Association, Inc.
SSPC	-	Steel Structures Painting Council
OBC	-	Ohio Building Code
IBC	-	International Building Code
UBC	-	Uniform Building Code
UL	-	Underwriters Laboratories, Inc.
USBM	-	United States Bureau of Mines

B. Wherever specific standard numbers are indicated, i.e., ASTM C150, it shall be understood to mean the latest revision thereof.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

PART 4 SPECIAL PROVISIONS

4.01 NORTHWESTERN WATER & SEWER DISTRICT SPECIFICATIONS

A. The General Notes and Specifications of the Northwestern Water & Sewer District shall be followed for the execution of the work, as modified by these Specifications.

B. The Contractor shall bring any discrepancies between the District's specifications and these specifications to the attention of the Engineer for interpretation.

C. References to the "District" shall mean the Northwestern Water & Sewer District.

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes requirements for submittals.

B. Contractor shall adhere to the submittal schedule as submitted under the provisions of the General Conditions. Contractor shall modify the schedule as required to allow sufficient time for submittal review based on current construction schedule.

C. Owner, Contractor and Engineer shall utilize the electronic project management system EPMS as specified in Section 01320 for the central repository of project related documents including but not limited to submittals, information for the record and Operation and maintenance manuals.

1.02 COORDINATION OF SUBMITTALS

A. The Contractor shall be responsible for the coordination of submittals and field verifications as required for the various parts of the Work.

B. All submittals to the Engineer, unless otherwise specified, shall be made only by the Contractor. Direct submittals from subcontractors or suppliers will not be accepted.

C. All submittals shall reference the Specification item that it covers, the Contractor's name, the Contract title and location, and the date of submission. Submittal shall also indicate whether the information is for the Engineer's review and approval, for record purposes, or for the fulfillment of the operation and maintenance requirements.

PART 2 PRODUCTS

2.01 GENERAL

A. Two categories of information are normally required:

1. Shop Drawings for review.
2. Information for Record:
   a. Operation and maintenance manuals.

2.02 SHOP DRAWINGS FOR REVIEW

A. Shop Drawings:

1. The Contractor shall submit Shop Drawings in accordance with the General Conditions, as required by individual Sections, shown on the Drawings or as directed.

2. The Contractor shall indicate all variances from the requirements of the Contract Documents in accordance with the General Conditions.

3. The Contractor shall clearly indicate quantities and the exact intended use of the equipment or material contained in the submittal.

4. All Submittals shall be tailored to the project by high-lighting appropriate information and deleting or crossing out nonapplicable information or where applicable the Contractor shall provide a data sheet with all necessary information to correctly identify the applicable Sections of the manuals for the actual material or equipment furnished. All options furnished shall be indicated.

5. Color charts or samples shall be included for all submittals where a color selection by the Owner is required. Original Color Charts (not Color Copies) and samples shall be delivered to the Site, Engineer's RPR or Owner as required. The Engineer shall be copied on the transmittal letter for record purposes.

B. Samples shall be provided as required in the individual Sections. Samples shall be of the precise material proposed to be furnished. The number of samples and sample size shall be the industry standard unless otherwise stated in the individual Sections.

2.03 INFORMATION FOR RECORD

A. Material certificates shall be submitted for materials as indicated in the individual Sections. The certificate shall state that the products have been sampled and tested in accordance with the proper industrial and governmental standards and meet the requirements of the Specifications. Certificates shall be signed by an authorized agent of the manufacturer.

B. Licenses and Permits - The Contractor shall submit copies of all licenses and permits required by Local, State, and Federal laws.

C. Installation and calibration certificates shall be submitted for equipment as indicated in the individual Sections. These certificates shall indicate manufacturer's satisfaction with the installation, the accuracy of calibration and alignment, and the operation of the equipment. Such certificates must be signed by an authorized agent of the manufacturer.

D. Progress Schedules shall be submitted in accordance with the General Conditions and Section 01310.

E. Schedule of Shop Drawings and Sample Submittals shall be submitted in accordance with the General Conditions.

F. Schedule of Values shall be submitted in accordance with the General Conditions.

G. Copy of programming for all PLC's and computers on the project.

2.04 OPERATION AND MAINTENANCE INFORMATION

A. Operation and maintenance manuals shall be submitted as information for the record.

B. Operation and maintenance manuals shall be submitted as electronic documents prior to the printing of the record copy.

1. Contractor shall provide one electronic copy of the manuals for preliminary review.

2. The final accepted manuals shall be provided as one electronic copy of the manual and one printed copy as specified below.

C. Electronic manuals shall be in Portable Document Format

D. This information will be reviewed only if properly identified with Specification Section numbers and only after revised, where necessary, to conform to the Engineer's notes on previous submittals that have been marked "Make Corrections Noted." Manuals shall be tailored to suit the specific equipment provided.

E. Submittals shall include but not limited to the following:

1. Descriptive literature, bulletins, or other data covering equipment or system.

2. Complete list of equipment and appurtenances included with system, complete with manufacturer serial number and model number.

3. Utility requirements.

4. General arrangement drawing.

5. Sectional assembly.

6. Dimension print.

7. Materials of construction.

8. Certified performance curve.

9. Parts list with assembly drawings.

10. Recommended spare parts list with part and catalog number.

11. Lubrication recommendations and instructions.

12. Schematic wiring diagrams.

13. Schematic piping diagrams.

14. Description of associated instrumentation.

15. Drive dimensions and data.

16. Operating instructions.

17. Maintenance instructions including trouble-shooting guidelines, lubrication, and preventive maintenance instructions with task schedule.

18. Special tools and equipment required for operation and maintenance.

19. Description of equipment controls.

20. Pump seal data.

21. Assembly, installation, alignment, adjustment, and checking instructions.
22. Confirmation of all corrections noted on Shop Drawings marked "Make Corrections Noted."
23. Manufacturer's name, address, and telephone number along with manufacturers job number and Purchase Order number.
24. Manufacturer's local sales representative, address, telephone number.
25. All installation instructions that were provided to Contractor for use to install equipment.

F. All manuals shall be tailored to the project by high-lighting appropriate information and deleting or crossing out nonapplicable information or the Contractor shall provide a data sheet with all necessary information to correctly identify the applicable Sections of the manuals for the actual equipment furnished. All options furnished shall be indicated.

G. Manuals shall be provided electronically. All manuals shall have a title label on the cover stating the specification item number and item name. A table of contents shall be included in all manuals.

H. Equipment installations shall not be considered substantially complete until all associated operation and maintenance manual submittals are accepted by the Engineer.

I. Field modifications to equipment during installation shall be included in the manual so that the manual reflects as-built conditions. Revisions to the manual may be submitted for incorporation into the manual where appropriate. However, the Engineer reserves the right to return all six manuals for revision to reflect as-built conditions.

PART 3 EXECUTION

3.01 IDENTIFICATION OF SUBMITTALS

A. All submittals shall have a Submittal Identification & Approval cover sheet attached. A sample of the submittal cover sheet is attached for reference. The form will be provided by Engineer and coordinated with Contractor.

B. All submittals shall be given a consecutive number when they are entered into the Electronic Project Management System (EPMS), See Section 01320.

C. Resubmittals shall be entered into EPMS as resubmittals.

D. Submittals to satisfy the operation and maintenance information requirements shall be entered into the EPMS as a submittal. The description shall have the prefix "OM".

3.02 PRINTING AND DISTRIBUTION

A. No printed documents are required.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

Submittal Identification & Approval

Date:	**Spec Section**
Submittal No.	**Drawing Sheet No.**
Description:	
Manufacturer(s)	

Contractor Comments/Deviations/Measurements

Contractor

Contractor Name

- ☐ Approved
- ☐ Forwarded
- ☐ Checked

By: _____ Date: _____

Engineer

SHOP DRAWING REVIEW
SUBJECT TO CONTRACT REQUIREMENTS

Jones & Henry Engineers, Ltd.

- ☐ Approved
- ☐ Approved—Make Corrections Noted
- ☐ Amend & Resubmit
- ☐ Rejected—See Remarks
- ☐ Distribute for Information

REVIEW IS FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS. NO RESPONSIBILITY IS ASSUMED FOR CORRECTNESS OF DIMENSIONS OR DETAILS

Approval in no way relieves the Contractor of any responsibility for capacities, performance, functions, compliance with Federal, State, and Local Codes; accuracy of dimensions and details; or continuity and completeness of the Project nor does approval constitute or imply any increase in Contract Price.

By: _____

Review Comments

Sample

SECTION 01310
CONSTRUCTION SCHEDULES AND DOCUMENTATION

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the requirements for construction schedules and construction sequences.

B. This Section includes the requirements for the tracking and documentation of the progress and activities driving the completion of the Work as specified, shown on the Drawings and as directed.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Information for the Record:

a. Preliminary Construction Schedule.

b. Contractor's Construction Schedule and monthly updates.

c. Submittals Schedule.

B. Contractor shall submit construction schedule on the EPMS.

1.03 QUALITY ASSURANCE

A. Scheduling conference shall be held prior to the commencement of the construction to discuss the following including, but not limited to:

1. Construction sequencing.
2. Contractor's coordination of subcontractors.
3. Coordination with the Owner's operations.
4. Coordination with other Contractor's or other Work.
5. Project milestones.
6. Owner's partial utilization.

PART 2 PRODUCTS

2.01 PRELIMINARY CONSTRUCTION SCHEDULE

A. Preliminary construction schedule shall be completed in accordance with the General Conditions and prior to the scheduling conference.

B. The preliminary schedule shall outline the Contractor's sequencing of tasks, activities, milestones, and all critical path items within the contract time.

2.02 CONSTRUCTION SCHEDULE

A. The Contractor's submission of the construction schedule will not change the contract completion date, whether reviewed by the Owner and Engineer or not. The Contractor shall incorporate all approved change orders that have resulted in a contract time extension.

B. The Contractor shall require all subcontractors engaged in the Work to submit to the Contractor construction schedules, as specified herein, for incorporation into the Contractor's construction schedule.

C. The construction schedule shall include, but not limited to, the following dates:

1. Notice to Proceed.
2. Substantial Completion and Final Completion.
3. Commencement of on-site operations.
4. Milestones as specified, shown on the Drawings, and as directed.
5. Ordering, submittals, fabrication, delivery, startup, and training time of major equipment items.
6. Submittal schedule per the General Conditions.

D. The Contractor shall incorporate into the construction schedule all constraints and work restrictions specified or otherwise required by the Contractor's operations, including, but not limited to, the following:

1. Construction sequencing.
2. Contractor's coordination of subcontractors.
3. Coordination with the Owner's operations.
4. Coordination with other Contractor's or other work.
5. Project milestones.
6. Owner's partial utilization.

2.03 UPDATING CONSTRUCTION SCHEDULE

A. The Contractor shall keep the construction schedule current to the progress of the Work continually through closeout of the project. The construction schedule shall be submitted monthly for the Engineer's review.

2.04 WEEKLY CONSTRUCTION SCHEDULE

A. The Contractor shall submit a schedule of his work for each week. This schedule shall identify the foreman of each work crew and the location and type of work the crew will be doing each day. It shall be delivered no later than 4:00 p.m. of the next to last regular workday of the preceding week to the Resident Project Representative's office.

PART 3 EXECUTION

3.01 COORDINATION

A. All phases of the Work requiring interference with normal operations of the existing facilities shall be scheduled in accordance with agreements among the Contractor, Owner, and Engineer. The Contractor shall notify the Owner at least one week before such Work is to begin.

PART 4 SPECIAL PROVISIONS

4.01 SCHEDULED NON-WORK DAYS

A. The Contractor shall restrict Work to days when the Owner's offices are open and consider the following list of holidays as mandatory non-work days, all of which shall be incorporated into the construction schedule:

1. New Year's Day.
2. Memorial Day.
3. Fourth of July.
4. Labor Day.
5. Thanksgiving Day.
6. Christmas Day.

END OF SECTION

SECTION 01320
ELECTRONIC PROJECT MANAGEMENT SYSTEM (EPMS)

PART 1 GENERAL

1.01 SCOPE

A. This section describes the requirements for the Electronic Project Management System (EPMS) which will be required on this project. Engineer will implement an internet/web site based Electronic Project Management System (EPMS) for the administration of the Contract on this project. Owner, Contractors and Engineer shall be responsible to interface with EPMS and collaborating via the EPMS on this project. The EPMS is intended to supplement the Contract Documents and the provisions of the Contract Documents shall not be superseded by the EPMS.

1. The EPMS is intended to provide a mode of communication which is electronic and to reduce the reliance upon printed documents. Printed documents transmitted will not be reviewed, and electronic documents emailed outside of the EPMS will not be reviewed. The Owner, Contractor and Engineer will collaborate on unique situations or circumstances in order to preserve the project electronic records.

C. The Owner, Contractor and Engineer shall be required to provide project related information/documents via EPMS. In general, the EPMS will receive information via uploaded documents as PDF documents, in their native format (when permitted or required), or other electronic formats designated or required for functionality. The EPMS shall be a central repository for information to all project team members. The EPMS will provide viewing, printing, up/downloading of various information/documents.

D. In general, the following is a partial list of information/documents which shall be tracked through the EPMS:

1. Drawings, Specifications and Addendums (included revisions as necessary).
2. Insurance.
3. General Project Communication, Emails, Memorandums, Correspondence and Collaboration or any other document any participant wishes to make part of the project records.
4. Request for Information (RFI).
5. Submittals (Shop Drawings, Operation and maintenance manuals, color selections etc.)
6. Work Change Directives, Change Request and Change Orders.
7. Schedule of Values, Pay Requests and Certified Payroll Reports.
8. Schedules (project, weekly and monthly).

9. Meeting Minutes.
10. Permits and Special Inspections Reports.
11. Laboratory Services (testing and reporting).
12. Closeout procedures (deficiency list, warranty, substantial completion).

E. In an effort to protect proprietary information and prohibit unauthorized use or modifications, levels of access security will be assigned in order to provide safe and secure access to information with respects to involvement and responsibility on the project. The Owner, Contractor and Engineer shall establish these levels of access and rights which are appropriate for this project.

F. Owner, Contractor and Engineer shall utilize the mark-up tool integral within the EMPS or have a PDF review software that includes the ability to mark up and apply electronic stamps (such as Adobe Acrobat, or Bluebeam PDF Revu).

G. A high-speed internet connection is required.

H. The EPMS will provide notifications regarding new or updated documents through an existing Email account outside of the EPMS.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 CONTRACT REQUIREMENTS

A. All provisions of the Contract Documents are in full effect and enforcement. The submittal procedures specified in the Contract Documents are applicable with the understanding that they will be electronic documents and submitted via the EPMS.

3.02 TRAINING

A. One training session by the Engineer and Eastern Engineering, Inc. will be provided to the team members at the beginning of the EPMS implementation. Training will be coordinated with the Preconstruction meeting and held at the same location. There are many tutorials, help features and technical support options located on the Eastern Engineering web site.

B. Engineer will provide project related support as needed within their ability to provide it. Technical support will be available to all project team members from Eastern Engineering, Inc.

3.03 OPERATION

A. Contractor and all Subcontractors shall maintain a Windows-based computer system including high speed internet access and ability to create/mark-up documents using Adobe Acrobat (pdf) and to scan documents.

B. Engineer will facilitate the implementation and overall operation of the EPMS with Eastern Engineering. Eastern Engineering will provide and maintain the EPMS server and will back up the information.

3.04 ARCHIVE PROJECT CLOSE OUT

A. All files on the EPMS web site will be archived at the end of the project. These archives will be made available to the Owner, Contractors and Engineer for download over the internet, at the end of the warranty period.

3.05 ELECTRONIC SUBMITTAL FILE NAMING CONVENTION

A. The Contractor shall utilize the following file name convention for PDF files submitted through eComm:

1. Spec Section - Number of Submittal from Section - Number of Times Submitted.

   a. Example: 02552-01-03.

2. The example represents the first submittal from Specification Section 02552 and the third time this Submittal has been submitted.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 01350
COMMON PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes general requirements for all materials, equipment and systems furnished or installed under this project.

B. Additional specific requirements included under a particular Section shall take precedence.

C. This Section includes, but is not limited to, the following procedural and administrative requirements:

1. Product Delivery Storage and Handling.
2. Warranties.
3. Quality Assurance and Control.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and related specification sections.

B. The specification sections and Drawings contain the specific submittal requirements.

1.03 QUALITY ASSURANCE

A. Where Contractor is required to provide design services or certification of the design, the specified product, equipment or system shall comply with the specified criteria.

1. Contractor shall submit a written request for clarification when specified criteria is incomplete or insufficient.

B. Manufacturer's name, make, model number and other designations provided in the contract documents are to establish the significant characteristics, including but not limited to, type, function, dimensions and physical properties, performance, and appearance for the purpose of evaluating comparable products. Contractor shall verify product, equipment or system proposed meets or exceeds the requirements as specified or shown on the Drawings.

1.04 PROJECT HANDLING

A. Schedule delivery to minimize the time goods are kept in storage.

B. Deliver goods to Site in manufacturer's original packaging.

C. Inspect the goods to determine if there is visible damage to the packaging.

1. The packaging shall be removed in a manner that will allow resealing for storage.
2. If packaging cannot be removed and reused, the goods shall be repackaged per the manufacturer's recommendations.

D. Goods that are susceptible to damage by the environmental or project conditions, including but not limited to, switchgear, motor control centers, panelboards, instrument control panels, fixtures shall be stored in a controlled environment per the manufacturer's recommendations. If no such area is available at the time such equipment is received, such space shall be provided by the Contractor at no expense to the Owner.

E. Where construction is in roads or streets, that portion of the right-of-way not required for public travel may be used for temporary storage purposes unless otherwise prohibited. Materials shall not be stored in areas where such storage creates a hazard. Any other additional space required for construction or storage of materials and equipment shall be obtained by the Contractor at his expense.

F. The Contractor shall confine his equipment, the storage of materials and equipment, and the operations of his workers to areas permitted by law, ordinances, permits, and the requirements of the Contract Documents, and shall not unreasonably encumber the premises with materials or equipment.

1.05 GUARANTEE

A. Manufacturer's warranty, extending beyond one-year after substantial completion for the specified product, equipment or system shall be provided to the Owner and endorsed by the manufacturer.

B. Requirements for warranties extending beyond one-year after substantial completion are described in individual Sections of these specifications.

C. Manufacturer's limitations and disclaimers shall not relieve the Contractor from warranty obligations under the Contract Documents.

PART 2 PRODUCTS

2.01 SHOP PAINTING

A. Non-galvanized ferrous surface shall be painted.

B. Shop painting of ferrous surfaces shall be as follows:

1. Surfaces shall be thoroughly cleaned of dirt, grease, oil, rust, scale, or other foreign substances. All metal surfaces shall, as a minimum, be abrasive blasted in accordance with SSPC-SP6, Commercial Blast Cleaning.

2. Surfaces shall receive a shop coat of a primer compatible with the finish coating to be used by the Contractor.

2.02 GALVANIZING

A. Where galvanized metal is indicated, unless otherwise specified, galvanizing shall conform to ASTM A123 (Hot Dip Galvanized). Threaded parts and hardware shall be galvanized in conformance with ASTM A153.

2.03 REGULATORY REQUIREMENTS

A. Materials, equipment, coatings, and chemicals in contact with potable water or water being treated for potable water use shall comply with the applicable NSF Standards.

PART 3 EXECUTION

3.01 INSTALLATION

A. Products shall be installed in accordance with the manufacturer's instructions and Contract Documents.

B. Required appurtenances including but not limited to, anchors, grout, and leveling shims, shall be provided.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 01410
LABORATORY SERVICES

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall retain an independent laboratory.

B. Testing, inspection(s) and quality control are required to certify compliance with the Contract Documents.

1. The laboratory services do not relieve the Contractor from the responsibility of compliance with the Contract Documents

2. Any test required by the Owner shall not relieve the Contractor from the responsibility of compliance with the Contract Documents.

3. Any test required by the Owner shall not relieve the Contractor from the responsibility of supplying certificates from manufacturers or suppliers to demonstrate compliance with the Specifications.

C. Specific testing, inspection(s) and quality control requirements are specified in the individual Sections of the specifications.

D. Specific testing, inspection(s) and quality control requirements of any Federal, State or Local authorities are specified in the related sections of Work.

E. Testing of materials or equipment for compliance with various national or technical society standards and ordinarily performed by manufacturers, and shop and field tests of equipment are not included under this Section but shall be performed by the Contractor or his supplier as specified elsewhere.

F. Contractor may conduct material or field test(s), inspection(s) and quality control as they deem necessary.

1. Should the Contractor, at any time, desire the Owner to consider the results of such testing, inspection(s), and quality control, such results shall be certified by an independent testing laboratory acceptable to the Owner. Any testing of this nature shall be conducted at the Contractor’s expense.

1.02 SUBMITTALS

A. Submittals of all required field and laboratory test results shall be made by the independent laboratory as soon as they are available to the Owner and Engineer directly.

1. Statement of Compliance per 1.03

1.03 QUALITY ASSURANCE

1. The laboratory shall be a recognized and independent commercial laboratory with experience in conducting the required tests.
2. Laboratory shall certify compliance with ASTM E548, ASTM E329, and ASTM C1093 when masonry construction is part of the project scope. In lieu of ASTM certification, the laboratory may submit written documentation demonstrating experience and training relevant to the inspections to be performed. The documentation shall demonstrate experience with projects of similar complexity and quantity of inspections as the project herein.
3. Testing, inspection(s) and quality control shall be certified by a professional engineer specialized in the related field and in the state where the Site is located.

PART 2 PRODUCTS

2.01 TESTS

A. Aggregates, Bedding Material, and Special Backfill - For each type of material, the laboratory shall perform an ASTM C136 sieve and screen analysis to determine compliance with the contract documents.

1. Retests shall be performed until the Specifications are met.
2. Retest shall be performed each time the source of material is changed.

B. Selected Backfill - At the discretion of the Engineer, but in no case, more than one test for each 1,000 cubic yards or portion thereof, the laboratory shall perform an ASTM C136 sieve and screen analysis to determine whether the material is suitable for backfilling purposes.

C. Mix Designs:

1. For each type of controlled density fill, concrete, and asphalt, the laboratory shall review, perform test(s).
2. Review, perform test(s) and approve change in source of materials.
3. The asphalt design shall be made in accordance with ASTM D1559, the Marshall Method of Mix Design and as specified.
4. Approved mix designs shall include sieve analyses and suppliers' certificates for materials incorporated in the mix.

D. Compaction Tests:

1. For each type of backfill material, the laboratory shall determine the moisture-density curve according to ASTM D698.
2. Using ASTM D2922 test methods, the laboratory shall determine the density of placed backfill.

3. Retests shall be performed if the compaction requirements stated in the individual Sections are not met.

4. The Engineer may at his discretion require the sand cone (ASTM D1556) or the balloon (ASTM D2167) tests for density and compaction to verify questionable results of the ASTM D2922 tests.

E. The independent testing laboratory shall test and report the soil bearing capacity under all foundations and slabs on grade. The testing shall be conducted at regular intervals in all directions. The independent testing laboratory shall immediately notify both the Contractor and Engineer of any such test not meeting the presumed soil bearing capacity contained in the Structural Design Data on the Drawings.

F. Asphalt and Concrete Quality Control Testing - Perform tests as indicated in Sections 02600 and 03300.

G. Miscellaneous Tests - Perform all other tests requested in the individual Sections of the Specifications.

2.02 RESERVED

2.03 EQUIPMENT

A. Provide all necessary equipment to extract and store samples and perform the required tests.

PART 3 EXECUTION

3.01 COORDINATION

A. The Contractor shall provide the source of all materials requiring testing and shall arrange access for the independent laboratory to obtain representative samples and perform required tests at the material source. The information shall be supplied in advance to allow time for testing and reporting. Concrete information shall be supplied at least 45 days prior to the first concrete placement.

B. Contractor shall coordinate activities to accommodate the required quality assurance/control.

1. Contractor shall not compromise the requirement for quality assurance /control in order to maintain the schedule.

C. The laboratory shall conduct tests on materials and in locations as directed by the Resident Project Representative.

D. All tests shall be performed in accordance with the proper test methods mentioned above and in the individual Sections. Results shall be compared to the required values included in the individual Sections.

3.02 PREPARATION

A. Contractor shall prepare all Work to be tested in accordance with the testing procedures as directed and required by independent laboratory, regulatory agency, or Owner and Owner's representative.

3.03 PROTECTION

A. Contractor shall at the completion of testing, repair damage to construction in accordance with these specifications.

B. Contractor shall be responsible for the protection regardless of the responsibility for quality assurance/control.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 01500
MAINTAINING TRAFFIC

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the furnishing of all labor, materials, equipment and services necessary for maintaining and protecting vehicular and pedestrian traffic.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Information for the Record:

a. The Contractor shall submit the name, address, and telephone number of a local individual who will be responsible for maintaining traffic facilities when the Contractor is not working.

b. Traffic control or maintenance plans with govern authority(s) approval.

c. Detour routes with governing authority(s) approval.

d. Delivery and haul routes for contractor's activities outside the zone of influence.

1.03 QUALITY ASSURANCE

A. The installation, maintenance, and operation of all traffic controls and traffic control devices shall conform to the requirements of the State Department of Transportation Manual of Uniform Traffic Control Devices for Streets and Highways, hereinafter called the MUTCD.

B. If, in the opinion of the authority having jurisdiction over traffic in the affected thoroughfares, proper maintenance of traffic facilities and proper provisions for traffic control are not being provided by the Contractor, they may take the necessary steps to place them in proper condition, and the cost of such services will be deducted from any money which may be due or become due the Contractor.

C. A traffic control conference, attended by Owner, Engineer, Contractor and governing authority, shall be held no later than 14 days prior to any traffic maintenance, placement of traffic control devices, lane closures, detouring of traffic or other activity that impedes the normal traffic flow.

PART 2 PRODUCTS

2.01 TRAFFIC CONTROL DEVICES

A. Traffic control devices shall be provided with suitable supports of sufficient strength and stability.

B. Faces of orange construction signs, barricades, vertical panels and drum bands shall be suitably reflectorized with sheeting.

C. Traffic cones shall be a highly visible orange color.

D. Pavement markings for traffic maintenance shall conform to the requirements of ODOT, the local authority and the MUTCD.

2.02 TEMPORARY TRAFFIC SIGNALS

A. The Contractor shall furnish, erect, maintain, and subsequently remove signal and signal controller equipment of a proper type and capacity to provide the required operation, and shall meet the general requirements of ODOT and the MUTCD.

1. Any malfunctions or failures shall be corrected without delay. Temporary traffic signals not in use shall be covered or removed.

B. The Contractor shall be responsible for the procurement of and payment for electric power for temporary traffic signals.

PART 3 EXECUTION

3.01 COORDINATION

A. The Contractor shall provide and maintain in safe condition such temporary facilities for vehicular and pedestrian traffic as may be necessary to provide safe vehicular and pedestrian ingress and egress for all property adjacent to the improvements. Such access shall be provided at all times unless workers or machinery are in the immediate area. Access shall be provided to all properties at the end of the Work day.

B. When the street or highway under construction is being used by vehicular traffic including periods of suspension of the Work, the Contractor shall maintain that portion of the street or highway being used to ensure that it is smooth, free from holes, ruts, ridges, bumps, and dust.

C. The Owner will enter upon that portion of a project, where the Contractor is responsible for maintaining through traffic on part or the entire project, to place abrasives at its own expense, as may be considered advisable.

1. The Contractor shall be responsible for the removal of abrasives placed, for which no claim for additional compensation shall be allowed nor shall the Contractor be relieved in any way of his obligation for maintenance of traffic.

D. The Owner will provide for the necessary maintenance of public streets or highways which are used as detour beyond the Work limits of the contract.

3.02 TRAFFIC CONTROL

A. Barricades, vertical panels, and cones shall be protected by adequate advance warning construction signs.

B. Equipment and material stored on the highway shall be marked at all times. At night, any such material or equipment stored within rights-of-way and easement(s) shall be clearly outlined with dependable lighted devices.

C. Contractor shall provide any other lights, barricades, etc., that may be needed for the protection of pedestrian traffic in all areas where materials are stored.

D. Road Closed - When a highway is permitted to be closed to traffic, the Contractor shall provide, erect, maintain, and subsequently remove approved traffic control devices, barricades, and suitable and sufficient red or yellow lights.

3.03 TRAFFIC MAINTAINED

A. Where the street or highway under construction is being used by vehicular traffic, including periods of suspension of the Work, the Contractor shall furnish and maintain pavement markings, lights, warning signs, road construction traffic-maintained signs, and end construction signs, barricades, temporary guardrail, and such other traffic control devices, and flaggers as may be necessary to maintain safe traffic conditions within the Work limits.

B. Existing signs and traffic control devices within the Work limits shall remain in use during the construction period. If the Contractor needs to relocate or modify permanent signs and other traffic control devices as a consequence of his work, he shall provide suitable supports and may modify the devices with prior approval of the Engineer and the concurrence of the maintaining agency. Routine maintenance of permanent traffic control devices will remain the responsibility of the maintaining agency.

C. The function of existing Stop or Yield signs shall be retained at all times although their position may be adjusted. Existing signs that must be relocated laterally shall be placed in accordance with the MUTCD.

D. When an existing signal operation must be interrupted for a period, the Contractor shall provide a temporary traffic control method.

E. The Contractor shall obtain the approval of the Owner and Engineer before closing a traffic lane or establishing a one-way traffic operation.

F. Flaggers:

1. Whenever one-way traffic is established, at least two flaggers shall be used and signs, cones, barricades, and other traffic control devices shall be erected by the Contractor in accordance with the MUTCD. The Contractor shall maintain positive and quick means of communication between the flaggers at the opposite ends of the restricted area.

2. Flaggers shall be equipped according to the standards for flagging traffic contained in the MUTCD. At night, flaggers' stations shall be adequately illuminated.

3. The Contractor may, in lieu of flaggers, or supplementing them, furnish, install, and operate a temporary traffic signal or signals, for the purpose of regulating traffic.

3.04 SNOW AND ICE REMOVAL

A. The state and local authority responsible for snow and ice removal will be responsible for removals during the construction provided the following:

1. The project area is open to public access.

2. In the opinion of the state and local authority the project area is accessible with their equipment.

3. In the opinion of the state and local authority the street surface will not cause damage to their equipment or their equipment will not cause damage to the street.

B. The Contractor shall be responsible for snow and ice removal during construction when:

1. The project area is closed to public access.

2. When Limited access is provided for local traffic but area is closed to through traffic.

3. The project area pavement has removed or damaged to the extent that the state and local authority's equipment will no longer effectively remove snow and ice or will cause damage to project area.

PART 4 SPECIAL PROVISIONS

4.01 WEST RIVER ROAD – STATE ROUTE 65 AT WILLOWBEND PUMP STATION SITE

A. West River Road may be closed to through traffic for 90 days to permit the work to be completed.

B. The District is obtaining an MR505 Permit from ODOT District 2 for this work. A copy of the approved permit will be provided once obtained.

C. The Contractor shall be responsible for contacting ODOT District 2 and the District a minimum of 21 days in advance of the work.

D. The detour route will be signed and maintained by ODOT District 2.

E. The Contractor will be required to provide the maintenance of traffic measures at the work site as marked with asterisks on the attached page titled Figure 6H-8 Road Closure with Off-Site Detour. A copy of the applicable excerpt from the Ohio Manual of Traffic Control Devices is attached to this specification.

4.02 WEST RIVER ROAD – STATE ROUTE 65 AT FORCE MAIN INTERCONNECTION LOCATION

A. A minimum of one-lane shall be maintained when work is occurring at this location. One lane of travel shall be maintained using a temporary traffic signal.

B. The District will obtain an MR505 Permit from ODOT District 2 for this work. A copy of the approved permit will be provided when obtained.

C. The Contractor shall be responsible for contacting ODOT District 2 and the District in a minimum of 14 days in advance of the work.

D. The Contractor will be required to provide the maintenance of traffic measures at the work site as shown on Figure 6H-12 Lane Closure on Two-Lane Road Using Traffic Control Signals. A copy of the applicable excerpt from the Ohio Manual of Traffic Control Devices is attached to this specification.

4.03 NORTH RIVER ROAD – LUCAS COUNTY ENGINEER

A. West River Road may be closed to through traffic for 14 days to permit the work to be completed.

B. The Contractor will obtain a permit from the Lucas County Engineer one week prior to commencing work in the public right of way in Lucas County. Application for permit shall be made at the Office of the Lucas County Engineer, 1049 S. McCord Road, Holland, OH 43528.

C. The detour route shall use Stitt Road, Russell Road, Fallen Timbers Lane and Jerome Road.

D. The detour route will be signed and maintained by the Contractor including all signage as required by the Ohio MUTCD and as shown on the attached page titled Figure 6H-8 Road Closure with Off-Site Detour.

4.04 JEROME ROAD – LUCAS COUNTY ENGINEER AND CITY OF MAUMEE

A. Jerome Road and River Road may be closed to through traffic for 2 days to permit the work to be completed.

B. The Contractor will obtain a permit from the Lucas County Engineer one week prior to commencing work in the public right of way in Lucas County. Application for permit shall be made at the Office of the Lucas County Engineer, 1049 S. McCord Road, Holland, OH 43528.

C. The Contractor shall has obtain a permit from the City of Maumee for this work.

D. No detour route is required for this road closure.

E. A sign notifying motorists of the closure shall be placed at Fallen Timbers Lane and the on-ramp to State Route 24.

END OF SECTION

Notes for Figure 6H-8—Typical Application 8
Road Closure with Off-Site Detour

Guidance:

1. Regulatory traffic control devices should be modified as needed for the duration of the detour.
2. If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection, the ROAD CLOSED and DETOUR signs on Type III Barricades should be located at the edge of the traveled way.

Option:

3. If the road is closed a short distance beyond the intersection and there are few origin/destination points beyond (for example, a few residences), the Type III Barricade shown in the figure may be moved to the center of the traveled lanes.

Standard:

4. **If the barricades are located as in Item 3 above, the ROAD CLOSED and DETOUR signs shall be placed only on the barricade centered in the lane of travel of traffic approaching the closure. The barricade centered in the lane of travel of departing traffic shall not be signed. The barricades in adjacent lanes shall be offset longitudinally from each other an adequate distance in order to permit traffic to travel around the barricades (the barricade in the road user's lane located in advance of the barricade located left of the center line).**

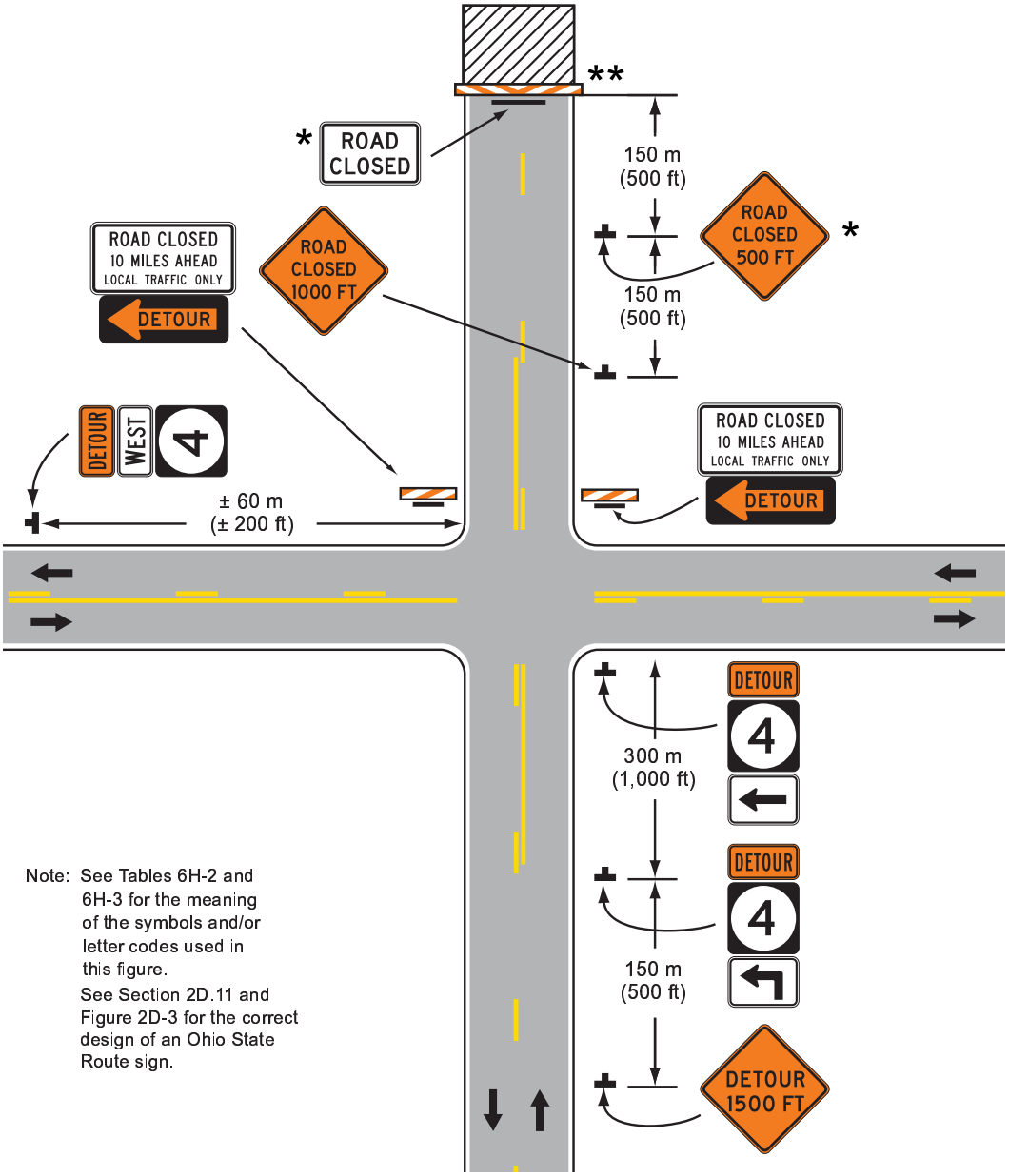
Option:

5. A Route Sign Directional assembly may be placed on the far left corner of the intersection to augment or replace the one shown on the near right corner.
6. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
7. Cardinal direction plaques may be used with route signs.

Figure 6H-8. Road Closure with Off-Site Detour (TA-8)

*2 Signs - One on each approach

**Type III Barricades as necessary to block roadway completely



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
See Section 2D.11 and Figure 2D-3 for the correct design of an Ohio State Route sign.

Typical Application 8

Notes for Figure 6H-12—Typical Application 12
Lane Closure on Two-Lane Road Using Traffic Control Signals

Standard:

1. **TTC signals shall be installed and operated in accordance with the provisions of Part 4. TTC signals shall meet the physical display and operational requirements of conventional traffic control signals.**
2. **TTC signal timing shall be established by authorized officials. Durations of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles.**
3. **When the TTC signal is changed to the flashing mode, either manually or automatically, red signal indications shall be flashed to both approaches.**
4. **Stop lines shall be installed with TTC signals for intermediate and long-term closures. Existing conflicting pavement markings and raised pavement marker reflectors between the activity area and the stop line shall be removed. After the TTC signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.**
5. **Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.**

Guidance:

6. Where no-passing lines are not already in place, they should be added.
7. Adjustments in the location of the advance warning signs should be made as needed to accommodate the horizontal or vertical alignment of the roadway, recognizing that the distances shown for sign spacings are minimums. Adjustments in the height of the signal heads should be made as needed to conform to the vertical alignment.

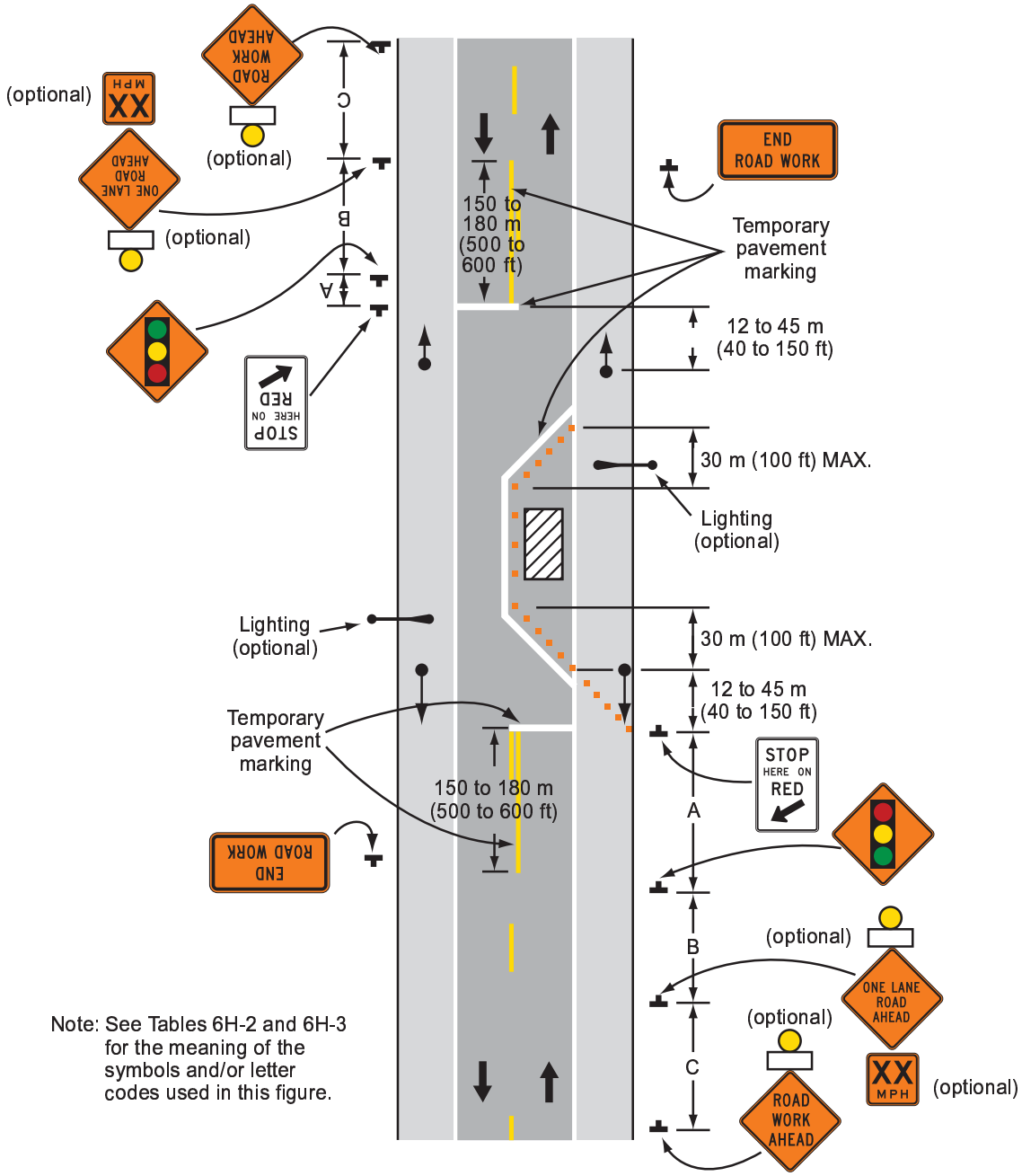
Option:

8. Flashing warning lights shown on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs may be used.
9. Removable pavement markings may be used.

Support:

10. TTC signals are preferable to flaggers for long-term projects and other activities that would require flagging at night.
11. The maximum length of activity area for one-way operation under TTC signal control is determined by the capacity required to handle the peak demand.

Figure 6H-12. Lane Closure on Two-Lane Road Using Traffic Control Signals (TA-12)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 12

SECTION 01565
TEMPORARY RESTORATION AND MAINTENANCE OF PAVEMENTS, CURBS, AND WALKWAYS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes temporary restoration and maintenance of pavements, curbs, and walkways.

B. Restoration:

1. The Contractor shall promptly restore as herein specified all curbs, walks, driveways, and roadways affected by the Work done under this Contract as soon as any sufficient portion thereof has been completed. Such temporary restoration shall be maintained in satisfactory condition until permanent restoration work replaces the temporary Work.

C. Maintenance:

1. All temporary pavement, sidewalks, and other pavements affected by the Contractor's operations shall be maintained by the Contractor at his expense in a suitable and safe condition for traffic until permanent replacement is to be made.

2. This Section includes maintenance in or along streets in which construction is taking place; streets used for moving materials and construction equipment to and from the construction area; and streets used for bypassing or detouring traffic around the construction area.

PART 2 PRODUCTS

2.01 PAVEMENT MATERIALS

A. Pavement materials shall be in conformance with Section 02600 and the ODOT CMS of these Specifications unless otherwise shown on the Drawings.

PART 3 EXECUTION

3.01 CONSTRUCTION OF TEMPORARY PAVEMENT, CURBS AND WALKS

A. Preparation of Subbase - Before laying any pavements, sidewalks, or curbs, the trenches shall be compacted and all resulting holes and depressions shall be filled and tamped solid.

B. Curbs - All curbs required to be reset temporarily shall be placed in their original position or as directed but the Contractor will not be required to set them in concrete.

C. Sidewalks - All sidewalks disturbed shall be temporarily restored immediately upon the placing of the backfill either by relaying the old sidewalk pavement, placing 4 inches of aggregate base, laying a pavement of wooden planks 2-inch-thick, suitably fastened, and

flush with the adjacent sidewalk, or otherwise as directed. Permanent sidewalks shall be replaced as soon as possible.

3.02 SEASONAL LIMITATIONS FOR TEMPORARY PAVEMENT CONSTRUCTION

A. Weather limitations for placing asphalt materials shall conform to ODOT CMS. When weather limitations prevent the placing asphalt materials, the Contractor shall place 8 inches of aggregate base and maintain it until seal coat can be applied.

B. When time restrictions are not in effect, the Contractor shall prepare the base and immediately place temporary or permanent pavement surface.

3.03 MAINTENANCE OF TEMPORARY PAVEMENTS

A. All existing temporary pavement and sidewalk shall be maintained by the Contractor at his own cost and expense in a suitable and safe condition for traffic until permanent replacement is to be made, or the Work finally accepted. Any depressions which develop shall be acceptably repaved when directed. Spots in the pavements which show signs of deficient bitumen or raveling shall be repaired by hand, and if deemed necessary, pavement shall be reconstructed in part or in whole as directed.

3.04 SEASONAL LIMITATIONS FOR MAINTENANCE OF BITUMINOUS PAVEMENT

A. During that time of year when asphalt concrete cannot be placed in conformance with ODOT Specifications, the Contractor shall remove loose material from holes and fill depressions in the pavement with temporary pavement as required to maintain the road surface in a condition acceptable to the Owner.

B. As soon as weather conditions permit, the Contractor shall remove the temporary pavement and permanent repairs as specified and shown on the plans.

3.05 PERFORMANCE

A. If, in the opinion of the Engineer, proper maintenance of traffic facilities and proper provisions for traffic control are not being provided by the Contractor, the Engineer may take the necessary steps to place them in proper condition, and the cost of such services will be deducted from any money which may be due or become due the Contractor.

PART 4 SPECIAL PROVISIONS

4.01 TEMPORARY PAVEMENT

A. Temporary pavement placed on the following roads during periods when permanent pavement cannot be placed or in locations that will remain in place for over 30 days shall include the specified permanent base and either a minimum of 3 inches of cold patch material (ODOT 441) or a layer of polyethylene sheeting and a minimum of 3 inches of concrete as specified in Section 02600.

SECTION 01568
POLLUTION CONTROL

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the requirements for pollution control.

PART 2 PRODUCTS

2.01 GENERAL

A. Dust palliatives shall conform to ODOT Item 616.

PART 3 EXECUTION

3.01 OHIO GENERAL REQUIREMENTS

A. The Contractor is responsible to obtain and pay for NPDES Permit for storm water discharge.

B. The Contractor is responsible for following an erosion control plan in accordance with the requirements of the Clean Water Act, 33 USC Section 1251 et seq. and the OWPCA, ORC 6111.01 et seq. and related rules. The Contractor warrants and agrees that it is equipped to limit water pollution for its activity according to applicable Federal and State standards.

C. It shall be the responsibility of the Contractor to prevent or limit pollution of air and water resulting from his operations.

D. The Contractor shall perform Work required to prevent soil from eroding or otherwise entering onto all paved areas and into natural watercourses, ditches, and public sewer systems, and to prevent dust attributable to his operations from entering the atmosphere.

E. Excess soil that is stockpiled shall be removed or regraded within 15 days of the completion of construction.

3.02 STREETS, SIDEWALKS AND DRIVEWAYS

A. Streets, haul roads, and detours and bypass roads shall be swept by automatic self-contained sweepers.

B. Excessive dirt on pavements shall be removed by means of hand shoveling or appropriate mechanical equipment and the area swept as directed above.

C. Sidewalks and driveways shall be cleaned by means of shovels and hand brooms or appropriate mechanical equipment.

D. Dust on unsurfaced streets or parking areas and any remaining dust on surfaced streets shall be controlled with calcium chloride dust palliative.

E. The Contractor shall comply with the above requirements on a daily basis. If the Contractor fails to perform the above Work in a satisfactory manner, all Work, except cleanup operations, shall be stopped until the Contractor has complied with the above requirement.

3.03 EROSION AND SEDIMENT CONTROL

A. The Contractor shall initiate appropriate vegetative practices on all disturbed areas to remain dormant (undisturbed) for more than 45 days within seven days.

1. Such practices may include: temporary seeding, permanent seeding, mulching, matting sod stabilization, vegetative buffer strips, phasing and protection of trees.

B. Permanent or temporary soil stabilization shall be applied to disturbed areas within seven (7) days after final grade is reached on any portion of the Site.

C. When seasonal conditions prohibit the application of temporary or permanent seeding, non-vegetative soil stabilization practices, such as mulching and matting, shall be used.

D. A stabilization construction entrance shall be provided to reduce vehicle tracking of sediment. The paved street adjacent to the Site entrance shall be swept a minimum of daily, or as needed, to remove any excess mud, dirt, or rock being tracked from the Site.

1. Dust and sediment along any street due to construction on this Site is to be swept a minimum of once at the end of the day or as necessary to prevent a build-up of dust and soil on the pavement surface.

E. Dump trucks hauling from the construction site shall be covered with a tarpaulin.

F. No more than 200-feet of trench shall be open at any given time. Trench opening, laying of pipe, and backfilling should occur so as to minimize the amount of disturbed area.

G. The Contractor shall minimize the width of his work area.

H. Existing trees, shrubs, and other ground cover vegetation shall be preserved where possible. Tree removal will be limited to that necessary for construction and will be limited further to the permanent easement wherever possible. No tree removal will be permitted outside the temporary easement.

I. Storm water runoff and natural stream flow shall be intercepted or diverted when originating upgrade away from the construction site so as to minimize the amount of flow over the construction site.

J. All dewatering flows are to be settled in siltation basins or directed through filters before discharge to stabilized sites, such as stream or storm sewers, and not onto exposed soils, stream banks, or any other sites where the flow could cause erosion.

K. When construction occurs near storm sewer inlets, erosion control measures such as inlet filters or hay bales shall be used to prevent silt from entering the storm sewers.

L. The clean-up and disposal of excess excavated material shall be done as soon as practical after laying of the pipe. However, clean-up work shall not fall behind the pipe laying more than 800-feet. Should the Contractor not keep his clean-up within the aforementioned distance, Work shall stop until the clean-up work is accomplished.

3.04 OHIO SEDIMENT CONTROL

A. Contractor shall control erosion and trap sediment from all sites remaining disturbed for more than 14 days. Such practices shall include among others, sediment traps, sediment basins, silt fences, and storm drain inlet protection. Silt Fence fabric shall be ODOT Item 712.09 type C Geotextile Fabric.

B. Timing - Sediment control structures shall be functional throughout earth-disturbing activity. Sediment ponds and perimeter sediment barriers shall be implemented as the first step of grading and within seven days from the start of grubbing. They shall continue to function until the upslope development area is restabilized.

C. Settling Ponds - Concentrated storm water runoff from disturbed areas flowing at rates which exceed the design capacity of sediment barriers shall pass through a sediment settling pond. The facility's storage capacity shall be 67 cubic yards per acre of drainage area.

D. Sediment Barriers - Sheet flow from runoff from denuded area shall be intercepted by sediment barriers. Sediment barriers, such as sediment fences or diversions directing runoff to settling facilities, shall protect adjacent properties and water resources from sediment transported by sheet flow.

E. Other erosion and sediment control practices shall prevent sediment-laden water from entering drain systems, unless the storm drain system drains to a settling pond. These practices shall divert runoff from distributed areas and steep slopes where practicable and stabilize channels and outfalls from erosive flows.

3.05 CONSTRUCTION OF SLOPES

A. The Contractor shall comply with the following requirements when working on slopes exceeding 4:1.

1. The pipeline shall be constructed during dry weather, low flow periods as determined by the Engineer. The construction time for this Work shall be limited to the shortest time possible in order to minimize environmental impacts.

2. Construction equipment shall be limited to trenching equipment or rubber tired backhoes in order to prevent soil erosion and maintain slope stabilization.

3. Biodegradable mesh shall be used for slope stabilization. The mesh shall cover the entire width of disturbed ground.

4. The trench shall be backfilled immediately after installation of the pipe. The disturbed areas shall be graded, seeded, and mulched within 24 hours after

backfilling. The Contractor shall maintain all seeded and mulched areas in accordance with the specifications until final acceptance of the Work.

5. The Contractor shall place straw or hay bales at the base of the slopes for sedimentation control. The bales shall be placed prior to construction of the pipeline and shall remain until final seeding has germinated and become established.

3.06 STREAM CROSSING

A. Construction of the stream crossings shall occur only during dry weather low-flow periods. Wherever possible, use of heavy equipment during crossing construction is to be restricted to the stream bank and is not to be permitted in the stream channel.

B. The width of stream banks disturbed in constructing a stream crossing shall be limited to the width of the trenching machine.

C. Immediately after the conduit and any required concrete encasement is in place, the re-establishment of channel contours and bank stabilization shall commence. The stream crossing and associated restoration shall be completed within 48 hours of initiation.

D. To minimize erosion, the Work of clearing, grading, excavation, pipe installation, backfilling, erosion protection, final cleanup and all other Work within 50-feet of the stream shall be performed immediately following installation of the Work within the stream.

3.07 PROHIBITED CONSTRUCTION ACTIVITIES

A. Disposing of excess or unsuitable excavated material in wetlands or floodplains, even with the permission of the property owner.

B. Locating stockpile storage areas in environmentally sensitive areas.

C. Indiscriminate, arbitrary, or capricious operation of equipment in any stream corridors, any wetlands, any surface waters, or outside the easement limits.

D. Pumping of sediment-laden water from trenches or other excavations directly into any surface waters, any stream corridors, any wetlands, or storm sewers; all such water will be properly filtered or settled to remove silt prior to release.

E. Discharging pollutants such as chemicals, fuels, lubricants, bituminous materials, raw sewage and other harmful waste into or alongside of rivers, streams, impoundments, or into natural or man-made channels leading thereto.

F. Permanent or unspecified alteration of the flow line of any stream.

G. Damaging vegetation outside of the construction area.

H. Disposal of trees, brush, and other debris in any stream corridors, any wetlands, any surface waters, or at unspecified locations.

I. Open burning of project debris without a permit.

J. Discharging injurious silica dust concentrations into the atmosphere resulting from breaking, cutting, chipping, drilling, buffing, grinding, polishing, shaping or surfacing closer than 200 feet to places of residences or places of human occupation.

K. Storing construction equipment and vehicles and/or stockpiling construction materials on property, public or private, not previously specified on the Drawings or not authorized by the Owner or Engineer for such purpose.

L. Running well point or pump discharge lines through private property or public property and rights-of-way without the written permission of the property owner and the consent of the Engineer.

PART 4 SPECIAL PROVISIONS

4.01 STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

A. The Drawings show recommendations for pollution prevention measures to be provided. The measures shown on the Drawings shall be considered the minimum level of pollution prevention.

B. The Contractor shall adhere to the SWPPP in accordance with OEPA Guidelines.

C. The SWPPP shall be updated and maintained throughout the Work.

D. A copy of the SWPPP shall be available at the Site.

E. The Owner has submitted a Notice of Intent (NOI) for the Work. The Contractor is required to apply for coverage as a co-permittee. The permit number will be provided to the Contractor at the time of co-permittee.

END OF SECTION

SECTION 01800
CONSTRUCTION SURVEY WORK

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the furnishing of all labor, materials, equipment, and services necessary for the completion of Construction Survey Work in accordance with the Contract Documents.

B. This Work consists of the layout of all lines and grades shown on the Drawings or as altered or modified by the Engineer, control survey and of miscellaneous survey work related to construction of the project.

1.02 PROJECTION

A. The Contractor shall protect and preserve the established reference points and monuments.

B. Whenever monuments are encountered in the line of Work, whether shown on the Drawings or not, the Contractor shall notify the Engineer in writing at least 24 hours in advance of moving same, and under no circumstances is such a stone or other monument to be removed or disturbed by the Contractor or by any of his men without a written order of the Engineer and only when a registered surveyor representative of the Owner is present.

1.03 REPLACEMENT OF LOST SURVEY POINTS

A. Whenever a reference point or monument is lost or destroyed or requires relocation, the Contractor shall, at his own expense, accurately relocate and replace all such points so lost, destroyed, and moved.

1.04 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Information for the Record:

a. Layout Sheets including, but not limited to, Benchmarks both temporary and permanent and Pipeline layout staking.

b. Field Notes and survey log.

c. Profile over Proposed Tunneled, Jacked, or Bored Pipe.

d. Certified Survey of Tunneled, Jacked, or Bored Pipe.

B. Contractor shall provide the Engineer and Resident Project Representative, no later than five working days prior to installation, all Logs, reports, field notes, drawings and documentation as specified shown on the Drawings or directed.

C. No pipeline or related Work shall be considered for payment until all logs, reports field notes drawings and documentation as specified, shown on the Drawings or directed has been submitted to the Engineer or Engineers representative.

PART 2 PRODUCTS

2.01 CONSTRUCTION STAKING

A. All construction points shall be marked with a wooden hub and nail or a PK nails in concrete and asphalt pavements and walks.

B. All points located in areas of heavy underbrush, inaccessible or limited site distance shall be identified with a wood lath extending a minimum of 3 feet above the ground.

C. All points located in paved surfaces shall be clearly marked with paint. Contractor shall obtain written permission from the Owner to use paint for marking.

PART 3 EXECUTION

3.01 COORDINATION

A. The Contractor shall provide field forces necessary to lay out the location, alignment, elevation, and grade of the Work shown on the Drawings and in conformance with the control points and benchmarks shown on the Drawings.

B. The Contractor shall use competent personnel and suitable equipment for the layout of the Work required. If the layout Work involves more than a few simple distance and elevations from established reference points, the Contractor shall employ a Registered Surveyor to supervise the layout Work.

C. Contractor shall furnish the necessary labor to assist the Engineer in checking the installation, if required.

3.02 EXISTING CONNECTION POINTS

A. The Contractor shall verify critical elevation points of the existing utilities prior to commencing installation of Work. Critical points shall include all points where new Work connects to existing utilities and existing utilities that could be conflicts with Work. All data shall be provided to the Engineer before commencing Work.

3.03 RIGHTS-OF-WAY AND EASEMENTS

A. Rights-of-way or easement(s) shall be staked at points along the boundaries so that at least two stakes can be seen distinctly from any point along the boundary line. The staking shall not exceed 200-feet in any direction. All points of change in width or direction of the rights-of-way or easement(s) boundary line shall be staked.

B. When the Contractor performs construction and the zone of influence is within 10-feet of a rights-of-way or easement(s) boundary line, they shall place stakes properly identifying points of change in width or direction of the boundary line and at points along the boundary line not to exceed 25-feet.

3.04 PAVEMENT

A. The Contractor shall establish a layout for location and grade on both sides of the road and 5-feet off the edge of the pavement or back of curb. Layout line shall consist of stakes set at station intervals necessary for the topography and environment to assure conformance to planned line and grade. Stakes shall be set at a minimum every 50-feet, at all vertical and horizontal points of curvature and points of tangent, and at all vertical high or low points.

B. Stakes for line and grade of pavement and curb shall be set at station intervals necessary for the topography and environment, not to exceed 50-feet, and at low and high points of vertical curves to assure conformance to planned line and grade.

3.05 PIPE IN OPEN CUT

A. The Contractor shall utilize a laser beam for establishing line and grade when installing pipeline in open-cut construction. In order to maintain control during pipeline installation and to obtain the required field data for the record documents (G.C. 6.19) the Contractor shall establish construction and layout stakes. These stakes shall be based on the contract documents and the survey control data as provided by the Engineer.

B. The construction staking shall be placed along the pipeline route at and at location of new manholes, valves, deflections both vertical and horizontal and as specified, shown on the Drawings or as directed. All construction layout stakes shall be offset at a minimum of 10-feet and at a right angle to the pipe line route. Layout shall be referenced to the downstream manhole or valve, in addition it may reference survey of baseline stationing.

C. Contractor shall provide to the Engineer, no later than five working days prior to the installation of the pipeline, all information of the completed construction layout staking. This information shall include but not be limited to stationing, elevations, control points, project coordinates, offset direction and distance for all deflections both horizontal and vertical, manholes and all other points as specified, shown on the Drawings and directed by the Engineer.

D. The grade of pipe in open-cut, whether placed by laser beam or other approved methods, shall be checked using surveying equipment. The Contractor shall have a surveyor’s level and level rod on the Site at all times when pipeline and appurtenances are being installed. The level rod shall be equipped with an attached “shoe” extension on the bottom for placing on the pipe invert. The pipe invert elevation shall be checked at a maximum of 50-feet intervals or more often as directed by the Engineer. Checks will

be performed by the Contractor and results, including but not limited to layout station shall be recorded in contractor's field log.

E. The Contractor shall furnish all equipment and labor and check his alignment from the offset stakes. Contractor shall record all information in the log.

F. Any inspection or checking of the Contractor's layout by the Engineer shall not relieve the Contractor of his responsibility to secure the proper dimensions, grades, and elevations of the Work.

3.06 PIPE INSTALLED BY DIRECTIONAL DRILLING

A. The Contractor shall utilize, as a minimum, RF (radio frequency) transmitter mounted inside the drill bit to track line and grade when installing pilot borehole in directional drilling construction. In order to maintain control during pipe installation and to obtain the required field data as specified, shown on the drawings or directed; the Contractor shall establish construction line stakes. These stakes shall be based on the contract documents and the survey control data as provided by the Engineer.

B. The construction line staking shall be placed along the centerline of pipeline route and at manholes, valves, deflections, PC and PT both vertical and horizontal and as specified, shown on the drawings or as directed. In addition, offset staking shall be provided at all manholes, valves, deflections and any place of excavation at a minimum of 10-feet and at a right angle to the pipeline route. Staking shall be referenced to the downstream manhole or valve, in addition it may reference survey of baseline stationing.

C. The depth and alignment of directional drilling pilot hole for pipe shall be checked at each drill rod, using a walkover system or wireline system. The Contractor shall have a surveyor's level and level rod on the Site at all times to confirm ground elevation and borehole elevation. The pipeline elevation and alignment shall be checked at a maximum of 25-feet intervals or more often as directed by the Engineer. Checks will be performed by the Contractor and results, including the layout station the elevation was checked, and recorded in contractor's log. The Contractor's logs must be submitted to the Engineer prior to receiving any payment for the Work.

D. Any inspection or checking of the Contractor's layout by the Engineer shall not relieve the Contractor of their responsibility to secure the proper dimensions, grades, and elevations of the Work.

3.07 TUNNELING, JACKING OR BORING PIPE

A. Control of line and grade of pipe Work installed in tunnel or by jacking or boring shall be the responsibility of the Contractor.

B. The line and grade of pipes installed shall be checked from lines and elevations established in the pipe and the construction shaft by a registered surveyor.

C. The Contractor shall furnish, install, and adjust ready for use such equipment as required to check at any time the line and grade of pipe or tunnel liner being installed.

D. Should the pipe or the tunnel liner deviate more than 0.06-feet from the proposed grade or 0.25-feet from the proposed line, the Contractor shall immediately make adjustments necessary to bring the installation back to the proposed location.

E. Upon completion of a section of pipe or tunnel liner, the Contractor shall provide the Engineer with a certified survey by a registered surveyor showing the location and invert elevation of the installation at a maximum of 50-feet intervals.

F. Prior to construction of sewers by tunneling, jacking, or boring, the Contractor shall provide the Resident Project Representative with ground elevations above the centerline of the proposed sewers taken at 25-feet interval stations, shaft locations, and manhole locations.

G. The Contractor shall establish temporary benchmarks outside the tunnels zone of influence, a minimum of 50-feet each side of centerline, before commencing construction. Temporary benchmarks shall be a maximum of 2,000-feet apart with a minimum of two benchmarks per tunnel run. The Contractor shall determine the final elevation of all original benchmarks shown on the Contract Drawings at the project completion.

3.08 LOCATION OF STRUCTURES AND UNDERGROUND PIPING

A. The location of new structures and underground utilities shall be based on the dimensions, coordinates, and requirements shown on the Drawings or specified.

B. If it is stated on the Drawings or specified that the location and/or elevation of the new structure or underground piping shall depend on the location of existing underground or otherwise hidden facilities, those existing underground or hidden facilities shall be located by the Contractor prior to his determination of the location and/or elevation of the new facilities. This requirement shall override any other specific location dimensions or coordinates shown on the Drawings for that structure or piping.

C. If the location or elevation determined by the Contractor, in accordance with the above requirements, appears to cause conflicts with existing structures or utilities or appears to potentially cause functional issues with either the existing or new structures or utilities, the Contractor shall notify the Engineer immediately.

D. In no case, shall coordinates or other location information be extracted or interpolated from the electronic CAD files that may be provided to the Contractor by the Owner or Engineer without the specific approval of the Engineer.

3.09 CURB AND GUTTER ELEVATIONS

A. In locations where the existing curb and gutter shall be removed as part of the Work, the Contractor shall be responsible for reconstructing the existing curb and gutter to match existing alignment, elevations and grades. The Contractor shall be responsible for collecting existing curb and gutter elevation information prior to commencing the Work.

3.10 BENCHMARKS/VERTICAL CONTROL

A. Benchmarks have been set for survey and construction reference purposes.

B. The Contractor shall protect and transfer these benchmarks as needed to complete the Work.

3.11 HORIZONTAL CONTROL

A. The centerline stationing provided is not based upon physical control points found or established as part of the design.

B. The Contractor shall establish horizontal control as necessary.

PART 4 SPECIAL PROVISIONS

4.01 REGISTERED SURVEYOR

A. The Contractor shall employ the services of a registered surveyor for the initial layout and staking of the project. The Registered Surveyor shall be utilized at any time when reestablishing control points, elevations and on any redesign or extension of the Work. All survey Work shall be as specified, shown on the drawings or as directed.

4.02 PRESSURE PIPE ELEVATIONS

A. Any deviation from the plan pipe elevations shall be brought to the attention of the Engineer, to permit the Engineer to evaluate the impact of the elevation modification upon air valve release placement.

B. The force main elevations are intended to provide controlled grades to permit the force main to expel air at air release valves. Deviation from the elevations provided may affect the performance of the force main, and any changes in grade should be reviewed by the Engineer.

4.03 CONSTRUCTION BENCHMARKS

A. In areas where vertical control benchmarks have not been provided, the Contractor shall set temporary benchmarks (hubs) at 200-foot intervals.

B. Any benchmarks lost during the work may be replaced if so directed by the Engineer.

C. The Contractor shall submit a bench circuit (forward and return), closing within 0.01’ to the engineer for the record.

D. The bench circuit shall be performed under the supervision of a surveyor registered in Ohio.

END OF SECTION

SECTION 01810
VIDEO RECORDING

PART 1 GENERAL

1.01 SCOPE

A. Under this Section the Contractor shall furnish all personnel, transportation, recording equipment, power, and materials to produce color video records of existing topography along all pipeline routes and designated haul roads, in designated residences, and as directed.

1.02 SCHEDULE OF WORK

A. Unless otherwise directed in writing by the Engineer, video recording shall be scheduled in conformance with the following:

1. No recording shall be started on any portion of the Work until that portion of the Work is under Contract unless otherwise directed by the Owner.
2. Recording shall not precede excavation for construction by more than three months.
3. Video recording shall be performed only when foliage is visible on trees, except as authorized by the Engineer.
4. Video recording shall not be performed when more than 10% of the ground is covered with snow or leaves, unless authorized by the Owner.

B. Before proceeding with the work, the video recording, Contractor shall consult with the Engineer concerning the following:

1. Scheduling recording to precede construction.

C. All recording shall be completed on a section of Contract before the Contractor starts excavation or places material or equipment in that section.

D. In areas where public utilities are to be relocated or replaced, a second video recording shall be made after the public utility has concluded their work but before the Contractor commences operations.

E. The Owner shall obtain permission for the recording crew to enter private property not included in an easement. The Contractor shall give the Owner sufficient prior notice to obtain the permission.

1.03 DEFINITIONS

A. Video Recording - Zone of Influence - Shall include producing video records as specified herein for the zone of influence. The zone of influence shall be defined as all surface area within street rights-of-way or easements in which project is to be installed or

within areas 50 feet on each side of a proposed utility centerline, whichever is greater, and additional features in contiguous areas as specified or directed.

B. Video Recording of Buildings - Entering - Shall include moving video equipment into buildings or residences (including attached or separate garages) designated by the Engineer for the purpose of recording existing conditions therein.

C. Video Recording of Building - Panels - Shall include video recording of designated panels of buildings. Panel as used herein shall mean the full surface of a room wall, ceiling, or floor or the outer side of a building not viewable in any zone of influence recording.

1.04 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Provide a minimum of four copies of the video.

PART 2 PRODUCTS

2.01 VIDEO RECORDING

A. Displays - All video shall, by electronic means, display (visible on the playback viewer) continuously and simultaneously generated transparent digital information which shall include the date and time of recording, as well as the corresponding planned station numbers. The date information shall contain the month, day, and year. The time information shall consist of hours, minutes, and seconds, separated by punctuation marks. Below the stationing, periodic transparent alpha/numeric information shall appear. The information shall consist of the name of the project, name of area covered, direction of travel, viewing side, and any other pertinent data.

2.02 VIDEO OUTPUTTING

A. Video recording shall be a digital file format such as MPEG, MP3, MP4, Wave or WMV or other current standard file formats as approved by Engineer.

B. The electronic file organization shall reasonably match the project stationing with file names including the station number and street names.

C. The electronic files shall be stored on a single solid-state memory device, such as a DVD disc or jump/thumb drive, external hard drive. Solid state memory devices shall have a USB for connection to a computer. The memory volume on the storage device shall be adequate to store the electronic video files in an unzipped capacity along with any associated or embedded data files.

2.03 AUXILIARY LIGHTING

A. Auxiliary lighting shall be used wherever necessary to ensure clarity of picture.

PART 3 EXECUTION

3.01 PERSONNEL

A. The Work shall be performed by competent personnel with knowledge of the procedures and methods to produce satisfactory records as specified herein.

3.02 PRODUCTION

A. Recording shall be composed in such a manner that Filming shall, in general, proceed in the direction of the project stationing.

B. Recorded Contents:

1. Video recordings shall be supported by appropriate audio description simultaneous with the visual coverage.

2. All houses or buildings and other readily recognizable objects as required shall be identified visually and audibly in such a manner that they can be referenced to the stationing of the project. Objects selected shall be at intervals not exceeding 100 lineal feet and shall include all houses and buildings identified by house numbers.

3. Within the zone of influence, the recording shall include but not be limited to all sidewalks, driveways, ditches, parkways, lawns, inlets, culvert pipe ends, trees, shrubs, fences, houses, and buildings that could conceivably be affected by the Contractor's operations. The video shall call attention to existing cracks or uneven areas in walks and driveways, damaged lawns, trees or shrubbery, broken or missing inlet castings, deteriorated fences, and, where feasible, broken or plugged culvert pipes.

4. Within street rights-of-way, the recording shall include but not be limited to all pavement, curbs and inlets, mailboxes, traffic signs, and street signs. The video shall call attention to damaged mailboxes, signs, curbs and inlet castings. Damaged areas in pavements over proposed project or in pavements scheduled for resurfacing need not be referred to.

5. Video recording for designated residences shall include documentation of surface conditions inside and outside of the building prior to starting project construction.

C. Control of Picture Quality - The camera carrier shall travel at a low speed to ensure against blur or distortion of the recorded pictures. A maximum rate of 48-feet per minute is recommended.

3.03 OWNER REVIEW

A. As the video recording work progresses, the Contractor shall deliver completed sections to the Owner and Engineer. The Owner and Engineer shall review the recordings and determine if they are acceptable for clarity and coverage. The recording may be rejected

if the picture is of poor quality (i.e., blurred, distorted, too light, too dark, improper color), insufficient coverage, or does not meet specified requirements.

B. The area of rejected recording shall be rerecorded by the Contractor and reinserted in the electronic file in the proper sequence.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 01820
VIDEO RECORDING OF UNDERGROUND INFRASTRUCTURE

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the requirements for video documentation of underground facilities.

B. The Contractor shall provide personnel, transportation, recording equipment, power, and materials, to produce color video records of existing or new underground pipelines, structures, designated service pipes and as directed.

C. The Contractor shall provide traffic control, flow control, by-pass pumping and cleaning of underground pipelines, structures and designated service pipe in order to produce video documents.

1.02 SCHEDULE OF WORK

A. Before proceeding with the work, the video recording contractor shall consult with the Engineer concerning the following:

1. Scheduling recording to precede construction.

B. The Owner will obtain permission for the recording crew to enter private property not included in an easement. The Contractor shall provide a schedule of locations 30 days in advance of Work. The Contractor shall coordinate access with Owner and adhere to the schedule.

1.03 DEFINITIONS

A. Video recording shall include producing video records of the area within the underground infrastructure as designated and as specified herein.

1.04 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Provide a minimum of two copies of the video.

2. Information for the Record:

a. The Contractor shall submit, prior to starting Work, at his own expense, a sample color USB flash or USB hard drives meeting the contract requirements and upon request, must submit at least three letters of reference for the video firm pertinent to the performance and

satisfactory completion of color video projects from various municipalities.

PART 2 PRODUCTS

2.01 VIDEO RECORDING

A. Picture Quality - Video output from camera(s) shall be produced at a minimum of 720 by 480 resolution. Camera(s) shall also produce optimum color imagery with a minimum of 20-foot-candles of illumination.

B. Displays - All video shall, by electronic means, display (visible on the playback viewer) continuously and simultaneously generated transparent digital information which shall include the date and time of recording, as well as the corresponding planned station numbers. The date information shall contain the month, day, and year. The time information shall consist of hours, minutes, and seconds, separated by punctuation marks. Below the stationing, periodic transparent alpha/numeric information shall appear. The information shall consist of the name of the project, name of area covered, direction of travel, viewing side, and any other pertinent data.

2.02 VIDEO OUTPUTTING

A. Video recording shall be a digital file format such as MPEG, MP3, MP4, Wave or WMV or other current standard file formats as approved by Engineer.

B. The electronic file organization shall reasonably match the project stationing with file names including the station number, street names and manhole numbers with distances measured from entry to exit manholes. The system shall start at the lower end of sections of the planned system and proceed upstream, completing one section before starting another.

C. The electronic files shall be stored on a single solid-state memory device, such as a jump/thrum drive, external hard drive. The solid-state memory device shall have a USB for connection to a computer. The memory volume on the storage device shall be adequate to store the electronic video files in an unzipped capacity along with any associated or embedded data files.

2.03 AUXILIARY LIGHTING

A. Auxiliary lighting shall be used wherever necessary to ensure clarity of picture.

PART 3 EXECUTION

3.01 PERSONNEL

A. The Work shall be performed by competent personnel with knowledge of the procedures and methods to produce satisfactory records as specified herein.

3.02 PRODUCTION

A. Recording shall be composed in such a manner that:

1. Filming shall, in general, proceed in the direction of the planned stationing.

B. Recorded Contents:

1. Readily recognizable objects shall be identified visually in such a manner that they can be referenced to the planned stationing. Objects selected shall be at intervals not exceeding 100 lineal feet and shall include all house leads/taps identified by measured distance.

2. The recording shall include but not be limited to all inlets, culvert pipe ends, house leads or taps. The video shall call attention to existing cracks or uneven areas, or missing pipe.

C. Control of Picture Quality - The camera carrier shall travel at a low speed to ensure against blur or distortion of the recorded pictures. A maximum rate of 30-feet per minute is required.

D. Depth of flow in section being inspected shall be no greater than 25%.

3.03 OWNER REVIEW

A. As the video recording work progresses, the Contractor shall deliver completed sections to the Owner and Engineer. The Owner and Engineer shall review the recordings and determine if they are acceptable for clarity and coverage. The recording may be rejected if the picture is of poor quality (i.e., blurred, distorted, too light, too dark, improper color), insufficient coverage, or does not meet specified requirements.

B. The area of rejected recording shall be rerecorded by the Contractor and reinserted in the electronic file in the proper sequence.

PART 4 SPECIAL PROVISIONS

4.01 POST CONSTRUCTION SEWER INSPECTION

A. The Contractor shall conduct a video recording of the inspection of new storm and sanitary sewers after the installation is complete as specified herein.

B. The Owner and Engineer shall be present for all video inspection during the initial recording.

C. Final acceptance, by Owner and Engineer, of sewer installations shall be based upon the video inspection of the sewers

END OF SECTION

SECTION 02100
CLEARING AND GRUBBING

PART 1 GENERAL

1.01 SCOPE

A. This Section includes grubbing, scalping, and otherwise clearing of the construction site in accordance with the Drawings and as specified herein or ordered.

B. This Work includes the removing and disposing of all trees, stumps, vegetation, and debris as necessary to accommodate new construction or to recontour the Site, and the preservation of all vegetation and other objects designated to remain.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Information for the Record:

a. Spoil Site Permit - When the material and debris resulting from the clearing and grubbing operations are disposed of at locations off the project, the Contractor shall obtain and submit as specified written permission from the owner of the property upon which the material and debris are to be placed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Paint required for cut or scarred surfaces of trees or shrubs designated to remain shall be a suitable asphaltum base paint.

PART 3 EXECUTION

3.01 COORDINATION

A. Clearing and grubbing shall be performed only after the Site has been surveyed and staked as required and in accordance with Section 01800.

3.02 PREPARATION

A. The Contractor shall protect and preserve all land survey monuments or property corners along the line of his work.

1. Where monuments, irons, or property corners are disturbed or removed due to operations under this Contract, the Contractor, at his own expense, shall employ the services of a registered land surveyor to establish, reset or replace such monuments, irons, or property corners.

B. The Contractor shall not damage or destroy trees or shrubs nor remove or cut them without authorization by the Owner. All trees and shrubs except those ordered to be removed shall be adequately protected by the Contractor. No excavated material shall be placed so as to damage such trees and shrubs.

1. Trees and shrubs damaged by the Contractor shall be replaced with new stock of similar size and age, or with other stock size and age satisfactory to the Owner, at the proper season, and at the sole expense of the Contractor. Scarred surfaces shall be treated as indicated in Part 2.

C. When or where any direct or indirect damage is done to public or private property resulting from Contractor's operations, such property shall be restored by the Contractor, at his expense, to a condition equal or better than that existing before such damage was done or the Contractor shall make good such damage in manner acceptable to the owner of the property.

3.03 CLEARING AND GRUBBING

A. Only those trees and shrubs shall be removed that are in actual interference with excavation or grading work and such removal shall be subject to approval by the Engineer. The Engineer reserves the right to order additional trees or shrubs removed at no additional cost if, in his opinion, they cannot be maintained or have been damaged by the Contractor's operations.

B. All trees, stumps, vegetation, and debris not designated to remain shall be cleared and/or grubbed, except for special treatment as follows:

1. In locations to be seeded, stumps, roots, and other protruding obstructions shall be removed to a minimum of 6 inches below the final ground surface.

2. Undisturbed stumps, roots, and non-biodegradable solid objects 3 feet minimum below proposed subgrade or embankment surfaces will not require removing providing they do not extend more than 6 inches above the existing ground surface.

C. The clearing and grubbing shall extend no more than 10 feet beyond the top of the backslope and/or toe of embankment, or edge of the pipe to be constructed.

D. At all times, the Contractor shall remain within the property lines and/or easement areas.

E. Except in areas to be excavated, all holes resulting from the clearing and grubbing operations shall be backfilled and compacted in accordance with Section 02200.

3.04 SCALPING

A. Areas of excavation or embankment shall be scalped of brush, roots, sod, grass, crop residue, decayed vegetable matters, and other organic materials.

B. Scalping depth shall be only as required to remove the above. Scalping of topsoil is not included under this Section.

3.05 DISPOSAL OF DEBRIS

A. Debris resulting from the clearing and grubbing operations shall be disposed of at designated spoil sites in a legal manner, in full compliance with applicable codes and ordinances.

PART 4 SPECIAL PROVISIONS

4.01 TREE REMOVAL

A. All trees to be removed shall be removed between October 1 and March 31.

B. A tree is defined as a live, dying or dead plant with a minimum diameter of 3 inches with snags at 4-feet above the ground surface and a minimum height of 12-feet above the ground surface.

C. Large clusters of trees have not been individually marked and removals in such areas are noted as “clear and grub”, with work to be performed in accordance with the requirements of these specifications.

4.02 TREES OR BRUSH TRIMMING

A. Trees or brush scheduled for trimming shall have only branches or foliage in conflict with the clear passage of equipment or work removed with the prior approval of the Engineer.

B. Limbs or branches shall be removed back to a branch greater than 3-inches in diameter or the main tree trunk.

C. Trimming shall be performed in a manner to prevent damage to the portion of the tree remaining.

4.03 CLEARING AND GRUBBING ON EASEMENT AREAS

A. The Contractor shall strictly adhere to the cleaning and grubbing limits shown on the plans.

B. A meeting shall be held on site with the Contractor, Owner and Engineer prior to commencing clearing and grubbing within easement areas.

4.04 CLEARING AND GRUBBING ADJACENT TO THE MAUMEE RIVER

A. Clearing and grubbing in the areas directly adjacent to any of the stream crossings or the Maumee State Recreational River shall not take place until 72 hours before installation of the utility crossing.

B. All streambank vegetation shall be left undisturbed to the maximum extent possible.

C. Areas where vegetation is removed shall be re-vegetated with native tree species.

D. Any disturbed streambanks shall be returned to previously existing contours and elevations.

E. A native tree species list can be provided by the Northwest Assistant Regional Scenic Rivers Manager, Christina Kuchle. After a full growing season for the trees, any stakes

and guide wires shall be removed and properly disposed of. Any trees that die during the first growing season shall be replaced.

F. Care shall be taken not to girdle or scuff tree trunks or damage any standing trees.

END OF SECTION

SECTION 02110
REMOVAL OF STRUCTURES AND OBSTRUCTIONS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes demolition of existing structures and removal of pavement, piping, and equipment necessary to clear space for new construction and/or to rehabilitate existing construction.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Information for the Record:

a. The Contractor shall submit, as specified, a copy of a signed permit from the owner of the property upon which the debris, removed under this Section, will be disposed.

b. Dust and noise control measures

c. Record documents, in accordance with the General Conditions, and photograph or video recording indicates the location of, but not limited to, the following existing, new, and abandoned:

1) Utilities.

2) Mechanical.

3) Electrical.

4) Structural.

5) Any embedded items.

d. Inventory and documentation list for removed and salvaged materials for the Owner.

1.03 QUALITY ASSURANCE

A. Contractor shall execute the Work in compliance with all federal, state, and local codes. Any removal or demolition shall not leave the Owner in violation of any such regulations or codes unless approved by the Owner and Engineer.

1.04 PROTECTION

A. Structures shall be removed in such a manner as not to damage any portions of the existing structure which are to remain in place.

PART 2 PRODUCTS

2.01 FILL MATERIAL

A. Fill material shall be in accordance with Section 02200.

PART 3 EXECUTION

3.01 COORDINATION

A. Demolition work extending beyond the limits as specified, shown on the Drawings, or as required, will be considered unauthorized. The Contractor, at no additional cost to the Owner, shall repair said damage to a condition equal to or better than existed prior to commencement of the Work.

B. Existing structures and equipment which are damaged in appearance or function by performance of demolition work shall be replaced or repaired, at Owner's discretion and to an approved condition, by the Contractor at no increase in Contract Price.

3.02 PAVEMENTS, SIDEWALKS, CURBING AND SIMILAR STRUCTURES

A. Removal of existing pavements, sidewalks, curbing, and similar structures shall end at an existing joint or a sawed joint per ODOT 202. Sawed joints shall be straight, neat, and free from chipped or damaged edges.

B. For removal of non-reinforced concrete, the minimum depth of saw cut shall be 3 inches.

C. For removal of reinforced concrete, the depth of saw cut shall be sufficient to cut the steel unless specified otherwise.

D. If the concrete is coated with a bituminous surface or other material, the depth shall be sufficient to cut into the concrete, not including the coating depth, as specified above.

3.03 EXCAVATION OF RIGID PAVEMENT

A. The Contractor shall excavate rigid pavement, consisting of concrete or concrete base with a wearing surface of brick or bituminous concrete per ODOT 202, wherever such excavation is required for the purposes of this Contract.

B. Pavement shall be excavated to neat lines and, unless otherwise specified in Part 4 of this Section, only to widths required for trenches for pipe laying and for construction of structures. Adequate provision shall be made to prevent settlement and breakage of pavement beyond the approved limits of excavation. Concrete pavement and sub-base shall be cut with a concrete saw in conformance with Subsection 3.02.

3.04 MANHOLES, CATCH BASINS, INLETS AND SIMILAR STRUCTURES

A. Existing manholes, catch basins, inlets, and similar structures designated to be removed shall be completely removed.

B. Manholes, catch basins, inlets, and similar structures designated to be abandoned shall be removed to an elevation of at least 3 feet below the finished subgrade or ground surface. The remaining void shall be filled with special backfill material compacted to 100% optimum density per ASTM D698 or controlled density fill, CDF if permitted by the Engineer. All sewer openings in manholes located on sewer lines that are not to be filled, shall be plugged with 8-inch minimum thickness masonry plug.

C. Sewers designated to remain in service and connected to structures indicated to be removed or abandoned shall be rebuilt through the area with new pipe. Sewer flow shall be maintained between removal and replacement operations. Abandoned sewers shall be sealed and made watertight with approved precast stoppers or masonry bulkheads.

D. All castings or hydrants salvaged from abandoned or removed structures shall remain the property of the Owner, if requested by the Owner, and shall be cleaned and transported by the Contractor to a site designated by the Owner or incorporated in the Work where called for on the Drawings, scheduled, or so directed. If Owner decides salvaged materials are not wanted, the Contractor shall dispose of them at no additional cost to the Owner.

3.05 GROUT-FILLED ABANDONMENT OF PIPE, CONDUIT AND SIMILAR STRUCTURES

A. Ends of sewer designated to be abandoned shall be sealed with approved masonry bulkheads or factory caps and plugs.

B. Contractor shall determine and modify, as necessary, the mix of the flowable fill material to satisfactorily fill the entire abandoned sewers and structures. ACI 229R-99 Table 5.1 provides examples of acceptable mix designs.

C. Contractor may need to include fill holes and vent pipes to assure thorough filling. The locations of grout tubes, vents and inspection ports for grout filling pipes to be abandoned shown on the Drawing shall be considered the minimum number. The Contractor may choose to provide more grout tubes, vents, and inspection ports at no additional cost.

D. Quantities of flowable fill material used to fill the conduits shall be monitored continuously during the placement.

E. Bulkheads shall be installed as shown on plans and as needed by the Contractor’s method to completely fill the abandoned sewers.

F. Sites disturbed by the grout-filled abandonment work shall be restored as part of this Work.

3.06 GUARDRAIL AND FENCE

A. Where so required by the Drawings, existing guardrail and fence shall be carefully dismantled and stored for reuse or for salvage by the Owner.

B. Wood posts and other materials not considered salvageable by the Owner shall be disposed of by the Contractor.

3.07 RESERVED

3.08 RESERVED

3.09 PRIVATE SIGNS

A. Private and commercial signs shall be carefully removed and relocated as directed by the Owner.

3.10 DISPOSAL OF DEBRIS

A. All debris resulting from demolition operations; i.e., broken concrete, masonry, pipe, miscellaneous metal, trees and brush, equipment, etc., shall be trucked from the Work site by the Contractor and disposed of at spoil sites in a legal manner, in full compliance with applicable codes and ordinances.

B. The Contractor shall police the hauling of debris to ensure that all spillage from haul trucks is promptly and completely cleaned up.

3.11 BACKFILLING

A. All trenches, holes, and pits resulting from the removal and abandonment of any structure or obstruction shall be backfilled and compacted in accordance with the requirements of Section 02200.

3.12 RESERVED

3.13 USE OF EXPLOSIVES

A. The use of explosives for the Work of removal of structures and obstructions is PROHIBITED.

3.14 PIPING REMOVAL

A. At the location where pipe removal stops, the remaining pipe end shall be capped. The cap must be pressure tight and restrained from movement due to pressures inside the pipe.

B. Piping removal includes, but not limited to, all hangers, stands, and anchoring devices.

3.15 OPENINGS AND PATCHING

A. The Contractor shall fill all openings created by equipment, piping, and conduit removals.

B. The Contractor shall patch any marred surfaces created by equipment and piping removals.

C. All filling and patching work shall be performed in accordance with the specifications.

D. All anchor bolts shall be removed and holes filled or cut off flush.

PART 4 SPECIAL PROVISIONS

4.01 WILLOWBEND PUMP STATION ABANDONMENT

A. The pump station shall be abandoned in accordance with the details provided on the Drawings and as specified herein. The dry and wet wells will be filled with the specified CDF material.

B. Equipment to be salvaged is identified herein.

C. Materials and Equipment not specifically identified for salvage may be abandoned in place.

D. The wet well shall be drained of all liquid and accumulated non-cementitious debris shall be removed.

1. Solid debris removed from the wet well shall be disposed of at a landfill facility.
2. Liquid containing sewage shall be disposed of at a wastewater treatment facility.
3. The Contractor is asked not to dispose of liquid material into the new gravity sewer. The nature and composition of the debris in the pump station is unknown.
4. The contractor shall consider the cost of all testing required to complete the disposal as part of the cost of work.

E. The Contractor should consider the dimensional information provided for the existing structures as approximate. Should the Contractor require more accurate measurement during the bid phase, the Contractor (as a Bidder) should make arrangements with the Owner to visit the site and obtain their own measurements.

4.02 SCHEDULE OF REMOVALS

A. The following list of items once removed shall remain the property of the Owner and shall be delivered to the Owner-designated location.

1. Pumps & Motors
2. Valves
3. Manhole Frame and Lid Castings
4. 8-inch TigerMag Flow Meter and HMI complete with potted cable

5. Meter Disconnect & Rack
6. Pump Control Panel (And Accessories)
7. RTU Panel

B. The Contractor shall remove existing electrical equipment including the following major components and accessories:
   1. Electrical wiring to be removed.
   2. Electrical Panels and Cabinets including structural supports and footings.

C. Items shown for removal and not designated for salvage shall be disposed of by the Contractor.

4.03 FORCE MAIN REMOVAL

A. As shown on the Drawings, existing sanitary sewer, force main, accessories, and appurtenances shall be removed within limits shown on the Drawings or as specified.

B. The removal shall include removal and disposal or aggregate backfill, pipe bedding and control density backfill.

C. Existing pipe removed shall become the property of the Contractor and shall be properly disposed of in accordance with the requirements of this Section.

D. At locations where the pipe removal is terminated, a water-tight sewer plug shall be placed in the end of the pipe to remain.

4.04 SANITARY SEWER & FORCE MAIN ABANDONMENT

A. Select sections of pipe connected to the existing pump station are to be abandoned.

B. These pipes shall be abandoned in accordance with Section 02110, 3.05.

4.05 SEWAGE DEBRIS REMOVAL

A. The Contractor shall remove accumulated sludge and debris from the wet well and the manhole provided for bypassing operations (MH2) prior to completing the abandonment of the wet well and filling MH2 with concrete to the invert of the connecting sewers.

B. Any water removed from the wet well shall be decanted back to the sanitary sewer before hauling debris off site.

C. The nature and quantity of debris is unknown. The Contractor shall be required to perform the necessary testing to dispose of debris removed from the wet well or collection system.

D. The Contractor shall properly dispose of debris. The cost of disposal shall be the responsibility of the Contractor.

4.06 VALVES, BOXES AND VALVE STRUCTURES ABANDONED

A. Manholes and valve box castings to be abandoned in place shall be removed to 18 inches below final grade and filled with low-strength mortar backfill in accordance to the bottom of the pavement typical section or to 12 inches below final grade in non-paved areas. The pavement section shall be removed and replace an additional 18 inches horizontally outside of the casting area. The void created by the removal of the casting, structure and valve box shall be backfilled to match the surrounding pavement section or as specified for non-pavement areas.

B. Valve boxes shown on the plans may also have existing manhole castings, frames, manhole structures around the existing valves. The abandonment of valves shall include the removal of all existing manhole casting, frame, and structure walls to be specified depths as associated with that particular valve.

C. Valve shall be abandoned in the off position when possible.

4.07 VALVES AND STRUCTURES REMOVED

A. Valves, boxes and structures to be removed shall be removed in their entirety or as approved otherwise by the Engineer.

4.08 PIPELINE CLEANING

A. The existing petroleum pipeline to be repurposed into a force main is believed to not have carried petroleum products.

B. The Owner has performed an inspection and cleaning of the pipeline prior to the commencement of the work.

C. The Contractor is to flush and clean the force main prior to making the new connections to the pipeline.

D. The Contractor is responsible to properly dispose of the water used for flushing the pipeline. Disposal of water used for cleaning into the Maumee River is not permitted.

4.09 SEWER AND MANHOLE CLEANING

A. The Contractor is expected to clean all accumulated debris from portions of the collection system used for the bypass pumping operation.

B. Sewers and manholes surcharged by bypassing operations shall be cleaned and television to confirm the condition of these facilities prior to returning the facilities to operation.

C. The Contractor shall be responsible for disposal of debris removed as specified herein.

D. The Contractor shall provide measures to prevent cleaning debris from entering the pumps station where damage could occur to the new equipment.

END OF SECTION

SECTION 02200
EXCAVATION AND BACKFILL

PART 1 GENERAL

1.01 SCOPE

A. This Section includes all excavations and related Work for the construction of the designated structures, pipelines, and other incidental Work.

B. Excavation includes the Work of making all necessary excavations for the construction of all Contract Work; of furnishing, placing, and use of sheeting, shoring, and sheet piling necessary in excavating for and protecting the Work and workers; of doing all pumping and fluming necessary to keep the excavation free from water; of providing for uninterrupted flow of existing streams, treatment plant processes, drains and sewers; of damming and cofferdamming where necessary; of supporting and protecting existing structures, pipes, conduits, sewers, culverts of all types of materials of construction, of supporting and protecting railroad tracks, posts, poles, wires, fences, buildings, and other public and private property adjacent to the Work; of removing and replacing existing sewers, culverts, pipelines, and bulkheads where necessary; of removing after completion of the Work all sheeting and shoring not necessary to support the sides of excavations; of removing and disposing of all surplus excavated material or material under structures that does not meet the soil design bearing capacities; of doing all backfilling, of compacting backfill to limits specified or ordered by the Engineer; and restoring all property damaged as a result of the Work involved in this Contract.

C. The Work includes obtaining and transporting suitable fill material from off-site when on-site material is not available.

D. The Work includes transporting surplus excavated material not needed for backfill at the location where the excavation is made, to other parts of the Work where filling is required, or disposal of all surplus on other sites selected by the Owner.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Sieve Analysis (ASTM C136) - One test for each material source.

   b. Submit a moisture density curve (ASTM D698) for each type of material used for backfill. Test shall be referenced to appropriate sieve analysis test. The maximum dry weight and optimum moisture content shall be indicated.

   c. Controlled Density Fill Material - Design Mix and Certified Test Results.

d. Test results for conformance with specified "Compaction Requirements":

1) Retests shall be referenced to the corresponding failing test.

e. Stripped soil and topsoil test per ODOT 659.

2. Information for the Record:

a. When excess excavated material is disposed at locations off the Site, the Contractor shall obtain and submit written permission from the Owner of the property upon which the material is to be placed.

b. Details of the proposed method of installation and construction of dewatering wells.

c. Schedule of the proposed sequence of dewatering well construction.

d. Dewatering logs.

e. Submit method for abandoning dewatering well.

PART 2 PRODUCTS

2.01 TOPSOIL

A. Soil stripped from the Site shall consist of loose, friable, loamy topsoil without admixture of subsoil or refuse. It shall be reasonably free from peat, muck, roots, hard clay, coarse gravel, stones, weeds, tall grass, brush, sticks, litter, ground debris and wood products. The stockpiled soil shall be subject to the approval of the Engineer.

B. Topsoil provided shall be in accordance with ODOT 653 and be loose, friable, loamy soil without admixture of subsoil or refuse. In order for the topsoil to be considered loamy the fraction of topsoil, passing a No. 10 sieve, shall contain not more than 40% clay. Topsoil shall contain not less than 4% nor more than 20% organic matter as determined by loss on ignition of oven-dried samples to constant weight at 212 degrees F.

C. Excess material shall be removed from Site, unless directed otherwise by Owner or Engineer.

2.02 SELECTED BACKFILL

A. Selected backfill shall be clean excavated soil. It shall be free of rock and foreign debris of any kind and shall be tested in accordance with ASTM C136 sieve screen analysis and ASTM D2487 soil classification. The material's use as selected backfill shall be approved by the Engineer.

B. Engineer may waive material testing of selected backfill. Such waiver shall apply only to the designated location and the source of the selected backfill. Such waiver shall not apply to excavated soil from locations not so designated.

2.03 SPECIAL BACKFILL MATERIAL

A. Special backfill material shall conform to ODOT 304.

2.04 AGGREGATE BEDDING MATERIAL

A. Aggregate bedding material shall be well-graded durable crushed gravel, crushed stone or meeting the graduation requirements of ODOT Table 703.01-1.

B. Aggregate bedding material for PVC pipe bedding material shall be No. 8 (nominal size 3/8-inch to sieve No. 8). The bedding of pipe fittings shall be as specified for the piping used for main line pipe construction.

2.05 CONTROLLED DENSITY FILL (CDF) MATERIAL

A. Controlled density fill material shall be a cement base fill material that can be deposited in a fluid state. It shall be composed of portland cement and approved filler material, sand and water. The mixture and shall have a compressive strength of 100 psi minimum and 500 psi maximum:

B. Filler material shall consist of mineral aggregates, slag, or fly ash. Metals, soil, or organic material will not be permitted.

C. The Contractor shall select and submit for approval a mix design with properties to fill the specified annular space (structure and conduit).

2.06 RESERVED

PART 3 EXECUTION

3.01 COORDINATION

A. Construction Through Highways:

1. Permits - The Owner will obtain permits required for open cut construction through highways. Contractor shall be responsible for compliance with and furnishing any item required by permit such as Bond Security.

2. Notification - The Contractor shall give written notice to appropriate officials of the affected Department of Transportation, City, or County at least five days, not including weekends and holidays, before starting construction under highways and as required under other roadways.

3. Contractor shall comply with standard permit conditions of controlling authority and special provisions noted in Part 4 of this Section.

B. Test Pits:

1. The Contractor shall perform exploratory test pits as may be necessary or ordered by Engineer in advance of excavation to determine the exact location and elevation of subsurface structures, pipelines, and conduits which are likely

to be encountered and shall make acceptable provision for their protection, support, and maintenance in operation. Vacuum excavation (pot hole) may be used if adequate information can be obtained by such method. No additional payment shall be made for test pits.

2. Conflicts with existing utilities not located, as specified, far enough in advance of construction, shall not be considered as a basis for delay claims or additional payment.

3.02 REMOVING AND REPLACING TOPSOIL

A. Removal

1. Excavation for trenches in which pipelines, sewers, conduits and other utilities are to be installed: The Contractor may elect to strip soil and stockpile unless the Contract Documents direct stripping and stockpiling prior to excavation.

2. General excavation, other than trench excavation: The Contractor shall remove, and stockpile the top 12 inches of the existing soils from all areas of construction including, but not limited to, excavation and embankment areas, stockpile sites, construction yard, storage areas, etc.

B. Replacing stockpiled soil and topsoil

1. Trench excavation areas disturbed as a result of trenching operations and which are to be restored with grass or other plantings shall be free of peat, muck, roots, hard clay, coarse gravel, stones, weeks, tall grass, brush, sticks, litter, ground debris and wood products. The surface shall be mechanically conditioned after removal of debris. After surface is prepared, it shall be covered with topsoil or stockpiled soil material to a minimum depth of 4 inches. Topsoils and stockpiled soil material shall meet the requirements specified herein and be tested.

2. General excavation areas which are to be restored with grass or other plantings shall be free of peak, muck, roots, hard clay, coarse gravel, stones, weeks, tall grass, brush, sticks, litter, ground debris, wood products and construction debris including loose stone. The surface shall be mechanically conditioned after removal of debris. After surface is prepared it shall be covered with stockpiled soil and then have a minimum of 4 inches of topsoil placed.

C. The Work shall be in accordance with applicable portions of ODOT items 652 and 653.

3.03 GENERAL EXCAVATION

A. All necessary excavation shall be performed to accommodate the completion of all Contract Work.

B. The Drawings show the horizontal and the lower limits of structures, pipelines, sewers and other utilities. The methods and equipment used by the Contractor when approaching the bottom limits of excavation and when trimming the bottom of the

excavation to a smooth surface shall be selected to prevent disturbing the soil below the bottom limits of excavation.

C. Excavation which is carried below the bottom limits shall be classified as Unauthorized Excavation, unless said excavation has been authorized by the Engineer prior to each occurrence.

D. Unauthorized excavation shall be filled with CDF material to the bottom limits. Under circumstances where structural integrity is not a factor, the Engineer may allow the filling of unauthorized excavation with pipe bedding material or special backfill material compacted to 100% density, as specified under compaction requirements.

E. Sheeting, Shoring, and Bracing:

1. The Contractor shall furnish and install adequate sheeting, shoring, and bracing to maintain safe working conditions, and to protect newly built work and all existing adjacent and neighboring structures and utilities from damage by settlement.

2. Sheeting, shoring and bracing shall be arranged so as not to place a strain on portions of completed Work until the construction has proceeded far enough to provide ample strength. Sheeting and bracing may be withdrawn and removed at the time of backfilling, but the Contractor shall be responsible for all damage to newly built Work and adjacent and neighboring structures and utilities.

3. Sheeting, shoring and bracing shall be removed or cut-off at the time of backfilling to avoid problems with finish grade or future excavation.

F. Construction Sheeting Left in Place:

1. The Contractor shall furnish, install, and leave in place, construction sheeting and bracing when specified or when indicated or shown on the Drawings.

2. Construction sheeting and bracing, placed by the Contractor to protect adjacent and neighboring structures and utilities, may be left in place if desired by the Contractor. All such sheeting and bracing left in place, shall be included in the cost for excavation.

3. Any construction sheeting and bracing which the Contractor has placed to facilitate his work may be ordered, in writing by the Engineer, to be left in place. The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating an obligation on his part to issue such orders. Failure of the Engineer to order sheeting and bracing left in place shall not relieve the Contractor of his responsibility under the Contract.

G. Removal of Water:

1. The Contractor shall at all times during construction provide and maintain ample means and devices with which to remove promptly and dispose of properly all water entering the excavations or other parts of the Work and shall keep said excavations dry until the structures to be built or pipelines to be placed therein are completed. No water shall be allowed to rise over or come in

contact with concrete or masonry until the concrete and mortar has attained a satisfactory set, except in cases where the concrete has been tremied into place with the approval of the Engineer. Water shall not be allowed to rise above the bottom of the bedding stone prior to placing pipe. In waterbearing sand, well points and/or sheeting shall be supplied, together with pumps and other appurtenances of ample capacity to keep the excavation free of water and in compliance with government regulations.

2. The Contractor shall dispose of water from the Work in a suitable manner without damage to adjacent property or structures and in compliance with all regulations.

3.04 TRENCH EXCAVATION

A. Excavation for trenches in which pipelines, sewers, conduits and other utilities are to be installed shall provide adequate space for workers to place and joint the pipe properly. The trench shall be kept to a minimum width. The width of trench at the top of the pipe shall comply with the limits specified or shown on the Drawings.

B. Excavation shall be to the depth necessary for placing aggregate bedding material under the pipeline, sewer, conduits and other utilities as shown on the Drawings. If over excavation occurs, the trench bottom shall be filled to grade with compacted aggregate bedding material.

C. The amount of trench open at any one time in advance of completed Work shall be limited to the minimum necessary for conducting laying operations.

D. In general, backfilling shall begin as soon as the pipeline, sewer, conduits and other utilities are in a condition to receive it and shall be carried to completion as rapidly as possible. New trenching shall not be started when earlier trenches need backfilling or the surfaces of streets or other areas need to be restored to a safe condition.

3.05 EXCAVATION OF UNSUITABLE MATERIAL

A. Unsuitable materials existing below the Contract bottom limits for excavation shall be removed as required by the Engineer. The Engineer may rely upon the independent laboratory retained on this Project when determining unsuitable soil conditions, removal and backfill. Such excavation shall be conducted at a time when the Engineer and independent laboratory are present and shall not exceed the vertical and lateral limits prescribed by both.

B. The voids left by removal of unsuitable material shall be filled with special backfill, pipe bedding material, or CDF material as listed in Part 4 or as prescribed by the independent laboratory and as approved and ordered by the Engineer. Special backfill or pipe bedding shall be installed as described in this Section and in general shall be compacted to 100% density as specified under compaction requirements.

3.06 DISPOSAL OF UNSUITABLE AND SURPLUS MATERIAL

A. All excavated materials which are unsuitable for use in backfilling trenches or around structures, and materials excavated that are in excess of that required for backfilling and for constructing fills and embankments as shown on the Drawings, shall be disposed of by the Contractor at his expense and at sites provided by him as may be required, except that the Owner reserves the right to require the Contractor to deposit such surplus at locations designated by the Owner within a five-mile radius of the Work.

B. No surplus excavated material of any class shall be deposited in any stream or watercourse or be dumped on public property without the consent of the Owner. All spoil areas shall be left smooth, level, with drainage to a water course and proper erosion and runoff control shall be used.

3.07 BACKFILL AND COMPACTION

A. Pipe and Conduit Bedding - Unless otherwise directed, pipe, conduits and other utilities shall be installed in specified aggregate bedding material as shown on the Drawings and as specified.

B. Backfilling Under Existing Pipeline, Sewer, Conduits and Other Utilities - Where it is necessary to undercut or replace existing utility conduits and/or service lines, the excavation beneath such lines shall be backfilled the entire length with aggregate bedding material tamped in place in 6-inch layers to the required density. The aggregate bedding shall extend outward from the spring line of the conduit a distance of 2-feet on all sides and thence downward at its natural slope.

C. Backfilling with Selected Backfill - Unless otherwise specified or directed, material excavated in connection with the Work may be used for backfilling and other filling purposes, if it meets all requirements given elsewhere in this specification for selected backfill. No material shall be used for backfilling that contains stones, rock, or pieces of masonry greater than 12 inches, frozen earth, debris, earth with an exceptionally high void content, organic material, or marl. No large pieces of rock or masonry shall be deposited closer than 24 inches from the completed outside surface of any structure or pipe.

D. Backfill Immediately - All trenches and excavations shall be backfilled immediately after completion of construction therein, unless otherwise directed by the Engineer. Under no circumstances shall water be permitted to rise in unbackfilled excavation during construction or after pipe has been placed.

E. House Leads and water services shall not be backfilled until the pipe ends are referenced and the Engineer has measured the pipe for payment from mainline to termination and photographed as needed.

F. Backfilling around and over structures, pipelines, conduits and other utilities comprising the Work shall be carefully done by hand and tamped with suitable tools of approved weight when within 2 feet of structures, pipeline, conduit and other utilities. Selected backfill or, where specified, shown on Drawings, or ordered by the Engineer, special

backfill material shall be used in this area. The material shall be placed in uniform layers not exceeding 6 inches in depth up each side. Each layer shall be placed, then carefully and uniformly tamped to the specified density so as to eliminate the possibility of lateral displacement of pipe or structure.

G. Backfilling may be done by machinery after the backfill has been placed and compacted beyond 2 feet horizontally of structures, pipelines, conduits and other utilities and to a minimum depth of 1 foot above the tops of any buried structures, pipelines, conduits, and other utilities. The backfill material shall be deposited in horizontal layers, not thicker than one foot, and each layer shall be thoroughly compacted to the specified density by approved methods before a succeeding layer is placed. In no case, will backfill material from a bucket be allowed to fall directly on a structure or pipe and in all cases the bucket must be lowered so that the shock of the falling material will not cause damage.

H. Backfilling Under Pavement and Walks - Where existing or new pavement, driveway, parking lot, curb and gutter, or walk is over an excavation, special backfill material shall be used to backfill the entire excavation from the bedding to surface. The material shall be placed and compacted to the required density in accordance with one of the following methods:

1. The backfill material shall be deposited in 6-inch horizontal layers and each layer shall be thoroughly compacted to the proper density by approved compaction method before a succeeding layer is placed.

2. No method of compaction which alters the gradation of the special backfill material or prevents compaction testing by standard testing methods shall be used.

I. Backfilling with Controlled Density Fill Material (CDF) - Where called for on the Drawings, specified, or ordered, CDF material shall be used in lieu of special backfill or bedding material specified herein. Before placing CDF material, the Contractor shall take required measures to protect the Work against flotation.

J. Backfilling Under Structures - Where structural slabs, mats or footings are to be placed on a backfilled area, special backfill material shall be used unless otherwise noted on the Drawings. The backfill material shall be placed in 6-inch horizontal layers and each layer shall be thoroughly compacted to the specified density by approved methods before a succeeding layer is placed. Where backfill is to be placed on undisturbed side slopes steeper than one vertical to six horizontal, steps shall be formed into the slope before each layer of the backfill is placed. These steps shall be cut vertically at no more than 2-feet intervals and shall have a horizontal dimension of not less than 3-feet.

K. Prior to backfilling under structures, the natural subgrade shall be evaluated at regular intervals in each direction by the independent testing laboratory to determine that the subgrade can obtain the design bearing capacity given by the “Structural Design Data” table on the Drawings. If the subgrade cannot obtain the design bearing capacity then the testing laboratory shall submit a remedy to the Engineer for approval and for the Contractor to perform.

L. Clay Trench Bulkheads - Where trenches are dug through areas of lateral groundwater seepage or in areas below the groundwater table, the Contractor shall, if required by the Drawings, construct bulkheads within the trench at ordered intervals. Bulkheads shall consist of native clay soil or other fines.

3.08 COMPACTION REQUIREMENTS

A. In areas to be filled, after the top 12-inches of soil is stripped, then the undisturbed subgrade shall be compacted to not less than 100% of maximum dry density per ASTM D698 (Standard Proctor) prior to placing of fill.

B. Backfill placed under areas receiving concrete slabs, mats, footings, or within the interior of buildings shall be compacted to not less than 100% of maximum dry density per ASTM D698.

C. Backfill placed around structures where other structures, pipelines, or slabs are to be constructed shall be compacted to not less than 100% of maximum dry density per ASTM D698.

D. The material used to construct embankments and fills in locations other than under pavements, walks, structures, or slabs and around and over pipelines, shall be compacted to not less than 95% of maximum dry density per ASTM D698.

E. All other backfill, including backfill around and over pipelines, and backfill around structures not covered in Paragraphs B. and C. above, shall be compacted to not less than 95% of maximum dry density per ASTM D698.

F. The bottom of excavations upon which concrete slabs or structures are to be placed shall be compacted to obtain 100% maximum dry density per ASTM D698 in the top 12 inches.

G. All soil subgrade which will provide bearing support for pavements or curbs, shall be compacted to a width of 6 inches beyond the back of curb and to a depth of 12 inches below the bottom of excavation to a density of not less than 100% of maximum dry density per ASTM D698. All fill below the subgrade shall be compacted to not less than 98% of maximum dry density, unless specified otherwise.

H. Subgrade under the driveways and walks shall be compacted to a depth of 6 inches below the subgrade surface to density of not less than 100% of the maximum dry density determined by ASTM D698.

I. Subgrade under structures shall be compacted to a depth of 12 inches below bottom of excavation surface to a density of not less than 100% of the maximum dry density determined by ASTM D698.

3.09 COMPACTION TESTS

A. Trenches and excavation around structures shall be backfilled and consolidated in layers, as specified, to the existing ground surface. Initial test series for each type of backfill material shall be continued until the method of consolidation employed has

proven to attain the required compaction. Any change in the proven method of consolidations will require additional testing and field verification of compaction.

B. Subgrade below pavements, curbs, sidewalks, and structures shall be consolidated as specified. Compaction tests shall be performed to verify specified consolidation.

C. Subsequent tests or series of tests shall be in locations and at depths ordered by the Engineer.

3.10 RESERVED

3.11 STREAM BANK PROTECTION

A. Following the installation of the pipeline or other structures, all Work areas along or crossing streams shall be restored immediately in accordance with procedures outlined below and in accordance with applicable permits.

B. Excavated areas shall be backfilled and compacted as specified herein and in no case, shall the density be less than the surrounding area.

C. Permanent riprap shall be placed 12 inches thick over disturbed areas of the stream's bank as shown on the Drawings or required. Excavated areas to be riprapped shall be backfilled and consolidated as specified for pavement and sidewalks. Installation of and materials for riprap shall conform to ODOT Item 601.08 "Dumped Rock Fill," (703.19-Type D).

D. All soil exposed above the permanent riprap protection line shall be either sodded or seeded, fertilized, and mulched. Temporary jut matting or synthetic matting shall be used to protect slopes until climatic conditions permit seeding or sodding. Exposed banks shall not remain unprotected over five days unless permitted by the Engineer in writing.

E. Seeding and sodding shall be as specified in Section 02800.

3.12 RESERVED

PART 4 SPECIAL PROVISIONS

4.01 FIELD TESTING (MINIMUM REQUIREMENTS)

A. The laboratory shall perform the following field tests:

1. Trench Backfill - One test for every 200 cubic yards of backfill material.
2. Subgrade Compaction - One test for every 300 square yards of subgrade.
3. If directed by the Engineer, additional tests shall be performed for any of the above.

4.02 CULTIVATED AREA TOPSOIL STRIPING

A. The Contractor shall use special care in excavating, storing and placement of topsoil in agricultural areas listed on the plans as “cultivated area”.

B. The Contractor shall remove and separately store the top 12-inches of topsoil for all excavations and soil disturbances occurring in areas designated as “cultivated area.

C. The excavation and storage of topsoil shall be performed in a manner that protects the top soil from contamination from other soils.

D. The stored topsoil shall be placed over the backfilled trench and areas previously stripped with a thickness not less than 12-inches.

E. Any topsoil contaminated, lost or otherwise not available to be placed back into areas where topsoil was removed, shall be replaced at the Contractor's cost.

F. The requirements of this Section shall supersede the requirements of Section 3.02 in areas designated as agricultural.

4.03 STEEL SHEET PILING RETAINING WALL

A. The steel sheet piling retaining wall shall be constructed in accordance with the design documents provided in the pages following this specification.

B. The Contractor shall provide the necessary earthwork and clearing necessary for the equipment using to install the steel sheet piping retaining wall.

C. The steel sheet piling retaining wall shall remain in place at the completion of the work with grades provided as shown on the Drawings.

4.04 DEWATERING IN THE VICINITY OF THE MAUMEE RIVER

A. No wastewater of any kind shall be directly discharged into the Maumee State Recreational River or any of its tributary streams, drainage ways or ditches. Any water pumped from open trenches shall be passed through a sediment impoundment structure that provides for partial settling of silt and sand or pumped onto a vegetated area a sufficient distance from the stream so as to provide for partial infiltration and removal of sand and silt particles.

B. Adequate outlet protection must be provided for each impoundment.

C. There shall be no discharges of turbid water to Maumee State Recreational River or its tributaries.

END OF SECTION

TOLEDO ENGINEERING SERVICES
Mail: 1419 Miami Street, Toledo, Ohio 43605
p: 419.691.4800 f: 419.691.4805
www.bowser-morner.com

ENGINEERING REPORT

Report To:	**Northwestern Water & Sewer District**	**Report Date:**	July 29, 2020
Attention:	Mr. Matt Dennis 12560 Middleton Pike Bowling Green, Ohio 43402	**Project Number:**	196423
		Report No.	196423-0720-8238
		No. of Pages:	5

Report On:	**SHEET PILE DESIGN RECOMMENDATIONS**
Project:	**Proposed Willowbend Pump Station Replacement, West River Road and Willowbend Road** **Northwestern Water & Sewer District** **Wood County, Ohio**

Dear Mr. Bass:

Please find the attached sheet pile design recommendations for the shoring system for the Willowbend Pump Station located in Perrysburg, Wood County, Ohio. The sheet-pile was designed using the computer program Sheet Pile Wall 911 (SPW911). Shoring design was assessed for permanent conditions.

According to our design analysis, we recommend that PZ-27 sheet pile be used and embedded to a depth of 20 feet (minimum). The maximum lateral deflection expected at the top of the excavation sheet pile should be less than 1 inch. The sheet pile design analysis is detailed on the attached calculation sheets.

Should you have any questions, or if we may be of further service, please contact our office at 419-691-4800

Respectfully submitted,

BOWSER-MORNER, INC.

Ahmad Rashid

Ahmad K. Rashid, P.E.
Chief Geotechnical Engineer

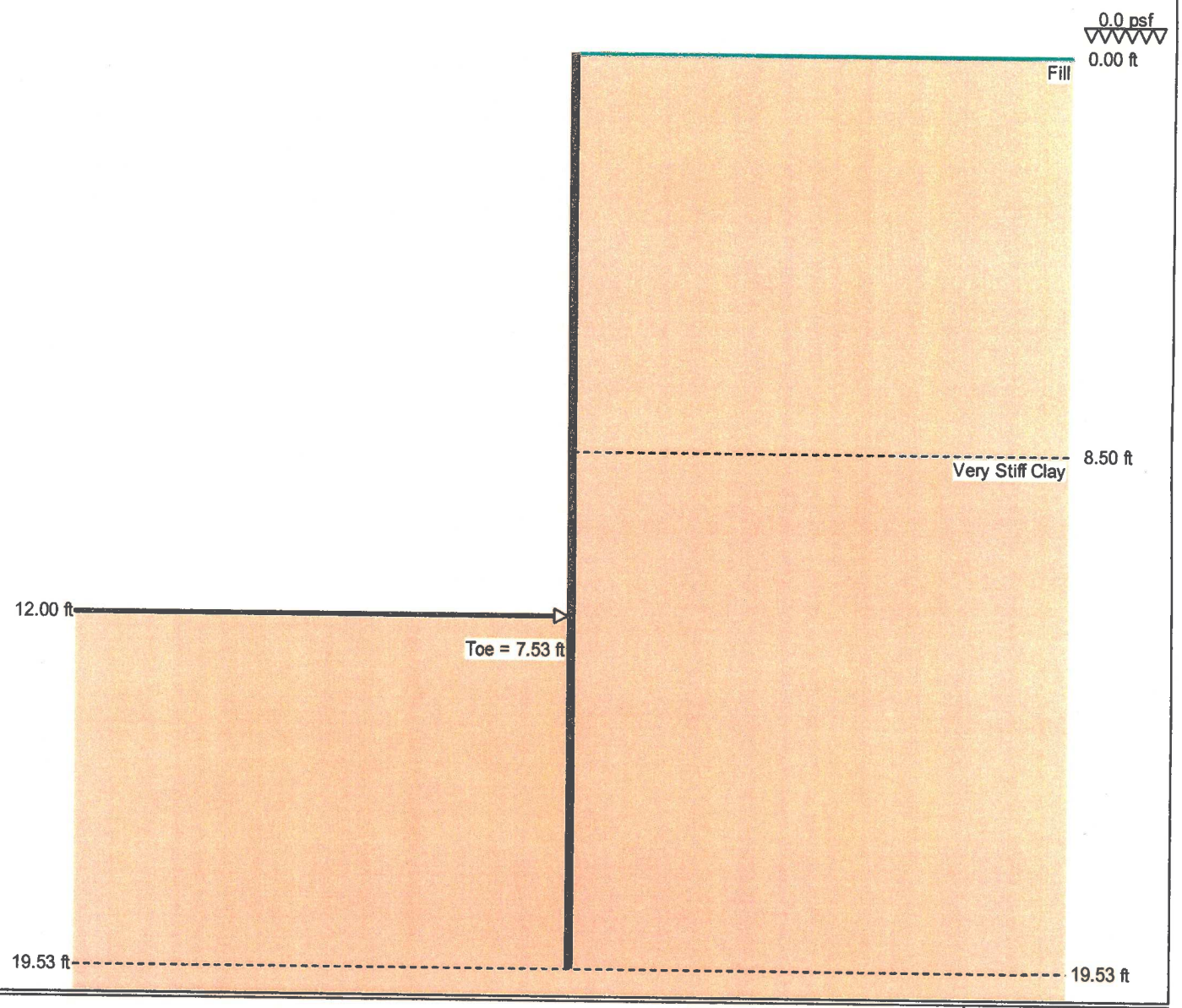
STATE OF OHIO
Ahmad K. Rashid
P.E. 76891
REGISTERED
PROFESSIONAL ENGINEER

AKR:all
Attachment: Calculation sheets
1-Client (via-email to mdennis@nwwsd.org)
1-Jones & Henry Engineers (via-email to tbennett@jheng.com)

All reports remain the confidential property of BOWSER-MORNER and no publication or distribution of reports may be made without our express written consent, except as authorized by contract. The recommendations and findings discussed in this report represent our ENGINEERING OPINION based on information available at the time of writing, our judgment and our experience with similar site and subsurface conditions. All geotechnical construction involves risk, and in no way should the information contained in this report be construed as a guarantee of performance. Because conditions may change, we reserve the right to revise and modify these recommendations. If there is any question regarding the application of this report, please contact this office immediately to schedule a re-evaluation.

Title: Willowbend Pump Station
Designer: AKR
Page: 1
Date: 7.29.20

Sheet: PZ27
Pressure: Terzaghi (m = 1.0; a = 0.4)
Toe: Cantilever



Bowser Morner, Inc.

SPW911, v2.40

© 2001 - 2007, Pile Buck®, Inc.
Email: pilebuck@pilebuck.com
Web: www.pilebuck.com

Title: Willowbend Pump Station
Designer: AKR
Page: 2
Date: 7.29.20

Sheet: PZ27
Pressure: Terzaghi (m = 1.0; a = 0.4)
Toe: Cantilever

Input Data

Depth Of Excavation = 12.00 ft
Surcharge = 0.0 psf

Depth Of Active Water = 23.50 ft
Depth Of Passive Water = 23.50 ft

Water Density = 62.43 pcf
Minimum Fluid Density = 40.03 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ(°)	δ(°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Fill	118.37	56.00	1357.1 (904.7)	0.0	0.0	0.0	1.00	2.00	1.00	2.00
8.50	Very Stiff Clay	137.46	75.09	3131.8 (2087.9)	0.0	0.0	0.0	1.00	2.00	1.00	2.00
29.50	Rock	137.46	75.09	2087.9 (1391.9)	0.0	0.0	0.0	1.00	2.00	1.00	2.00

( ) indicates factored value used in calculations. Factor(s): K_p+1.5; C+1.5

Solution

Sheet

Sheet Name	I (in⁴/ft)	E (psi)	Z (in³/ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
PZ27	187.50	3.04E+07	31.00	24970.3	64506.5	0.00	7.53	19.53

Maxima

	Maximum	Depth
Bending Moment	41314.9 ftlb/ft	13.70 ft
Deflection	1.2 in	0.00 ft
Pressure	659.8 psf	2.99 ft
Shear Force	6375.3 lb/ft	11.98 ft

Bowser Morner, Inc.

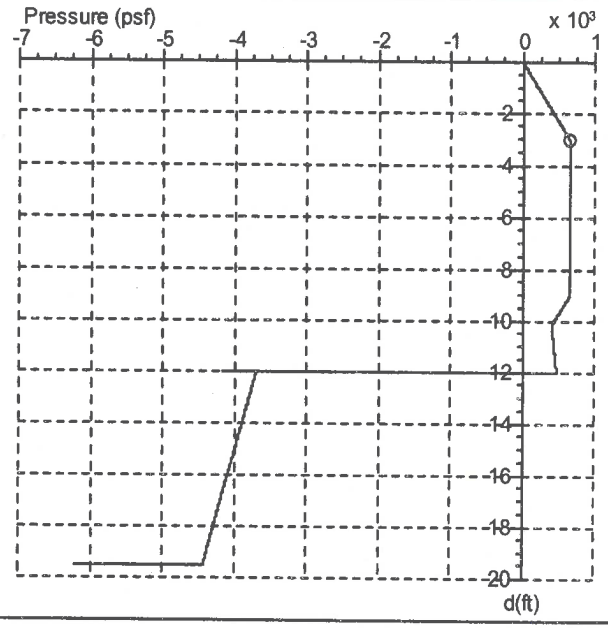
SPW911, v2.40

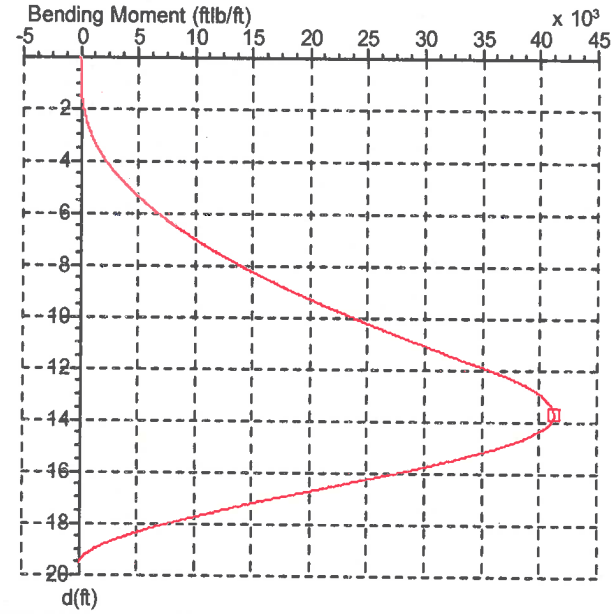
© 2001 - 2007, Pile Buck®, Inc.
Email: pilebuck@pilebuck.com
Web: www.pilebuck.com

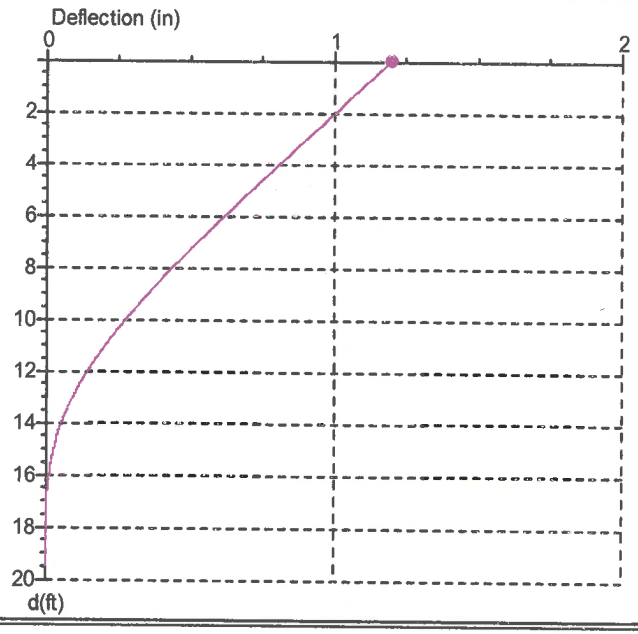
Title: Willowbend Pump Station
Designer: AKR
Page: 3
Date: 7.29.20

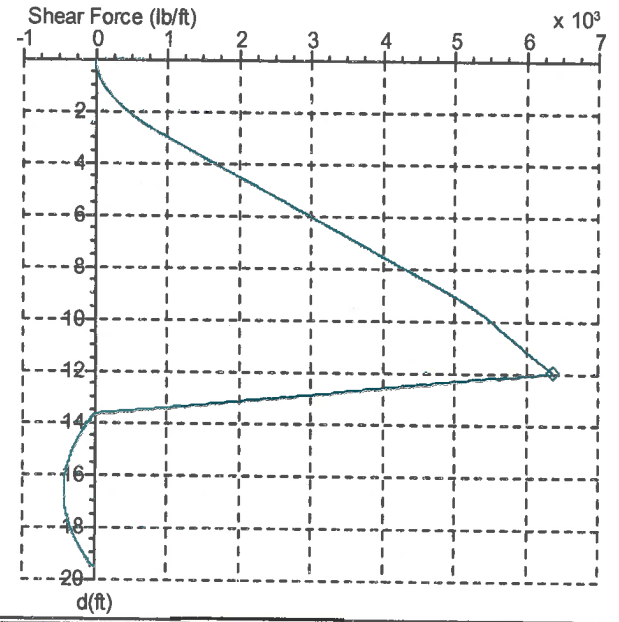
Sheet: PZ27
Pressure: Terzaghi (m = 1.0; a = 0.4)
Toe: Cantilever

Maximum	d (ft)
○ 659.8 psf	2.99
□ 41314.9 ftlb/ft	13.70
◇ 6375.3 lb/ft	11.98
● 1.2 in	0.00









Bowser Morner, Inc.

SPW911, v2.40

© 2001 - 2007, Pile Buck®, Inc.
Email: pilebuck@pilebuck.com
Web: www.pilebuck.com

Title: Willowbend Pump Station
Designer: AKR
Page: 4
Date: 7.29.20

Sheet: PZ27
Pressure: Terzaghi (m = 1.0; a = 0.4)
Toe: Cantilever

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	0.0	0.0	1.2	0.0
0.17	39.4	0.2	1.2	3.8
0.35	75.2	1.5	1.2	13.5
0.52	114.5	5.2	1.1	30.7
0.69	150.3	11.7	1.1	52.6
0.86	189.7	23.4	1.1	83.3
1.04	229.1	41.3	1.1	121.1
1.21	264.8	63.8	1.1	161.6
1.38	304.2	96.7	1.1	212.9
1.56	343.6	139.4	1.0	271.1
1.73	379.4	187.6	1.0	330.3
1.90	418.7	252.3	1.0	402.0
2.07	454.5	322.7	1.0	473.3
2.25	493.9	414.0	1.0	558.5
2.42	533.3	521.1	1.0	650.8
2.59	569.0	633.3	0.9	740.8
2.76	608.4	774.0	0.9	846.5
2.94	647.8	934.2	0.9	959.2
3.11	659.8	1097.7	0.9	1066.3
3.28	659.8	1297.7	0.9	1184.4
3.46	659.8	1497.8	0.9	1291.8
3.63	659.8	1738.0	0.8	1409.9
3.80	659.8	1999.3	0.8	1528.0
3.97	659.8	2255.2	0.8	1635.4
4.15	659.8	2556.8	0.8	1753.5
4.32	659.8	2849.3	0.8	1860.9
4.49	659.8	3191.1	0.8	1979.0
4.67	659.8	3554.0	0.7	2097.1
4.84	659.8	3902.3	0.7	2204.4
5.01	659.8	4305.5	0.7	2322.5
5.18	659.8	4729.7	0.7	2440.6
5.36	659.8	5133.7	0.7	2548.0
5.53	659.8	5598.3	0.7	2666.1
5.70	659.8	6038.9	0.7	2773.5
5.88	659.8	6543.7	0.6	2891.6
6.05	659.8	7069.5	0.6	3009.7
6.22	659.8	7565.9	0.6	3117.0
6.39	659.8	8132.0	0.6	3235.1
6.57	659.8	8719.3	0.6	3353.2
6.74	659.8	9271.4	0.6	3460.6
6.91	659.8	9898.9	0.5	3578.7
7.08	659.8	10487.6	0.5	3686.1
7.26	659.8	11155.4	0.5	3804.2
7.43	659.8	11844.2	0.5	3922.3
7.60	659.8	12488.7	0.5	4029.6
7.78	659.8	13217.8	0.5	4147.7
7.95	659.8	13898.9	0.4	4255.1
8.12	659.8	14668.2	0.4	4373.2
8.29	659.8	15458.6	0.4	4491.3
8.47	659.8	16195.5	0.4	4598.7
8.64	659.8	17026.2	0.4	4716.8
8.81	659.8	17877.9	0.4	4834.9
8.99	659.8	18670.6	0.4	4942.2
9.16	624.3	19562.5	0.3	5057.2
9.33	588.6	20390.6	0.3	5155.6
9.50	549.2	21319.5	0.3	5257.1
9.68	509.8	22265.9	0.3	5351.5
9.85	474.0	23140.5	0.3	5431.3
10.02	434.7	24116.9	0.3	5512.3
10.20	408.7	25107.2	0.3	5586.7
10.37	415.3	26018.9	0.3	5653.8
10.54	422.4	27034.5	0.2	5728.8
10.71	429.0	27969.5	0.2	5798.1
10.89	436.1	29011.0	0.2	5875.6
11.06	443.3	30066.5	0.2	5954.4
11.23	449.8	31038.3	0.2	6027.1
11.40	457.0	32121.0	0.2	6108.3
11.58	464.2	33218.3	0.2	6190.8
11.75	470.7	34228.8	0.2	6266.9
11.92	477.9	35354.6	0.1	6351.9
12.10	-3703.8	36378.4	0.1	6066.5
12.27	-3721.2	37407.7	0.1	5402.2
12.44	-3738.6	38318.1	0.1	4734.7
12.61	-3754.5	39042.2	0.1	4125.2
12.79	-3771.9	39724.1	0.1	3451.7
12.96	-3787.8	40239.5	0.1	2836.8
13.13	-3805.2	40691.0	0.1	2157.4
13.31	-3822.6	41020.8	0.1	1474.9
13.48	-3838.5	41214.7	0.1	851.7
13.65	-3855.9	41311.0	0.1	163.2
13.82	-3873.4	41262.9	0.1	-36.7
14.00	-3889.2	41036.4	0.1	-80.1
14.17	-3906.6	40591.4	0.0	-125.0
14.34	-3922.5	40020.1	0.0	-163.1
14.52	-3939.9	39220.8	0.0	-202.0
14.69	-3957.4	38256.1	0.0	-237.8
14.86	-3973.2	37247.0	0.0	-267.6
15.03	-3990.6	36004.6	0.0	-297.4
15.21	-4008.1	34636.8	0.0	-324.1
15.38	-4023.9	33296.0	0.0	-345.7
15.55	-4041.4	31727.0	0.0	-366.5
15.73	-4057.2	30226.1	0.0	-382.6
15.90	-4074.6	28506.1	0.0	-397.4
16.07	-4092.1	26727.0	0.0	-409.1
16.24	-4107.9	25070.0	0.0	-417.0
16.42	-4125.4	23216.5	0.0	-422.7
16.59	-4141.2	21514.6	0.0	-425.2
16.76	-4158.6	19636.8	0.0	-424.9
16.93	-4176.1	17766.4	0.0	-421.6
17.11	-4191.9	16083.9	0.0	-415.8
17.28	-4209.4	14265.7	0.0	-406.5
17.45	-4226.8	12494.9	0.0	-394.1
17.63	-4242.6	10937.8	0.0	-380.0
17.80	-4260.1	9295.7	0.0	-361.6
17.97	-4275.9	7878.5	0.0	-342.2
18.14	-4293.4	6415.4	0.0	-317.9
18.32	-4310.8	5066.1	0.0	-290.4
18.49	-4326.6	3949.9	0.0	-262.7
18.66	-4344.1	2856.1	0.0	-229.3
18.84	-4361.5	1916.1	0.0	-192.7
19.01	-4377.4	1206.8	0.0	-156.8
19.18	-4394.8	598.8	0.0	-114.3
19.35	-4410.6	214.1	0.0	-72.9
19.53	-6206.7	0.0	0.0	0.0

Bowser Morner, Inc.

SPW911, v2.40

© 2001 - 2007, Pile Buck®, Inc.
Email: pilebuck@pilebuck.com
Web: www.pilebuck.com

SECTION 02201
ROCK EXCAVATION

PART 1 GENERAL

1.01 SCOPE

A. Wherever rock or other hard material similar to rock, is encountered with the excavation, it shall be removed and disposed of in accordance with any clauses of this Specification which may apply. This Work shall consist of making, to the width and depth shown on the Drawings, or as may be ordered by the Engineer, all rock excavation required for the construction of sewers, water lines, and other structures in accordance with the Drawings, together with any other rock excavations which in the opinion of the Engineer are necessary for any purpose pertinent to the construction of the Work.

B. The Contractor shall excavate rock within the lines and grades shown on the Drawings or given by the Engineer, and shall satisfactorily remove and dispose of all rock and boulders encountered in the excavation.

PART 2 PRODUCTS

2.01 ROCK

A. Materials classed as rock under the Contract will be solid sandstone, limestone, granite, or other ledge rock only, or existing concrete (except concrete pavement or pavement base or other kinds of pavement) or boulders. Loam, sand, gravel, clay, or other overlying material will not be classed as rock excavation even though portions of it may be stratified or laminated or may be approximately as hard as portions of sandstone or limestone.

PART 3 EXECUTION

3.01 REMOVAL OF ROCK

A. Removal of rock by blasting is not permitted.

B. The fact that the removal of loose or shattered rock or other loose material may enlarge the excavation beyond the required limits shall not operate to relieve the Contractor from the necessity for making such removal, and the Contractor shall not be entitled to additional compensation therefore.

C. The sides and bottom of all rock excavation shall be trimmed as necessary to meet the requirements of any of the structures. All rock shattered below the established limits for any structures will be classified as unauthorized excavation and shall be removed.

D. All voids created by the removal of rock shall be backfilled as required under Section 02200.

3.02 DISPOSAL OF EXCAVATED ROCK

A. Excavated rock shall be disposed according to the provisions of Section 02200.

B. If rock fragments are deemed suitable for use as dump rock fill, by the Engineer, this material may be placed as erosion protection in areas defined by the Engineer at the work site.

PART 4 SPECIAL PROVISIONS

None

END OF SECTION

SECTION 02550
SANITARY SEWERS AND STORM SEWERS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing sanitary sewers and storm sewers.

B. Reconstruction of existing sewers, house connections, and catch basin leads shall be in conformance with requirements of this Section.

C. This Section shall include furnishing and installing all required pipe, bends or beveled pipe, tees, wyes, tee manhole base pipes, bulkheads and stoppers, jointing material, granular material for pipe bedding, concrete used for encasement or bedding, making watertight connections to existing and new sewers and existing manholes, catch basins and inlets, cleaning and testing sewers, removing temporary bulkheads, and other work incidental to the sewer installation unless specifically included under other Items.

D. Additional product requirements are specified in Section 01350.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturer's Shop Drawings indicating pipe and joint materials, physical dimensions, and joint details for each size, type, and class of pipe, fittings and specials furnished for the project compliance with specified standards.

   b. Manufacturer's concrete design strength and reinforcing steel for RCP.

2. Information for the Record:

   a. Manufacturer's certification indicating that the pipe and joints meet specifications for each production run for each size, type, and class of pipe furnished. The Engineer may request test results to verify certification. Certification documents shall be according to the Source Quality Control of this Section.

   b. Manufacturer's installation instructions.

   c. The laboratory shall submit test certifications of pipe ordered tested under "Field Quality Control," of this Section.

PART 2 PRODUCTS

2.01 SOLID WALLED PIPES

A. Polyvinyl Chloride Pipe (PVC):

1. For pipe 15-inch diameter and smaller: Pipe, fittings, and jointing systems shall conform to ASTM D3034, except that the standard dimension ratio of the outside diameter of the pipe to wall thickness shall not exceed 35.
2. For pipe 18 inch thru 24-inch diameter: Pipe, fittings, and jointing systems shall conform to ASTM F679 with a SDR 26 or PS 115 wall thickness.
3. Joint systems shall be elastomeric seal (gasket) type. Seals shall conform to ASTM F-477 requirements. Joint materials and testing shall conform to ASTM D3212 requirements.
4. All service connections shall be made using a wye and a bend. Tees shall be used only as directed by the Engineer. Tees and wyes shall be die cast or factory fabricated. All service pipe shall be SDR 35.

B. Reinforced Concrete Pipe (RCP):

1. Reinforced concrete pipe and specials for storm sewers shall conform to ASTM C76 Wall B (minimum) of classes designated on the Drawings.
2. Reinforced concrete pipe and specials for sanitary sewer shall conform to ASTM C361, including the joint and joint material.

2.02 COMPOSITE AND PROFILE WALLED PIPES

A. High-Density Polyethylene (HDPE) Profile Wall Drainage Pipe:

1. Drainage Pipe shall have a smooth interior with a profile wall conforming to ASTM F949. Pipe shall be manufactures to 46 psi stiffness when tested in accordance with ASTM D2412.
2. The pipe shall be made of a PVC compound having a minimum cell classification of 12454 as defined by ASTM D1784.
3. All fittings shall be manufactured with a smooth interior conforming to ASTM F949, Section 5.2.3 or F794, Section 7.2.4. Fittings shall be provided by the same manufacturer as the pipe.
4. All joints shall be made with integrally formed bell and spigot gasketed connections. Joints shall be watertight in accordance with ASM D3212. Gaskets shall meet the requirements of ASTM F477.

2.03 ACCESSORIES

A. Non-shrinking Mortar Material:

1. Material for non-shrinking mortar used in pointing joints shall be Sauereisen F-100 Grout as manufactured by Sauereisen Cements Co., Pittsburgh, Pennsylvania; Five-Star Grout as manufactured by US Grout Corp., Old Greenwich, Connecticut; or equal.

B. Flexible Pipe Repair Couplings:

1. Flexible repair couplings shall be made of elastomeric polyvinyl chloride boot with series 300 stainless steel shield and clamps. Couplings shall be Strong Back RC series as manufactured by Fernco Joint Sealer Co., Ferndale, Michigan; Logan Clay Pipe Co., Logan, Ohio; Mission Clay Products Corp., or equal.

C. Flexible Watertight Joints:

1. Flexible watertight joints used in connecting to existing sewers shall be a “boot” type sealed to the pipe wall with an internal expanding band and around the connecting pipe with an external adjustable band. Other types of applicable flexible joints may be submitted for approval.

D. Granular Pipe Bedding Material:

1. Granular pipe bedding material shall be as specified in Section 02200.

2.04 REPLACEMENT DRAINS, SEWERS AND APPURTENANCES

A. Vitrified clay pipe sanitary sewers removed or damaged in completed the Work shall be replaced using pipe and joints as specified in this Section. Connections to existing sewers shall be as specified in this Section.

B. Reinforced concrete pipe sanitary sewers removed or damaged in completing the Work shall be replaced using pipe meeting ASTM C76, Class IV, unless otherwise indicated and joints meeting ASTM C361. Reinforced concrete pipe storm sewers shall also be replaced with ASTM C76 Cl. IV RCP with joints equal to those of the pipe removed.

C. Nonreinforced concrete pipe removed or damaged in completing the Work shall be replaced using pipe meeting ASTM C76 Class IV RCP.

D. Driveway culverts removed or damaged in completing the Work shall be replaced with existing pipe, if undamaged, or new pipe and joints matching the existing, unless specified otherwise.

2.05 RESERVED

PART 3 EXECUTION

3.01 CONSTRUCTION IN HIGHWAY PROPERTIES

A. Construction in Highway properties shall conform to the requirements of Section 02200.

3.02 PREPARATION OF TRENCH

A. Trench excavation shall conform to requirements of Section 02200.

B. For rigid pipes the width of trench at the top of pipe shall be as shown in the Trench Detail on the Drawings.

C. Unless otherwise indicated minimum trench widths for flexible pipes shall meet the requirements of ASTM D2321 and the Trench Detail shown on the Drawings.

D. Unless otherwise indicated all sewer trenches shall be excavated below the proposed pipe invert as required to accommodate the depths of bedding material as shown on the Drawings and specified herein.

3.03 RIGID PIPE INSTALLATION

A. Pipe trenches shall be excavated to the depth indicated on details to provide adequate depth of bedding and the pipe shall be placed and supported on bedding material the full length of the barrel. Bedding material shall then be placed 4-inch maximum depth along both sides of the pipe and tamped firmly under the pipe haunches. Additional bedding material shall be placed and compacted in 6-inch layers to the height shown on the Drawings or as directed. Hand tampers shall be used for installing bedding material around pipes smaller than 36-inch diameter and mechanical hand tampers shall be used around pipes 36-inch diameter and larger unless otherwise directed by the Engineer. The remainder of the trench shall be backfilled as specified and called for on the Drawings.

B. Concrete bedding and encasement in lieu of bedding material shall be installed as shown on the Drawings or specified.

C. The laying of pipe in finished trenches shall be commenced at the lowest point, with the bell end or groove end laid upgrade. Pipe shall be laid with ends abutting and true to line and grade. They shall be carefully centered to form a sewer with a uniform invert of line and grade shown on the Drawings.

D. Pipe shall be laid to lines and grades by use of a laser beam and checked in conformance with Section 01800. Pipes installed more than 0.04 feet above or below specified elevation shall be removed and reinstalled to grade.

E. Where holes are cast in concrete pipe for handling, they shall be completely filled with non-shrinking mortar after the pipe is placed. A metal disc of proper size may be inserted near the bottom of the hole to retain the mortar until hardened. Wood plugs or rocks intended to plug the hole for retention of the mortar will not be permitted.

3.04 FLEXIBLE PIPE INSTALLATION

A. Flexible pipe shall be installed in accordance with ASTM D2321. Bedding, backfill, and compaction shall meet the requirements of this Section and Section 02200.

B. Concrete bedding and encasement in lieu of bedding material shall be installed as shown on the Drawings or specified.

C. The laying of pipe in finished trenches shall be commenced at the lowest point, with the bell end or groove end laid upgrade. Pipe shall be laid with ends abutting and true to line and grade. They shall be carefully centered to form a sewer with a uniform invert of line and grade shown on the Drawings.

D. Pipe shall be laid to lines and grades and checked in conformance with Section 01800. Pipes installed more than 0.04-feet above or below specified elevation shall be removed and reinstalled to grade.

E. Temporary internal supports shall be used as recommended by the pipe manufacturer. Pipes with 48 inches or larger diameter shall have, as a minimum, struts temporarily inserted at the ends of the pipes. Struts shall be in the vertical position when the pipe is installed in the trench. Struts shall remain in place until after the trench has been completely backfilled.

3.05 RESERVED

3.06 PIPE JOINTS

A. O-Ring and Chemically Welded Joints - Pipe jointing surfaces shall be clean and dry when preparing surfaces for joining. Lubricants, primers, adhesives, etc., shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing materials or factory fabricated joints shall then be placed, fitted, joined, and adjusted in such a manner as to obtain a watertight joint. Trenches shall be kept water-free and as dry as possible during bedding, laying, and jointing. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to prevent movement of the pipe from any cause.

B. Flexible Plastic Gasket Joints - Materials used for gaskets shall be as specified in this Section. Cross section size of gaskets and method of installation shall conform to the manufacturer's recommendations.

C. Non-shrinking Mortar Joints - Where specified or shown on the Drawings, joints of concrete pipe sewers shall be thoroughly pointed full inside circumference with a non-shrinking mortar in conformance with the material manufacturer's instructions. The mortar shall be tightly packed and the interior face of the joint shall be left smooth and continuous with the interior face of the pipe. Pointing shall not be done until the backfill over the pipe is placed and compacted.

3.07 CONNECTIONS TO EXISTING SEWERS

A. Unless indicated otherwise new pipe connections through the side of existing sewers shall be made as follows:

1. Vitrified clay pipe, plain concrete pipe, and asbestos cement pipe, 15-inch diameter and smaller, and larger diameter at the option of the Contractor, shall be connected by removing a section of the existing sewer and inserting connecting fittings using specified flexible repair couplings.

2. Reinforced concrete pipe and larger sizes of asbestos cement pipe and plain concrete pipe, unless otherwise shown on the Drawings, shall be connected by coring the existing sewer pipe wall and inserting a flexible watertight joint to receive the new pipe.

3. Polyvinyl chloride pipe, ABS pipe, and ABS truss pipe shall be connected in conformance with the manufacturer's recommendations as approved by the Engineer.

4. Connections shall be made in conformance with the jointing materials manufacturer's recommendations and as directed by the Resident Project Representative.

3.08 FIELD QUALITY CONTROL

A. The Resident Project Representative may select one sample of pipe on the job site of each production run of each size and type of pipe to be tested by the Contractor's laboratory. The Contractor shall furnish the first test piece or pipe core and any additional samples required because of failures. The Contractor shall pay for tests on the first sample. Should the sample fail to meet specifications, retests shall be conducted by the Contractor's laboratory in conformance with the specifications and shall be at no additional expense to Owner.

B. Deflection of PVC, PE and ABS Composite Piping Sewers:

1. Vertical Ring Deflection - Before final acceptance of sewer lines, all sections of sewer pipe 8 inches and larger specified diameter shall be measured for vertical ring deflection by the Contractor and witnessed by the Resident Project Representative. Maximum deflection under full load shall not exceed 5% of the ASTM designated average inside diameter as determined by the laboratory for the specified piping.

2. Failures - Should a pipe exceed the allowable deflection; the Contractor shall replace those pipes and retest the section.

3. Equipment used in testing shall be go-no-go pull through gauges of a type approved by the Engineer. A metal or plastic gauging ring of diameter equal to 95% of the specified average inside pipe diameter shall be furnished with each gauge.

4. The Contractor shall furnish testing equipment and personnel and perform the required tests. Tests must be witnessed by the Resident Project Representative.

5. Use of mechanical pulling devices is not permitted.

6. Deflection testing shall not be performed until the completed and accepted trench backfill has been in place for at least 30 days.

C. Field Inspection:

1. Individual sections of pipe may be rejected at any time because of defective joints, dimension variations, fractures, cracks, chips, or blisters exceeding the permissible tolerances.
2. Rejected pipe shall be so marked with a lumber crayon or paint and shall be removed from the job site before the end of the following work day.

3.09 RESERVED

3.10 LOW PRESSURE AIR ACCEPTANCE TESTS

A. Where approved by the Engineer, the Contractor may perform low pressure air acceptance tests in lieu of infiltration or exfiltration tests for pipes 24 inches in diameter or smaller. Test shall be made in accordance with ASTM F1417-Plastic Gravity Sewer Lines; ASTM C924-Concrete (Circular) Sewer Pipe with Gasket.

1. If the air pressure required for the test is greater than 5.0 psig, the low-pressure air acceptance test shall not be used.

B. The Contractor shall furnish all equipment, materials, and labor, and conduct the tests under observation of the Resident Project Representative.

C. Safety:

1. The air test may be dangerous if the line is improperly prepared. All plugs shall be installed and braced in such a manner to prevent blowouts. No one shall be allowed in manholes during testing.
2. Pressurizing equipment shall include a regulator set at the maximum pressure.

D. Line Preparation:

1. Sewers to be air tested shall be prepared and inspected as specified herein for infiltration and exfiltration tests.
2. Where porous pipe materials are used, the pipe walls may be wetted to temporarily reduce the porosity of the material.
3. All pipe outlets shall be plugged, braced, and the joints restrained adequately to prevent blowouts.

E. Test Procedure:

1. Low pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0 psig greater than the average back pressure of any groundwater above the invert of the pipe.
2. When a constant pressure of 4.0 psig greater than the average back pressure of any groundwater above the pipe is reached, the air supply shall be throttled to maintain that internal pressure for at least 2 minutes to permit temperature equalization.

3. When temperatures have been equalized and the pressure stabilized at 4.0 psig greater than the average back pressure of any groundwater above the pipe, the air supply shall be shut off or disconnected.

4. Decrease the pressure in the sealed line until the continuous monitoring pressure gauge reads 3.5 psig greater than the average back pressure of any groundwater above the pipe. When this pressure is reached, timing shall commence with a stop watch.

5. Determine the time, as shown on the stop watch, required for the pressure in the sealed line to drop 1.0 psig.

F. Test Method ASTM F1417-Plastic Gravity Sewer Line:

1. Low pressure air test method shall be the Time-Pressure Drop Method.

2. The pressure used in the test shall be the stated pressure plus the average back pressure of any groundwater above the pipe.

3. The time required for the pressure in the test section to drop 1.0 psig shall be measured using a stop watch. If the time is less than the time determined from ASTM F1417, the section fails. The table below has been reprinted from ASTM F1417 for Contractor's information.

Pipe Diameter, Inches	Minimum Time, Min.: Sec.	Length for Minimum Time, Feet	Time for Longer Length, Sec. (L=Ft)
6	5:40	398	0.854 L
8	7:34	298	1.520 L
10	9:26	239	2.374 L
12	11:20	199	3.418 L
15	14:10	159	5.342 L
18	17:00	133	7.692 L
21	19:50	114	10.470L
24	22:40	99	13.674L

Note: Minimum time applied to all lengths less than or equal to the length shown. For more information, see ASTM F-1417, Table 1.

PART 4 SPECIAL PROVISIONS

4.01 PIPE SCHEDULE

A. The following letter designations are used in the Piping Schedule:

Material Designation:

DIP - Ductile Iron Pipe
HDPE - High Density Polyethylene
PVC - Polyvinyl Chloride
RCP - Reinforced Concrete Pipe

B. Sanitary Sewer Schedule

Size	Thickness Class	Material	Spec Section	Remarks
6” – 15”	SDR 35	PVC	2.01A	

C. Storm Sewer Schedule

Size	Thickness Class	Material	Spec Section	Remarks
4” – 24”	SDR35	PVC	2.01A	Flow Meter Drain Pipe, Repairs to Existing Storm Sewers & Culverts
30 – 36”	PS46	PVC	2.02A	Culverts
12”	Class IV	RCP	2.01B	Pump Station Driveway Pipe
All Others	As Specified	As Specified	2.04	Repairs to Existing

D. Schedules are not guaranteed to be complete. All piping show on Drawings or specified shall be furnished and installed by the contractor whether or not listed in the above schedule.

4.02 TESTING REQUIREMENTS

A. Low-pressure air tests are only required for new sanitary sewers installed between two new manholes or structures.

B. Deflection and low-pressure air testing is not required for repair sections of sanitary or storm sewers.

C. Deflection testing is required for culverts.

D. All new or repaired sections of sewers and culverts will be televised for acceptance in accordance with the requirements of Section 01820.

END OF SECTION

SECTION 02551
PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing precast concrete structure sections of types and at locations shown on the Drawings and scheduled.

B. This Section includes removing existing structures, additional excavation to widen and deepen trenches for structures construction, furnishing and installing concrete of indicated strength, portland cement mortar, reinforcing steel, precast concrete integral base sections, bottom riser sections, transition sections, and riser sections, flat slab tops and grade rings, pipe opening with flexible pipe connections, pipe for drop connections, manhole steps, manhole frames and covers, plugging lifting holes, pointing joints, forming channels through bottoms, making watertight connections to new and existing sewers, and other work incidental to construction and testing.

C. Additional product requirements are specified in Section 01350.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturer's Shop Drawings indicating physical dimensions, joint details, reinforcing steel, and layout for each size and type of structure(s) components furnished for the project.

   b. Manufacturer's certification indicating that the precast structure components and joints meet specifications for each production run for each size and type furnished.

2. Information for the Record:

   a. The Engineer may request test results to verify certification. Certification documents shall be according to the Source Quality Control of this Section.

PART 2 PRODUCTS

2.01 MATERIALS OR PRODUCTS OR EQUIPMENT

A. Precast concrete sections, integral base sections, and flat slab tops shall be designed by an Engineer licensed in the state of the project and conforming to ASTM C913 and ASTM C890. The design shall be adequate to support traffic or non-traffic loads as specified in Part 4.

B. All joints in the walls and bottom of precast tanks and vaults shall be tongue and groove type with a preformed butyl rubber joint sealant placed in the joint prior to assembly of the joint. This joint material shall provide a permanent flexible non-shrinking watertight seal and shall meet the requirements of ASTM C990. After assembly of the joint, a 12-inch-wide band of permanent flexible water barrier wrap shall be applied to the exterior surfaces centered on all wall joints and any buried top slab joints. This barrier wrap shall meet the requirements of ASTM E1745, C877, and C990. The barrier wrap shall be bonded to the concrete with a brush or roller applied adhesive surface primer formulated for use with the barrier wrap material.

C. There shall be no opening or penetration within 6 inches of any joint on precast structure. Section heights shall be adjusted as required.

D. Precast integral base and top sections shall be of monolithic construction.

E. Holes required in the structure shall be cast and formed during fabrication. Field cutting of holes is not permitted without Engineer's approval.

F. Additional concrete reinforcing steel and dowels shall be installed as shown on drawings to resist the buoyant forces. Concrete shall be as specified below.

2.02 ACCESSORIES

A. Manhole Steps - Manhole Steps shall be of polypropylene plastic reinforced with a 1/2-inch No. 60 grade reinforcing rod. Steps shall be M. A. Industries Model PS-1, or equal.

1. Specified manhole steps shall be factory installed to provide a continuous ladder of 16-inch Center-to-Center rung spacing. Steps shall be placed in the forms and cast in wall or placed immediately after removal from casting and carefully mortared in place with non-shrink mortar to insure a watertight joint. Step installation shall be in compliance with OSHA regulations. If the outer surface of the wall is pierced the patch shall be completely covered with a bituminous sealer.

B. Manhole frames and covers shall be as shown on the Drawings and in conformance with requirements of Section 05540.

C. Floor doors shall be the size and type as shown on the Drawings and as specified in Section 08320.

D. Mortar:

1. Mortar used for the structures herein specified shall conform to ASTM C270 Type S, containing no masonry cement. The mortar shall be composed of one-part portland cement to two parts sand by volume.

2. Non-shrinking Mortar - Materials for non-shrinking mortar shall be Sauereisen F-100, Five-Star, or equal.

E. Cast-in-Place Concrete:

1. All cast-in-place concrete used for forming channels in structure bottoms shall be Class A as specified in 03305.
2. All concrete used for supporting precast concrete structure bases shall be Class B as specified in 03305.

F. Flexible Joints - Joints for precast pipe openings shall be “Res-Seal” type as manufactured by Price Brothers Company, “Kor-n-seal” as manufactured by National Pollution Control Systems, Inc., or equal.

G. Wall Sleeves shall be used as indicated on the drawings and in conformance with Section 15210.

PART 3 EXECUTION

3.01 COORDINATION

A. Location and type of precast concrete structure installed shall be as shown on the Drawings or directed.

B. Construction shall be in conformance with details shown on the Drawings and as specified.

C. Excavation for structure construction shall be prepared as specified, shown on the Drawings and as directed in Section 02200.

3.02 INSTALLATION OF INTEGRAL BASE SECTIONS

A. Base sections shall be paced on a minimum 6-inch thick bedding material under the entire area of the structure base. Bottom sections placed on bedding shall be a minimum of 6 inches thick. Base section shall be level and plumb. Structures that are not plumb and level shall be removed and reset as specified.

3.03 FORMING STRUCTURE BOTTOMS

A. The bottoms of all structures shall be channeled or fillets placed as shown on the drawings to conduct flow in the planned direction.

3.04 PRECAST CONCRETE RISER SECTIONS

A. Sections 32 inches in height or less shall be incorporated into the structure immediately below the top.

B. Structure joints shall be pointed and lifting holes filled with non-shrink nonmetallic mortar.

3.05 INSTALLATION OF CASTING FRAMES AND COVERS

A. Frames and covers shall be installed to grades shown on the Drawings or as directed.

B. Adjustment of castings shall be made using specified precast grade rings and portland cement mortar joints or preferred bitumen seals.

C. Each pressure tight manhole casting shall be anchored in place using four 5/8-inch stainless steel bolts with nuts as detailed on the Drawings or directed.

D. The maximum depth of adjustment below any manhole casting shall be 16 inches and the minimum depth of adjustment shall be 4 inches.

E. In concrete pavement, separate frame from pavement with 1/2-inch-thick premolded mastic joint material extending from the base of the frame to the top of the frame.

3.06 FLOOR DOORS

A. Contractor shall coordinate with precast manufacturer to have floor doors cast as an integral part of the top section with proper coatings at metal/concrete interface. Provide drain piping as needed for floor door channels.

3.07 FIELD QUALITY CONTROL

A. Field Inspection:

1. Individual sections may be rejected at any time because of defective joints, dimension variations, fractures, cracks, honeycombing, chips, or blisters exceeding the permissible tolerances as set by ASTM C913.

2. Rejected sections shall be so marked with a lumber crayon or paint and shall be removed from the job site before the end of the following work day.

B. Correction of honeycombing, chips, blisters and filling lifting holes shall not be performed without prior approval from the Engineer.

C. Field cutting of the precast sections shall not be performed without prior approval from the Engineer.

PART 4 SPECIAL PROVISIONS

4.01 ACCESSORIES

A. Flexible Joints - Joints for precast pipe openings shall be “A-LOK X-CEL” as manufactured by A-LOK Products, Inc., “Kor-n-seal” as manufactured by National Pollution Control Systems, Inc., or equal in accordance with ASTM C923.

B. Pipe for Manhole Drops - Pipe for manhole drops shall conform to specifications of Section 02550 for the required size and type shown on the Drawings.

C. Sewer Drop Bowls shall be as specified in Section 066882.

D. Joint Wrap - Polyolefin backed exterior joint wrap used to cover the exterior side of joints shall be ConSeal CS212; Riser Wrap by Pipeline Seal & Insulator, Inc. or equal. Minimum width shall be 12 inches. Joint wrap shall include the use of brush or roller

applied adhesive surface primer formulated for use with joint wrap. Seal shall meet the requirements of ASTM E1745, C-877, and ASTM C990.

E. Chimney seal shall be applied to the exterior of all manholes and shall cover the joint at iron casting, adjusting ring and lap over manhole riser/top section. Seal shall be HDPE heat shrink as manufactured by Pipeline Seal & Insulator, Inc. (Riser-Wrap) and CCI Pipeline System (Wrapid Seal), or equal.

F. Chimney seals which are installed on the interior of manholes will not be acceptable.

G. The specified accessories shall be used for existing structures to be modified as well as new structures included in this project.

4.02 CONCRETE ADMIXTURES

A. Crystalline Waterproofing Admixture

1. The Contractor shall provide crystalline waterproofing admixture to precast concrete sanitary sewer manholes sections as indicated on the drawings and as specified herein.

2. The admixture shall be Xypex Admix C-500 or C-1000 (reduced set) or approved equal. Requests for equal materials shall demonstrate the same or superior performance to the specified materials.

3. Concrete waterproofing system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. The system shall cause the concrete to become sealed against the penetration of liquids from any direction, and shall protect the concrete from deterioration due to harsh environmental conditions.

4. The manufacturer of the crystalline water proofing shall provide the type of material and the dosage rate for the application. Admixture must be added to concrete mix at time of batching. The actual dosage in the mix design shall be certified at the time of application.

5. Manufacturer shall coordinate with the concrete batch facility and other admixture suppliers to ensure compatibility with the concrete mix design, other admixtures and concrete properties. The addition of the crystalline water proofing shall not reduce the concrete strength or compromise the ASTM specifications or other quality standards governing the concrete mix.

6. The admixture shall include a red oxide colorant to permit visual inspection of the cured precast section.

7. Concrete containing Xypex Admix shall be moist cured in accordance with ACI Reference 308, “Standard Practice for Curing Concrete.”

4.03 WET WELL PROTECTIVE COATING

A. Contractor to provide a multi-component (layer) flexible-sealant liner as specified herein. The liner is intended to provide infiltration resistance and corrosion protection. Acceptable liner products are as follows:

1. OBIC Products – OBIC Armor 1000F

B. The protective coating system shall consist of a spray-able, solvent free modified polymer or VOC free two component polyurea that chemically and permanently fills voids in concrete within the precast structure. The system should cause the precast concrete to become sealed against the penetration of liquids from any direction and shall protect the precast concrete from deterioration due to corrosive wastewater environments.

C. The manufacturer of the sealant liner shall provide the type of material and dosage for the application. The sealant equipment provided by the manufacturer shall be specifically designed for the actual dosage amount to apply the liner system.

D. The specified coating shall be applied to the walls, floor (including fillets) and underside of the ceiling.

E. Protective Coating Installation Procedure:

1. The Contractor shall monitor the atmosphere for hydrogen sulfide, methane, low oxygen or other gases. The Contractor shall provide approved flow control equipment, surface preparation, and installation and testing equipment.

2. Preparation and Cleaning of Interior Surfaces - The Contractor shall clean all interior surfaces to be free of grease, loose bricks, mortar, unsound concrete and other materials by water blasting, wet or dry sandblasting, acid washing or other mechanical methods as approved by the Engineer. The Contractor may be required to employ degreasers or concrete cleaners to properly prepare the concrete interior surface to receive the primer and liner material. Following the cleaning, the interior surfaces shall be thoroughly rinsed to remove any residue from the cleaning operation. The precast concrete interior surface shall be dried and at a proper temperature to receive the primer and liner material.

3. Concrete Patching - all non-leaking holes, missing bricks, missing mortar, unsound concrete, delaminated concrete, cracks and spalls shall be repaired, repointed or filled using a pre-mixed, non-shrink, cement based patching mortar consisting of hydraulic cement, graded silica aggregates, polymer, special plasticizing and accelerating agents formulated specifically for vertical or overhead use. The concrete patching material shall contain no chlorides, gypsums, plasters, iron particles, aluminum powder or gas forming agents and shall not promote corrosion of steel that the grout material may come into contact with.

   a. Set time - less than 30 minutes per ASTM C191.

   b. One hour compressive strength - minimum of 200 psi per ASTM C109.

   c. Ultimate compressive strength - minimum of 5,000 psi per ASTM C109.

   d. Bond strength - minimum of 1,700 psi per ASTM C882.

4. Grouting – All leaking holes, missing bricks, missing mortar, cracks or joints shall be grouted as specified in section 02772.

5. Flow Bypassing - The Contractor shall provide all required flow bypassing around the structures to be rehabilitated. The bypass shall be constructed in accordance with these Specifications.

6. After completion of surface preparation, the Contractor shall perform the seven-point check list, which is the inspection for leaks, cracks, holes, exposed rebar, ring and cover condition, invert condition, and inlet and outlet pipe connection.

7. The Contractor's liner application procedures shall conform to recommendations of the manufacturer, including materials handling, mixing, environmental controls during application, safety and spray equipment. The liner shall be applied to entirety of the interior surfaces of the structure including chimney, walls and benches.

8. Spray equipment shall be specifically designed to accurately ratio and apply the liner system.

9. Application of multi-component liner system shall be in strict accordance with manufacturer's recommendation. Final installation shall be a minimum of 500 mils. Acceptance of the liner shall be based upon the specified thickness. A permanent identification and date of work performed shall be affixed to the structure in a readily visible location.

10. The Contractor shall provide a final written report to Owner and Engineer detailing the location, date of report, and description of repair.

4.04 SCHEDULE

Description	Design Loading Condition	Top	Admixtures	Protective Coatings	Access
Wet Well	H-20	Flat Slab	4.02	4.03	Floor Door
Meter Chamber	300psf	Flat Slab	None	None	Floor Door

END OF SECTION

SECTION 02552
PRECAST CONCRETE MANHOLES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing precast concrete manholes, including drops and manhole stacks of types and at locations shown on the Drawings and scheduled.

B. This Section includes removing existing structures, additional excavation to widen and deepen trenches for manhole construction, furnishing and installing concrete of classes called for, portland cement mortar, reinforcing steel, precast concrete pipe integral base sections, bottom riser sections, transition sections, and riser sections, eccentric cones, flat slab tops and grade rings, flexible manhole connections, pipe for drop connections, manhole steps, manhole frames and covers, plugging lifting holes, pointing joints, joint wrap installing, forming channels through manhole bottoms, making watertight connections to new and existing sewers, and other work incidental to manhole construction and testing.

C. Additional product requirements are specified in Section 01350.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop drawings for Review:

   a. Manufacturer's Shop Drawings indicating physical dimensions, pipe openings, precast section arrangement, adjusting rings, castings, and joint details for each size and type of manhole components furnished for the project. Shop Drawing shall incorporate the planned elevations and details.

   b. Manufacturer's certification indicating that the manhole components and joints meet specifications for each production run for each size and type furnished.

2. Information for the Record:

   a. The Engineer may request test results to verify certification. Certification documents shall be according to the Source Quality Control of this Section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Type of Manhole Sections:

1. Manhole Stacks - Manhole stacks shall mean 4-feet diameter manholes used for access to reinforced concrete manhole chambers and precast manhole riser tee sections.

2. Type I Manholes - Type I manholes shall mean 4-feet diameter manholes with precast integral base sections for sanitary sewers and either precast integral base sections or precast bottoms for storm sewers. Pipe connections to manholes shall be made with flexible water tight joints. Type I manholes are intended for installation of pipes 18-inch diameter and smaller unless noted otherwise.

3. Type II Manholes - Type II manholes shall mean manholes with 5-feet diameter precast integral base sections. Pipe connections to manholes shall be made with flexible water tight joints. Type II manholes are intended for installation of 21-inch through 30-inch diameter pipes unless noted otherwise.

4. Type III Manholes - Type III manholes shall mean manholes with precast integral base sections or precast bottoms that are larger than 5-feet diameter. The diameter of the bottom riser sections shall be as shown on the Drawings. Pipe connections to manholes shall be made with flexible water tight joints. Type III manholes are intended for installation of pipes where the additional wall area is needed for installation on flexible joints and of 36-inch through 48-inch diameter pipes unless noted otherwise.

5. Type IV Manholes - Type IV manholes shall mean manholes with cut-outs in the bottom riser sections installed on cast-in-place or precast concrete bases. The diameter of the bottom riser sections shall be as shown on the Drawings. Pipe connections above bottom riser section shall be made with flexible water tight joints. Type IV manholes are intended for installation on sewers 48-inch diameter and larger and on existing pipes where identified on Drawings.

6. Type S Manholes - S following manhole type shall mean the designated type manhole constructed with a precast flat slab top in lieu of a precast cone.

B. Precast concrete pipe manhole sections, integral base sections, transition sections, eccentric cones, flat slab tops, and adjusting rings shall conform to ASTM C 478. Reinforcing in transition sections shall be equal to that specified for wall sections of the larger diameter.

C. Joints shall be tongue and groove type with a gasketed seal type conforming to ASTM C443.

D. The standard length of riser sections shall be 48-inch. Lengths of 32-inch or 16-inch shall be used to meet required dimensions and as specified.

E. Openings for connecting pipes in riser sections, bottom riser sections, and integral base sections, and for access in flat slabs shall be pre-formed or cored by the manufacturer, except “cut-out” openings may be made in bottom riser sections for Type IV manholes. Cut-out openings shall be made immediately after the pipe is removed from the casting form. All cored openings for sewer pipe connections shall have flexible joints.

F. Precast integral base sections shall be of monolithic construction. Base flat slab floors or integral floors shall have a minimum thickness of 6-inch for risers up to and including 48-inch in diameter and 8-inch for larger diameters. A layer of reinforcement shall be placed above the midpoint, and shall have a minimum area of 0.12 square inch/linear feet in both directions.

G. Manhole sections shall be constructed with no pipe connection within 6 inches of a joint in the structure.

H. Manhole sections shall be clearly marked and identified with the manhole number, section placement order, casting date, trademark, name of the manufacturer, and location of the production plant.

2.02 ACCESSORIES

A. Manhole Steps - Manhole steps shall be of polypropylene plastic reinforced with a 1/2-inch No. 60 grade reinforcing rod. Steps shall be M. A. Industries Model PS-1, or equal.

1. Specified manhole steps shall be factory installed to provide a continuous ladder of 16-inch Center-to-Center rung spacing. Steps shall be placed in the forms and cast in pipe wall or placed immediately after the pipe is removed from casting and carefully mortared in place with non-shrinking mortar to ensure a watertight joint. Manhole step installation shall be in compliance with OSHA regulations. If the outer surface of the pipe wall is pierced the patch shall be completely covered with a bituminous sealer.

B. Manhole frames and covers shall be as shown on the Drawings and in conformance with requirements of Section 05540.

1. Where pressure tight manhole frames and covers are called for, threaded inserts shall be cast in eccentric cones or flat slab tops and holes formed or cored in adjusting rings to match bolt size and spacing specified for manhole casting.

C. Mortar:

1. Mortar used for the structures herein specified shall conform to ASTM C270 Type S, containing no masonry cement. The mortar shall be composed of one-part portland cement to two parts sand by volume.

2. Non-shrinking Mortar - Materials for non-shrinking mortar shall be Sauereisen F-100, Five-Star, or equal.

D. Cast-in-Place Concrete:

1. All cast-in-place concrete used for concrete bases and for forming channels in manhole bottoms shall be Class A as specified in Section 03300.
2. All concrete used for supporting precast concrete manhole bases shall be Class B as specified in Section 03300.

E. Reinforcing Steel - Reinforcing steel used in cast-in-place concrete shall meet the requirements of Section 03200.

F. Flexible Joints - Joints for precast pipe openings shall be “A-LOK X-CEL” as manufactured by A-LOK Products, Inc., “Kor-n-seal” as manufactured by National Pollution Control Systems, Inc., or equal in accordance with ASTM C923.

G. Pipe for Manhole Drops - Pipe for manhole drops shall conform to specifications of Section 02550 or Section 15210 for the required size and type shown on the Drawings.

H. Joint Wrap - Polyolefin backed exterior joint wrap used to cover the exterior side of joints shall be ConSeal CS212; Riser Wrap by Pipeline Seal & Insulator, Inc. or equal. Minimum width shall be 12 inches. Joint wrap shall include the use of brush or roller applied adhesive surface primer formulated for use with joint wrap. Seal shall meet the requirements of ASTM E1745, C-877, and ASTM C990.

I. Chimney seal shall be applied to the exterior of all manholes and shall cover the joint at iron casting, adjusting ring and lap over manhole riser/top section. Seal shall be HDPE heat shrink as manufactured by Pipeline Seal & Insulator, Inc. (Riser-Wrap) and CCI Pipeline System (Wrapid Seal), or equal.

J. Chimney seals which are installed on the interior of manholes will not be acceptable.

PART 3 EXECUTION

3.01 COORDINATION

A. Location and type of manholes installed shall be as shown on the Drawings or directed.

B. Construction shall be in conformance with details shown on the Drawings and as specified.

C. Excavation for manhole construction shall be prepared as directed in applicable paragraphs of Section 02200.

3.02 INSTALLATION OF INTEGRAL BASE SECTIONS

A. The manhole base may be placed on 6 inches compacted granular bedding material.

3.03 INSTALLATION OF BOTTOM RISER SECTIONS (WITHOUT INTEGRAL BASE)

A. Unless otherwise called for on the Drawings or directed, precast bottom riser sections shall be placed with cast-in-place reinforced concrete bases.

B. The base shall be of Class A concrete 12-inch thick minimum placed on undisturbed earth or a minimum 6-inch-thick aggregate stone cushion. Reinforcing shall be as shown on the Drawings.

C. The cut-out riser section shall be blocked in place above the pipe and the concrete base poured in place. Concrete shall be extended above the lower rim of the riser wall as required to provide a watertight seal around the entire circumference of the riser section. The sewer pipe shall be bedded in concrete monolithic with the base to the first joint each way from the manholes.

D. On straight runs the Contractor may carry the pipe through the manhole and break out the top half after the fill concrete has set. In all cases the pipe shall extend through the manhole wall to the inside face.

3.04 CHANNELING MANHOLE BOTTOMS

A. The bottoms of all manholes shall be channeled to conduct flow in the planned direction. The channel walls shall be formed or shaped to the full height of the crown of the outlet sewer in such a manner to not obstruct maintenance of flow in the sewers and shall match inverts of connection pipe at the manhole wall.

B. Manholes which do not have integral base or channels precast with base section, as approved by Engineer, shall have channels formed and placed in the field with Class A concrete.

3.05 PRECAST CONCRETE RISER SECTIONS

A. The shortest length of riser section to be incorporated into the manhole shall be installed immediately below the eccentric cone section or the flat slab top.

B. Riser section joints shall be pointed and lifting holes filled with non-shrinking mortar.

C. Riser section exterior joints shall be wrapped and sealed with joint wrap as specified herein. Concrete shall be primed a minimum of two times. The first coat shall be allowed to fill concrete depressions and bug holes. Contractor shall follow manufacturer recommendations.

D. Contractor shall protect joint wrap from damage during back filling and other related work.

3.06 INSTALLATION OF MANHOLE FRAMES

A. Manhole frames and covers shall be installed to grades shown on the Drawings or as directed.

B. Adjustment of manhole castings shall be made using specified precast grade rings and portland cement mortar joints or preferred bitumen seals.

C. Each manhole casting shall be anchored in place using four 5/8-inch stainless steel bolts with nuts as detailed on the Drawings or directed.

D. The maximum depth of adjustment below any manhole casting shall be 16 inches and the minimum depth of adjustment shall be 4 inches.

E. In concrete pavement, separate frame from pavement with 1/2-inch thick premolded mastic joint material extending from the base of the frame to the top of the frame.

F. Manhole castings located in pavement areas shall be installed with the top of the casting 1/4 inch below the finished grade of the adjacent pavement surface.

3.07 CHIMNEY SEAL

A. Installation of chimney seal shall be after casting has been adjusted to final grade. Chimney seal shall cover all joints at manhole top including, but not limited to, iron casting, adjusting rings and manhole riser.

B. Chimney seal shall be installed per manufacturer recommendations. Chimney seal shall provide a water tight seal.

3.08 MANHOLE TESTING

A. Each manhole shall be tested in accordance with ASTM C1244 'Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.' in the presence of the Engineer

B. All lift holes shall be plugged with an approved non-shrink grout before testing.

C. All pipes entering the manhole shall be plugged and braced to prevent being drawn into the manhole.

D. Testing shall be by drawing a vacuum on the manhole using equipment specifically designed for such testing. A test head with necessary gauges and connections shall be placed at the inside of the top of the cone section and sealed in accordance with the manufacturer's instructions. A vacuum of 10 inches of mercury shall then be drawn and the vacuum pump shut off. With valves closed, the time shall be measured for the vacuum to drop to 9 inches. The test shall be successful if the time measured is greater than the required time based on the following chart:

	Diameter (in)				
	48	**60**	**72**	**84**	**96**
Depth (ft.)	**Time (sec.)**				
<4	10	13	16	20	23
6	15	20	25	29	34
8	20	26	33	39	45
10	25	33	41	48	56
12	30	39	49	58	67
14	35	46	57	67	78
16	40	52	67	77	89
18	45	59	73	86	100
20	50	65	81	96	111
22	55	72	89	105	122

	Diameter (in)				
	48	**60**	**72**	**84**	**96**
Depth (ft.)	**Time (sec.)**				
24	59	78	97	115	133
26	64	85	105	124	144
28	69	91	113	134	155
30	74	98	121	143	166

E. If the test is unsuccessful, necessary repairs shall be made and retesting shall proceed until a satisfactory test is obtained.

F. If a manhole is constructed of different diameters, the largest diameter shall be used to determine the time required for testing.

G. The Contractor may perform testing after completely backfilling the manhole, and the following modification to the testing procedure shall be followed.

1. Determine depth of water table and depth of manhole being tested.

2. Using above depths, calculate the hydrostatic head above the lowest manhole connection.

3. Adjust test pressure according to the following table:

External Hydrostatic Head (ft)	≤12	13	14	15	16	17	18	19	20	21	22
Vacuum Pressure (in Hg)	10	9	8	7	6	5	4	3	2	1	0

4. If hydrostatic head above the lowest manhole connection is equal to or greater than 22 feet, vacuum testing must be completed before backfilling.

PART 4 SPECIAL PROVISIONS

4.01 MANHOLE VACUUM TESTING

A. Vacuum testing is required for new manhole sections installed as part of the Work.

B. Vacuum testing is not required for the doghouse style manhole

4.02 MANHOLE PROTECTIVE COATING

A. Contractor to provide a protective coating to existing precast concrete manholes as indicated on the Drawings and as specified herein.

B. The system should cause the precast concrete manhole to become sealed against the penetration of liquids from any direction, and shall protect the precast concrete from deterioration due to corrosive wastewater environments.

C. The protective coating is intended to provide infiltration and corrosion protection. Acceptable protective coatings are as follows:

1. OBIC Products – OBIC Armor 1000F

D. The manhole sealant protective coating system shall consist of a spray-able multi-component (layer) flexible-sealant, solvent free modified polymer or VOC free two component polyurea that chemically and permanently fills voids in concrete and damaged bricks within the manhole structure.

E. The manufacturer of the protective coating shall provide the type of material and dosage for the application. The installation equipment provided by the manufacturer shall be specifically designed for the actual dosage amount to apply the liner system.

F. Manhole Installation Procedure:

1. The Contractor shall monitor the atmosphere for hydrogen sulfide, methane, low oxygen or other gases. The Contractor shall provide approved flow control equipment, surface preparation, and installation and testing equipment.

2. Preparation and Cleaning of Interior Surfaces - The Contractor shall clean all interior surfaces to be free of grease, loose bricks, mortar, unsound concrete and other materials by water blasting, wet or dry sandblasting, acid washing or other mechanical methods as approved by the Engineer. The Contractor may be required to employ degreasers or concrete cleaners to properly prepare the manhole interior surface to receive the manhole primer and liner material. Following the cleaning, the manhole interior surfaces shall be thoroughly rinsed to remove any residue from the cleaning operation. The manhole interior surface shall be dried and at a proper temperature to receive the primer and liner material.

3. Manhole Patching - all non-leaking holes, missing bricks, missing mortar, unsound concrete, delaminated concrete, cracks and spalls shall be repaired, repointed or filled using a pre-mixed, non-shrink, cement based patching mortar consisting of hydraulic cement, graded silica aggregates, polymer, special plasticizing and accelerating agents formulated specifically for vertical or overhead use. The manhole patching material shall contain no chlorides, gypsums, plasters, iron particles, aluminum powder or gas forming agents and shall not promote corrosion of steel that the grout material may come into contact with.

   a. Set time - less than 30 minutes per ASTM C191.

   b. One hour compressive strength - minimum of 200 psi per ASTM C109.

   c. Ultimate compressive strength - minimum of 5,000 psi per ASTM C109.

   d. Bond strength - minimum of 1,700 psi per ASTM C882.

   e. Patching materials shall be compatible for use with the protective coating system.

4. Manhole Grouting – All leaking holes, missing bricks, missing mortar, cracks or joints shall be grouted as specified in Section 02772.

5. Flow Bypassing - The Contractor shall provide all required flow bypassing around the manhole to be rehabilitated. The bypass shall be constructed by plugging the sanitary sewer upstream of the manhole and pumping flow into a

downstream manhole or as approved by the Engineer. The pump and bypass piping shall be adequate capacity to handle the flow from the upstream sewer.

6. After completion of surface preparation, the Contractor shall perform the seven-point check list, which is the inspection for leaks, cracks, holes, exposed rebar, ring and cover condition, invert condition, and inlet and outlet pipe connection.

7. The Contractor's liner application procedures shall conform to recommendations of the manufacturer, including materials handling, mixing, environmental controls during application, safety and spray equipment. The liner shall be applied to entirety of the interior surfaces of the manhole including chimney, walls and benches.

8. Spray equipment shall be specifically designed to accurately ratio and apply the liner system.

9. Application of multi-component liner system shall be in strict accordance with manufacturer's recommendation. Acceptance of the liner shall be based upon the specified thickness. A permanent identification and date of work performed shall be affixed to the structure in a readily visible location.

    a. Final installation of the polyurea coating shall be a minimum of 500 mils.

    b. The final installation of the calcium aluminate, fiber reinforced, wet shotcrete material shall be as recommended by the manufacturer.

10. The Contractor shall provide a final written report to Owner and Engineer detailing the location, date of report, and description of repair.

11. The Contractor shall be aware of the 21-days cure time required prior to the application of OBIC to the interior of the new manholes. The curing time shall be included in the Contractor's project schedule for the work.

G. Protective Coating Limits:

1. Protective Coatings for manholes shall be applied from the manhole frame down to the manhole bench.

2. Invert channels need not be lined.

END OF SECTION

SECTION 02555
PRESSURE PIPE

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing pressure pipe of the materials, class, size, and length as shown on the Drawings, specified, or directed.

B. Pressure pipelines constructed under this Section shall include but not be limited to water mains and sewer force mains.

C. This Section shall include furnishing and installing all required pipe, fittings, specials, adaptors, closure pieces, tees, bends, joint restraints, granular pipe bedding material, concrete used for encasement or bedding, removing and relaying existing pressure pipe as required, providing temporary services and temporary blocking or harnessing, making connections to new and existing pressure pipe, installing temporary bulkheads and plugs, testing pipe, cleaning and sterilizing water mains, and other work incidental to the pressure pipe installation, unless specifically included under other Items.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturer's Shop Drawing indicating physical dimensions, joint details, fittings, and special details for each size, type, and class of pipe furnished for the project. Shop Drawings shall also note salient features of a specific pipe, i.e., concrete strength and reinforcing details.

2. Information for the Record:

   a. Manufacturer's certification indicating that the pipe and joints meet Specifications for each production run for each size, type, and class of pipe furnished.

1.03 PRODUCT HANDLING

A. Care shall be taken in handling and transporting to avoid damaging pipes and their coatings. Loading and unloading shall be accomplished with the pipe under control at all times and under no circumstances shall the pipe be dropped. Pipe shall be securely wedged and restrained during transportation and supported on blocks when stored in the shop or field.

PART 2 PRODUCTS

2.01 PRESSURE PIPE SPECIFICATIONS

A. RESERVED

B. Polyvinyl Chloride Pipe (PVC):

1. Medium Diameter

a. PVC pipe 4 inches to 12 inches in diameter shall meet the requirements of AWWA C900 or AWWA C909, and unless otherwise specified, shall be Pressure Class 235 (C909), or have a standard pipe dimension ratio (D.R.) of 18 (C900).

b. PVC pipe 14-inch diameter and larger shall meet the requirements of AWWA C905 and unless otherwise specified shall have a standard thermoplastic pipe dimension ratio (D.R.) of 18 or less.

c. Pipe OD shall be equivalent to ductile iron pipe OD for the same nominal pipe size.

d. Pipe shall have integral bell push-on type joints meeting the requirements of ASTM D3139.

e. Joints for pipe shall be push-on gasket style. Gaskets shall meet the requirements of ASTM F477 for high-head (50 feet of head or higher) applications.

f. Restrained Joints, where required or shown, shall meet the requirements of the UNI-Bell Plastic Pipe Association Performance Standard UNI-B-13, similar to EBAA Iron Sales, Inc., Series 2000 PV for mechanical joints and Series 1500 for push-on joints.

C. RESERVED

2.02 PRESSURE PIPE FITTINGS

A. Ductile Iron Pipe Fittings:

1. All Ductile Iron Pipe, PVC or PVCO pressure pipe shall utilize Ductile Iron Pipe fittings with mechanical joints as specified in this section.

2. Mechanical joint fittings shall be ductile iron and conform to ANSI A21.10 or AWWA C110 and ANSI A21.53 or AWWA C153. All fittings shall have a pressure rating of 250 psi for all pipe sizes unless otherwise specified.

3. Fittings shall have mechanical joints with retainer glands unless otherwise specified or shown. Retainer glands shall be ductile iron. The restraining mechanism shall impart multiple wedging actions against the pipe. Restraining devices shall be of heat treated ductile iron. Twist-off nuts shall be used to

ensure proper actuation of the restraining device. The mechanical joint retainer gland shall be Ebaa Iron, Inc., Series 1100 Megalug, or equal.

4. Mechanical joints

   a. Mechanical Joints shall conform to ANSI A21.11 (AWWA C111), except as specified herein.

   b. The mechanical joint retainer gland shall be Ebaa Iron, Inc., Series 1100 Megalug, or equal

   c. Mechanical couplings, if required or permitted, shall be Dresser Style 38, or equal.

5. Bell Restraints

   a. For new PVC Pipe Bell restraints shall be EBAA Iron Series 2800 Restrain Harnesses or approved equal.

   b. For new Ductile Iron Pipe bell restraints shall be EBAA Iron Series 1700 MEGA Lug Harnesses or approved equal.

      Split ring harnesses may be used on existing pipes where joint restraints are to be added, but split ring type harnesses are not permitted on new pipe installations.

2.03 ACCESSORIES

A. Nuts and bolts for buried pipe shall be as follows:

1. Nuts and bolts used in wall castings shall be of stainless steel Type 316.

2. Nuts and bolts encased in grout on concrete pressure pipe shall conform to recommendations of the pipe manufacturer.

3. Nuts and bolts used on buried pressure pipe and fittings in contact with earth shall be Cor-Blue coated low alloy steel and have a minimum yield strength of 45,000 psi complying with ANSI A21.11 and AWWA C111.

4. All other nuts and bolts shall be low carbon steel in conformance with the chemical and mechanical requirements of ASTM A307, Grade B. Higher strength bolts will be acceptable.

B. Tracing Wire shall be installed on all pipe.

1. Direct Burial No. 12 AWG Solid (0.0808-inch diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 1150-pound average tensile break load, 45 mil, high molecular weight, high density polyethylene jacket complying with ASTM D1248, 30 volt rating. SoloShot™ extra high strength No. 1245 as manufactured by Copperhead Industries, LLC, or equal. Wire shall be secured to the pipe with tape at intervals not to exceed 10 feet.

a. Tracer wire installed on pipe by horizontal directional drilling shall be continuous without any splices.

b. Heat shrink splices are permissible only on tracer wire at pipe connection.

2. Tracer wires shall terminate inside all structures including but not limited to, air relief structures, valve box assemblies, indicated on plans. Tracer wire shall extend 4-feet above the opening on structures.

3. Tracer wire shall be tested for continuity after installation and considered acceptable when a continuous read is obtained between terminals.

C. Utility Markers and Locator stations shall be installed as noted in Part 4 and on the drawings.

1. Utility Markers shall be flexible above ground, impact resistant, UV stabilized fiberglass Reinforce composite material. Utility markers shall be a minimum of 3-3/4 inches wide and 66 inches long. Color shall be integral to the material and selected by the Owner.

2. Locator stations shall be impact resistant, UV stabilized, and fiberglass reinforced composite material, 3 inches in diameter. Locator stations shall have a polycarbonate cap assembly with brass or stainless-steel terminal board for tracer wire. The cap assembly color shall be selected by the Owner.

3. Utility markers and locator stations shall have a 3-inch-wide by 13-inch-long label readable from 100 feet. Label color shall be selected by the Owner. The wording of the label shall be as specified in Part 4.

4. A polypropylene identification tape marked “buried sewer” shall be installed 24 inches above all water mains installed by open-cut methods. The tape shall be blue.

2.04 RESERVED

2.05 SOURCES QUALITY CONTROL

A. Pipe Manufacturer’s Certification:

1. The pipe manufacturer’s certificate shall state that the materials have been sampled and tested in accordance with the provision for and meet the requirements of the designated specification and shall be signed by an authorized agent of the seller or the manufacturer.

2. A test results report shall accompany the manufacturer’s certificate, if requested by the Engineer. The report shall compare test results to Specification requirements.

PART 3 EXECUTION

3.01 COORDINATION

A. Construction in Highway Properties

1. Construction in highway properties shall conform to the requirements of Section 02200.

3.02 PREPARATION OF TRENCH

A. Trench excavation shall conform to requirements of Section 02200.

B. Unless otherwise specified or called for on the Drawings, the width of trench at the top of pipe 24 inches in diameter or less shall not exceed the outside diameter of the pipe or encasement, plus 9 inches on each side of the pipe measured to the face of the trench or to the back of the sheeting when used. For pipe having a diameter greater than 24 inches, the width of trenches at the top of the pipe shall not exceed the outside diameter of the pipe or encasement, plus 15 inches on each side of the pipe measured as specified above.

C. Unless otherwise directed or called for on the Drawings, all sewer trenches shall be excavated below the proposed pipe invert as required to accommodate the depths of pipe bedding material as scheduled on the Drawings.

3.03 PIPE INSTALLATION

A. All pipe fittings and specials shall be laid in accordance with the manufacturer's instructions, with AWWA C600, and as supplemented herein.

B. Precautions shall be taken during construction to protect the pipe interiors, fittings, and valves against contamination. Pipe interiors shall be thoroughly cleaned of dirt and foreign matter before laying, by brushing, swabbing or other method approved by the Engineer, and means shall be provided to prevent entry of dirt during the progress of installation. Groundwater shall be kept out of the pipe at all times.

C. Bedding and Backfilling:

1. Bedding and backfilling shall be in conformance with Section 02200.

2. At joints, enough depth and width shall be provided to permit working entirely around the pipe as needed to make the joints in the proper manner.

D. Handling and Cutting:

1. Suitable tools and appliances for cutting, handling, and laying of the pipes and special castings shall be used and care shall be taken to prevent damage to pipe coatings.

2. Where new or existing pipe requires cutting in the field it shall be done in a manner to leave a smooth end at right angles to the pipe centerline. The finished cut must be approved by the Engineer.

E. Pipe Laying:

1. Pipe and appurtenances shall be installed true to line, grade, and location; with joints centered, spigots home; pipe properly supported and restrained against movement; and all valve stems plumb.

2. All elbows, tees, plugs, etc., shall be properly anchored, blocked, or otherwise restrained to prevent movement of the pipe in the joints due to internal or external pressure.

3. The open ends of all pipes and special castings shall be plugged or otherwise closed with a watertight plug to the approval of the Engineer before leaving the Work for the night, and at other times of interruption of the Work. All pipe ends which are to be permanently closed shall be plugged or capped and restrained against internal pressure.

F. Pipe Jointing:

1. Gaskets - Just prior to joining the pipes, the surfaces of the joint rings shall be wiped clean and the joint rings and rubber gaskets shall be liberally lubricated with an approved type of vegetable oil soap. The spigot end, with the gasket placed in the groove, shall be entered into the bell of the pipe already laid, making sure that both pipes are properly aligned. Before the joint is fully "home," the position of the gasket in the joint shall be determined by means of a suitable feeler gauge supplied by the pipe manufacturer. If the gasket is found not to be in proper position, the pipes shall be separated and the damaged gasket replaced. The pipe is then forced "home" firmly and fully. In its final position, the joint between the pipes shall not be deflected more than 1/2 inch at any point.

G. Anchoring Pipe:

1. Disjointing hydrostatic pressure at bends, plugs, tees, and wyes shall be counteracted by thrust blocks, restrained joints, or reinforced concrete anchorage as directed on the Drawings or specified.

2. Thrust blocks shall be installed only where directed or specifically called for on the Drawings, unless otherwise specified. Installation shall be in conformance with Drawings.

3. Approved joint restraints shall be installed in locations shown or scheduled on the Drawings.

4. Reinforced concrete joint anchorage shall be installed in conformance with the Drawings.

3.04 PIPE PROTECTION

A. Detectable marking tape shall be installed in the trench of each non-metallic pipe. The tape shall be installed directly above the force main at the depth recommended by the manufacturer. The tape shall extend the full length of the force main, and shall be

imprinted with a continuous warning message repeated at least every 36 inches. The warning message shall state that a sewer line is buried below. The tape shall consist of one layer of aluminum foil laminated between two layers of inert plastic film. The lamination bond shall be strong enough that the layers cannot be separated by hand. The tape shall be inductively located and conductively traceable using a standard pipe and cable locating device.

B. Utility markers and locator stations shall be installed with 42 inches to 48 inches above ground.

3.05 FIELD INSPECTION

A. All pipe sections, specials, and jointing materials shall be carefully examined for defects and no piece shall be laid that is known to be defective. Any defective piece discovered installed shall be removed and replaced with a sound one in a manner satisfactory to the Engineer at the Contractor's expense.

B. Defective material shall be marked with lumber crayon and removed from the job site before the end of the following day.

3.06 PRESSURE AND LEAKAGE TESTS

A. The Contractor shall furnish the pump, pipe connections, taps, gauges, auxiliary water container, bulkheads, plugs, and other necessary equipment and make pressure and leakage tests of all lines unless otherwise directed by the Engineer.

B. Tests shall be conducted on all pipelines or valved sections thereof as directed by the Engineer. Testing of pipelines laid in embankments or bedded in concrete shall be done prior to backfilling or placing concrete cover unless otherwise permitted by the Engineer. Tests on lines anchored or blocked by concrete shall not be conducted until the concrete has taken permanent set. A maximum of 1,000 feet of pipe may be included in a test section. All valves shall be tested for leakage.

C. The line or section thereof to be tested shall be filled slowly with water to expel all air. Hydrostatic pressure shall be applied by pumping water from an auxiliary supply. The test pressure shall be maintained two hours minimum and additional time as required for thorough inspection to find any leaks or defects in the force main and appurtenances. The test pressure shall be 100 pounds per square-inch. Should the pipe section fail to pass the tests, the Contractor shall find and correct failures and repeat the tests until satisfactory results are obtained.

D. Leakage tests shall be made simultaneously with or following completion of pressure tests of all lines or valved sections thereof. Leakage is defined as the quantity of water added to the pipe under test to maintain the required test pressure for a specified time.

E. Pressure testing shall be performed in accordance with AWWA C600 and C605.

3.07 RESERVED

PART 4 SPECIAL PROVISIONS

4.01 UTILITY MARKERS/LOCATORS

A. Utility Markers or Location Station shall be installed along pipeline at all bends and valves.

B. Utility Markers and Locator Stations labels shall have the following wording on the labels. “SANITARY“

4.02 PIPING SCHEDULE

A. The following letter designations are used in the Piping Schedule:

Material Designation:

DIP - Ductile Iron Pipe
PVC - Polyvinyl Chloride

B. Schedule:

Service	Size	Pressure Class Thickness Class	Material	Remarks
Force Main	8” - 12”	PC235	PVC C-909	Open-Cut Construction
Force Main	12”	DR-18	PVC C-900	Horizontal Directional Drilling, See Specification Section 02790, 2.02
Force Main	20”	DR-18	PVC C-905	Open Cut Construction

C. Schedules are not guaranteed to be complete. All piping shown on the Drawings or specified shall be furnished and installed by the Contractor whether or not listed in the above schedule.

D. This section applies to buried pipe only. See Section 15210 for flanged pipe inside structures.

E. See Section 02790 for pipe material requirements for pressure pipe installed by trenchless methods.

4.03 PERMANENT AND TEMPORARY BLOWOFFS/TAPS

A. The Contractor shall provide all blowoffs and taps as necessary to properly exhaust air from test sections, flush and disinfect the new pressure pipe system.

4.04 PRESSURE PIPE ELEVATIONS

A. Elevations shown on the plans shall be checked as specified in this Section.

B. Any deviation in the pipe elevations shall be brought to the Engineer's attention to permit the Engineer to evaluate the impact upon air release mechanism placements.

END OF SECTION

SECTION 02557
VALVES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing valves, valve boxes, floor boxes, extension stems, and appurtenances as specified, shown on the drawing.

B. Valves in hydrant assemblies are included in this Item.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:
2. Drawings for Review:
   a. Manufacturer's assembly drawings and parts list including model number and materials of construction.
3. Information for the Record:
   a. A certificate of compliance with AWWA C509, or AWWA C504 shall be submitted, if required by the Engineer.
   b. Certification of NSF approval.

PART 2 PRODUCTS

2.01 GATE VALVES

A. Gate valves shall be cast iron body, bronze mounted, AWWA C509 or C-515 resilient seat, nonrising stem type with mechanical joint ends. Gate valves shall be Mueller A-2361, Mueller A-2362, Kennedy C-509 or C-515.

B. Valves shall be furnished with an O-ring seal incorporating two rubber O-ring seals.

C. Valves shall be designed for 150 psi working pressure and shall be shop tested at 300 psi pressure, with the pressure held on the valve for at least one minute.

D. Unless specified otherwise, valves shall be designed to open as specified with an arrow indicating the direction for opening. Wrench nuts shall be 2-inch square.

E. Iron parts shall be painted before leaving the shop with two coats of acceptable epoxy paint.

F. Bolts and nuts on buried valves shall be a low alloy steel cathodic to the valve body and having a minimum yield strength of 45,000 psi. All other nuts and bolts shall be low

carbon steel conforming with the mechanical and chemical requirements of ASTM A307, Grade B.

2.02 PLUG VALVES

A. Plug Valves shall close tight for pressures up to 100-psi to stop flow in the piping system.

B. Valve Bodies and covers shall be Cast Iron ASTM A126 Class B or ASTM A536 Grade 65-45-12. Ports shall be rectangular and 100% Port. The valve port area shall meet or exceed standard pipe area per ASME/ANSI B36. 10M. Round ports are not acceptable.

1. Bearings shall be sleeve type and made of sintered, oil impregnated permanently lubricated type 316 stainless steel for sizes 4-18”
2. Bearings shall be ASTM A473 Grade CF8M for sizes 20-36”.
3. In valves larger than 36”, the upper and lower plug journals shall be fitted with ASTM A 240 type 316 stainless sleeves with body bearings of ASTM B30, Alloy C95400 aluminum bronze.

C. Plugs shall be solid one piece, Cast Iron ASTM A126 Class B or Ductile Iron ASTM A536 Grad 65-45-12. The plug shall have a cylindrical seating surface eccentrically offset from the center of the shaft. Plug shall not contact the seat until at least 90% closed. Resilient plug facing shall be Chloroprene (CR). Spherical shaped plugs are not acceptable.

D. Seats shall be 1/8” thick welded overlay of not less than 95% pure nickel. Seat shall be at least ½” wide, 1/8” thick through entire width and raised. The raised surface shall be completely covered with nickel to ensure that the resilient plug face contacts only the nickel seat.

E. Adjustable packing shall be Acrylonitrile-Butadiene (NBR) multiple V-ring type with a packing gland follower. Packing gland shall permit inspection, adjustment, or complete replacement of packing without disturbing any part of the valve or actuator assembly, expect the gland follower. Non-adjustable packing or packing requiring actuator removal to replace the packing, is not acceptable. Both the packing and bearings in the upper and lower journals shall be protected by Buna-N shaft seals located on the valve shaft to minimize the entrance of grit into the bearing journal and shaft seal areas.

F. Pressure ratings shall be 175 psi on valve sizes through 12” and 150 psi for 14” and larger. Every valve shall be given a certified hydrostatic shell test and seat test, with test reports being available upon request.

G. All valves larger than 6” shall be installed with worm gear actuators. All gearing shall be enclosed in a cast iron housing, with outboard seals to protect the bearings and other internal components. The actuator shaft and gear quadrant shall be supported on permanently lubricated bronze bearings.

H. Buried actuators shall be 90% grease filled. Input shaft and fasteners shall be stainless steel. Actuator mounting brackets shall be totally enclosed. Actuators shall be provided in accordance with the drawings and the schedule included in this section.

I. End connections shall meet or exceed the latest revisions of AWWA C517 and other applicable standards. End Connections shall be flanged drilled per ASME B16.1 per AWWA C111.

J. Valves shall be clearly marked with the seat end.

K. All valve bolts shall be 316 stainless steel.

L. Plug valves in wastewater applications shall be mounted with the plug in the horizontal position to prevent the accumulation of debris in the bottom of the valve.

M. Plug Valves shall be Dezurick PEF Full Port eccentric plug valves, Val-Matic 100% Port Plug Valve or approved equal.

2.03 RESERVED

2.04 RESERVED

2.05 RESERVED

2.06 RESERVED

2.07 ACCESSORIES

A. Valve Boxes:

1. All buried valves shall be provided with valve boxes. Valve boxes shall be standard, three-piece screw type, cast iron adjustable boxes, with tops of boxes set flush to finished grade. Valve boxes shall not be less than 5 inches in diameter and shall have a minimum thickness at any point of 3/16 inch. The cover shall have cast thereon an appropriate name for the kind of service for which the valve is used.

2. A valve box shall be provided for each curb stop. At least three keys shall be furnished to operate curb stops.

3. All parts of valve boxes, bases, and covers shall be coated by dipping in bituminous varnish.

4. Extension stems shall be provided for buried valves when the operating nut is more than 5 feet below finished grade. Extension stem shall extend operating nut to within 16 inches of the ground surface, shall be provided with spacers which will center the stem in the valve box, and shall be equipped with a 2-inch square wrench nut. Extension stems shall meet the requirements of this Section.

B. Extension Stems and Stem Guides:

1. Unless otherwise specified, each extension stem shall be made of cold-rolled steel material and the same size as the valve stem of the valve it operates. Stem guides shall be made of cast iron and fully adjustable. The guide block shall be

bronze brushed where it contacts the extension stem. Stem guides shall be as manufactured by the Eddy Valve Co., Rodney Hunt, or equal.

2. All valves which are to be operated by tee-wrench shall have 2-inch square operating nut at the top of the extension stem.

3. Stems for operation of plug valves shall not be less than 1-1/4-inch diameter Schedule 80 galvanized steel pipe with intermediate steady guides. Weld socket for 2-inch valve nuts to bottom of extension stems and pin sockets to nuts with stainless steel plated 3/8-inch bolts. Provide a permanent lever or a 2-inch square operating nut at top of stems, in accordance with requirements of Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Gate Valves:

1. Valves shall be installed in their respective positions, free from distortion and stress. Connecting joints shall be as specified in Section 02555.

B. Accessories:

1. Valve Boxes shall be installed in a plumb position and in alignment with the operating nut.

2. Extensions stems and stem guides shall be in alignment with operating nut and prevent binding and stresses on connecting pins.

3. When there is a change to the grade elevation, valve boxes new and existing shall be adjusted to the new grade elevation.

PART 4 SPECIAL PROVISIONS

4.01 VALVES IN STRUCTURES

A. This section applies to buried valves specified with Mechanical Joint connections.

B. See Schedule in Section 15250 for valves installed inside structures.

4.02 EXTENSION STEMS

A. Extension stems shall be provided for all valves located more than 5-feet below final grade.

4.03 VALVE OPENING DIRECTION

A. Valves shall open in accordance with the District’s Specifications.

B. The Contractor shall note that not all valves required for this work open in the same direction. District’s Specifications shall be consulted.

4.04 TAPPING SLEEVES AND VALVES

A. Tapping valves shall be Mueller T-2361, T-2362 or approved equal.

B. Tapping sleeves shall be Mueller H-304 stainless steel tapping sleeve with test plug or approved equal.

END OF SECTION

SECTION 02600
PAVEMENTS, CURBING AND WALKS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the construction of sidewalks, curbing pavements, and berms of various designated types as shown or scheduled on the Drawings, specified or directed.

B. This Section includes preparation of the base and subgrade construction of walks, curbs, pavements and base courses, adjustment of manhole castings, and valve boxes to conform to new pavement courses, and other work and materials incidental to the construction of pavements, curbing and walks.

C. Existing curbs and walks of stone or concrete shall be replaced using concrete.

D. This Section includes temporary and restoration of permanent pavement markings as they exist at the time of bidding unless otherwise shown on the Drawings, specified or directed.

1.02 OWNER'S STANDARDS AND SPECIFICATIONS

A. Sidewalks, curbs, driveways, parking areas, and street pavement and berms disturbed by construction shall be restored in accordance with the Owner's present standards and specifications.

1.03 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturers' and suppliers' material certificates.

   b. A sieve analysis (ASTM C136) shall be furnished for each material source.

2. Information for the Record:

   a. Delivery tickets from the asphalt and aggregate suppliers shall be given to the inspector at the unloading site. Tickets shall include (as a minimum) name of source, date, type of material, and weight.

   b. Test results and certificates.

PART 2 PRODUCTS

2.01 AGGREGATE BASE AND SURFACE COURES

A. The aggregate shall meet the requirements of ODOT Item 304 and Item 411, respectively.

2.02 RESERVED

2.03 TACK COAT

A. The tack coat shall meet the requirements of ODOT Item 407.

B. The tack coat material shall be RS-1 or SS-1, SH-1h, or CSS-1h, and shall meet the requirements of ODOT Item 702.04.

2.04 RESERVED

2.05 ASPHALT CONCRETE BASE, INTERMEDIATE AND SURFACE COURSES

A. Bituminous Material - The asphalt cement shall meet the specified performance grade (design temperature) and shall meet the requirements of ODOT Item 702.01.

B. Aggregate - The aggregate shall meet the requirements of ODOT Items 301.02 and 703.04 for asphalt concrete base and ODOT Item 703.05 for asphalt concrete.

C. Design Mixes

1. Bituminous aggregate base mix shall meet the requirements of ODOT Item 301.
2. Asphalt concrete mix for intermediate course shall meet the requirements of ODOT Item 441.
3. Asphalt concrete mix for surface course and overlays shall meet the requirements of ODOT Item 441.

2.06 CONCRETE (CAST-IN-PLACE)

A. All concrete used for pavement, curbing driveways and sidewalk shall be as specified in ODOT Item 499 and 452.

B. Reinforcing steel and dowel bars shall be as specified in ODOT Items 709.09, 709.10, 709.12, and 709.13

C. Other materials required for placing concrete shall be as follows:

1. Rubber-Asphalt Joint Sealer:
   a. Hot Applied Sealer - ODOT Item 705.04.
2. Preformed Elastic Joint Sealer - ODOT Item 705.11.

3. Preformed Filler - ODOT Item 705.03:
   a. Fiber Filler - ASTM D1751 (AASHTO M213).
   b. Sponge Filler - ASTM D1752, Type I (AASHTO M153, Type I.
4. Curing Materials:
   a. Burlap Cloth - ODOT Item 705.5 (AASHTO M182, Class 2).
   b. Sheet Materials - ODOT Item 705.06.
   c. Transparent Membrane - ODOT Item 705.07 (ASTM C309 Type I Class B).
   d. White Membrane - ASTM C309 Type II Class B as modified by ODOT Item 705.07.

2.07 PAVEMENT MARKING

A. Contractor shall provide temporary and permanent pavement markings equal to those markings that existed on the paved surfaces prior to commencement of the Work unless otherwise shown on the Drawings, specified in Part 4, or directed.

B. Pavement markings shall be in accordance with the requirements of ODOT Section 640.

C. Pavement markings shall match existing or adjoining pavement markings.

D. Pavement markings partially disturbed by construction shall be replaced entirely.

PART 3 EXECUTION

3.01 COORDINATION

A. All soil subgrade under pavements, driveways, curbs, curb and gutter, and walks shall be compacted in accordance with Section 02200.

B. All service boxes, manholes, inlets and other structures shall be adjusted or reconstructed to the required grades in both new and resurfacing pavement areas.

3.02 PAVEMENT INSTALLATION

A. All construction shall be in conformance with applicable portions of ODOT Specifications, except as otherwise specified or called for herein.

B. Unless otherwise directed by Engineer all aggregate bases which are to receive bituminous courses shall be primed as specified.

C. A tack coat at a rate as specified shall be applied to all existing pavements which are to be overlaid, and between subsequent courses when directed by the Engineer.

3.03 TRANSITION JOINTS FOR BITUMINOUS CONCRETE PAVEMENT OVERLAY

A. Types of Transition Joints:

1. Transition joints shall be either butt type or feathered type as directed by the Engineer.
2. Butt joints shall be used on State and Federal roads and main thoroughfares and feathered joints used elsewhere unless otherwise specified.
3. Butt Joints:
    a. When a butt joint is called for on the Drawings or specified, the old surface shall be cut back for at least 3 feet to a depth of at least 1 inch for the full width of the joint and pavement installed.
    b. A bituminous seal shall be placed on the finished surface at the junction of the new and old pavements.
4. Feathered Joint:
    a. Feathered joints shall be constructed by manually raking the paving material to a smooth transition from the full depth material to the existing pavement surface.
    b. Existing pavement surface shall be bond-coated to include the transition area.
    c. Feathering shall be done by a workman skilled in the operation and shall be approved by the Resident Project Representative.

3.04 CURBING

A. Curbing shall be constructed in conformance with applicable portions of ODOT Item 609 and the ODOT Standard Construction Drawings.

B. Place 1-inch dowelled expansion joints at inlets and at spring lines of street and driveway returns. If intersecting streets and driveways are more than 300-feet apart, place expansion joints at 300-feet intervals.

C. Contraction joints shall be placed at approximately 10-feet intervals.

3.05 CONCRETE SIDEWALK

A. Sidewalk shall be constructed in conformance with applicable portions of ODOT Item 608.

B. Unless otherwise indicated on the Drawings, concrete sidewalks shall be a minimum of 4-feet-0-inch wide and 4-inch thickness of concrete. Concrete walk removed and replaced shall be equal to the section removed.

C. The surface of the walks shall be divided into equally spaced blocks at approximately 5-feet intervals. Expansion joint filler 1/2-inch thick shall be installed between the walk and any fixed structure, at all changes in direction or shape and at intervals of 20-feet maximum. The expansion joint filler shall be 1-inch thick where the walk is installed

against the back of curb. The filler shall be recessed 1/2-inch from top of finished surface.

D. Surface of new sidewalks shall be broomed to slightly roughen surface. On sections of sidewalk to be replaced, the surface texture shall match the adjoining.

3.06 CONCRETE DRIVEWAYS

A. Concrete driveways shall be constructed in conformance with applicable portions of ODOT Item 452.

B. Dowelled contraction joints shall be placed at a maximum spacing of 20-feet. Lesser spacing shall be used on irregular areas as directed by the Engineer.

C. Expansion joint filler 1/2-inch thick shall be installed at intervals of 24-feet maximum. One-inch expansion joint filler shall be installed between the driveway and any fixed structure.

3.07 BITUMINOUS AND AGGREGATE DRIVEWAYS

A. Bituminous driveways and parking lots shall be constructed as shown on the Drawings and indicated in Part 4 using materials specified for asphalt concrete pavements. Placement shall be in accordance with ODOT Item 401.

B. Aggregate driveways and parking lots shall be constructed as shown on the Drawings using base aggregate meeting the requirements of ODOT Item 411.

C. Replacement of bituminous or aggregate driveways and parking lots shall conform to Section 01565 and this Section but in no case, be inferior to that being replaced.

3.08 RESERVED

3.09 INSPECTION

A. Laboratory services shall be in accordance with the requirements of Section 01410 and shall include:

1. A compaction test on the subgrade, aggregate base, and each layer of asphalt shall be performed for every 300 square yards of material placed.

2. Asphalt Concrete:

   a. Quality Control Testing - A sample of the mix shall be taken for each 200-cubic yard of bituminous material or fraction thereof delivered to the project. An extraction test AASHTO T164-70 and a mechanical analysis AASHTO T30-70 shall be performed on the mix samples.

3. Cast-in-Place Concrete:

   a. The following tests shall be performed by an independent testing laboratory acceptable to the Engineer during progress of the work:

1) Compression Tests Cylinders – Strength test shall consist of three cylinders molded and cured. Cast three cylinders for each 50 cubic yards, or fraction thereof, for each class of concrete placed on any one day, but at least three for each day. Test one cylinder at seven days and two at 28 days in accordance with ASTM C39.

2) Slump Tests – ASTM C143. Slump shall be measured for first batch of each concrete class delivered in morning and afternoon, for each strength tests, and whenever consistency of concrete appears to vary.

3) Air Entrainment – ASTM C173 or C231. Perform one test for every second ready mix truck load.

4) Temperature – ASTM C1064. Perform with each slump test.

3.10 PROTECTION

A. No heavy construction vehicle shall operate on any pavement, curbing or walk after it has been installed.

B. Traffic shall be prohibited on newly installed asphalt pavement until it has cooled sufficiently to avoid marking.

C. Asphalt Pavements:

1. Bituminous mixtures shall be transported and placed in accordance with ODOT Item 401

D. Concrete Pavements, Curbing and Walks:

1. Concrete shall be mixed, transported, placed, and finished in accordance with the temperature and environmental requirements of ODOT Item 451 or 452 depending on the pavement type being placed.

2. No concrete shall be mixed, transported, placed, or finished when the temperature of the base, subgrade, or air is below 40 degrees F or whenever, in the opinion of the Engineer, the temperature may fall below 40 degrees F within 24 hours after the concrete has been placed.

3. The Contractor shall take such precautions as are necessary to protect the concrete from rain.

4. The Contractor shall protect the concrete from freezing for no less than seven days or until such time that specimen beams have attained a modulus of rupture of at least 600 psi.

PART 4 SPECIAL PROVISIONS

4.01 PROOF ROLLING OF NEW PAVEMENT AREAS

A. Prior to the completion of roadway excavation down to the bottom of the subgrade material, the Contractor shall proof roll the subgrade to identify areas of weak subgrade materials. Proof rolling shall be performed in accordance with ODOT Item 204 unless an alternate method is approved by the Engineer.

B. The presence of weak subgrade locations shall be marked by the Engineer. The Engineer may require additional excavation of the weak soils or the installation of a subgrade support material.

C. Compensation for the additional excavation and backfill shall be measured and paid in accordance with the provided bid items.

4.02 SUBGRADE SUPPORT MATERIAL

A. Subgrade support material shall be Tensar TriAx TX130S or approved equal. Equal materials shall meet the requirements of ODOT CMS 712.15.

B. The subgrade support material shall be placed on the prepared subgrade surface in accordance with the manufacturer's recommendations.

4.03 NON-REINFORCED PORTLAND CEMENT CONCRETE PAVEMENT

A. All non-reinforced concrete pavement or base material required shall be installed to match the thickness of the adjacent concrete pavement meeting the minimum thickness requirements as specified and shown on the Contract Documents.

B. All concrete pavement base shall be Class MS moderate set course.

END OF SECTION

SECTION 02790
HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing pipelines by directional drilling of the sizes, types and lengths as shown on the Drawings, specified, or directed.

B. Pipelines constructed under this Section shall include but are not limited to sewer force mains, water mains, pressurized sanitary sewers, gravity sewer mains, and gravity house leads.

1. This Section shall include furnishing all labor, components, materials, tools and appurtenances necessary or proper to install, locate, and test pipeline.

C. Horizontal directional drilling is a method of trenchless construction using a surface launched steerable drill tool controlled from a mobile drilling frame, and includes a field power unit, drilling fluid mixing system, and mobile spoils extraction system.

1. The Work generally consists of three phases, beginning with drilling a pilot hole from the surface or pit at a starting point to an exit pit at the surface beyond the obstacle or area that is to be avoided. The second phase consists of reaming the pilot hole to make it large enough for the pipeline to be installed. Finally, the pipeline is pulled into place. During the pipe pulling operation, drilling fluid (a bentonite, water, and polymer solution) is injected to stabilize the hole, remove cuttings, and lubricate the pipe.

1.02 QUALIFICATIONS

A. Directional drilling Contractors or subcontractors shall have actively engaged in the installation of pipe using directional drilling for a minimum of five years.

B. Field supervisory personnel employed by the directional drilling Contractor or subcontractor shall have at least three years experience in the performance of the Work and tasks required.

C. Contractor shall provide a list of jobs with contact names and phone numbers where he has performed directional drilling operations during the last five years. A similar list of jobs shall be provided for the field supervisor personnel.

1.03 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Manufacturer's Shop Drawing indicating physical dimensions, joint details, fittings, and special details for each size, type, and class of pipe

furnished for the project. Shop Drawings shall also note salient features of a specific pipe, i.e., concrete strength and reinforcing details.

b. Samples, if requested by the Engineer.

c. Contractor shall submit the Work plans for all segments of drilling including but not limited to the launch and recovery location and requirements, and the drill path survey.

d. The Contractor shall submit to the Engineer for review and comment, and compliance with permit requirements prior to commencing any Work, a detailed statement of the drilling equipment, with a pulling gauge monitor, and tracking transmitter/devices selected and procedures to be used in performance of the Work. A drilling fluid disposal plan shall also be submitted.

1) During the construction, a data sheet or drilling log for each pilot hole shall be prepared to document the location and depth of the drill head in relation to the found elevation and centerline of the drilling path at a minimum of 10-foot intervals. Locating and guidance can be completed by hand wire tracing or by wireless steering tool system.

2. Information for the Record:

a. Manufacturer's certification indicating that the pipe and joints meet Specifications for each production run for each size, type, and class of pipe furnished. The Engineer may request test results to verify certification.

PART 2 PRODUCTS

2.01 RESERVED

2.02 PVC PIPE (C900/RJ)

A. PVC pipe for horizontal directional drill installation method shall have restrained joints and meet AWWA C900, SDR-18 test requirements.

B. PVC pipe joints shall be restrained by non-metallic couplings. The pipe ends and coupling shall be grooved; restraint shall be provided by a nylon spline inserted in the grooves between the pipe and coupling. The pipe joint shall be made watertight by a flexible elastomeric seal (O-ring) in compression between the pipe and the coupling.

C. The pipe shall be Certa-Lok C900/RJ by Certainteed or equal.

2.03 RESERVED

2.04 SOURCE QUALITY CONTROL

A. Pipe Manufacturer's Certification:

1. The pipe manufacturer's certificate shall state that the materials have been sampled and tested in accordance with the provision for and meet the requirements of the designated specification and shall be signed by an authorized agent of the seller or the manufacturer.
2. A test results report shall accompany the manufacturer's certificate, if requested by the Engineer. The report shall compare test results to Specification requirements.

2.05 RESERVED

2.06 RESERVED

2.07 TRACER WIRE

A. Direct Burial #12 AWG Solids (0.0808-inch diameter), 21% conductivity copper-clad annealed high carbon steel high strength tracer wire, 1150-pound average tensile break load, 45 mil, high molecular weight, high density polyethylene jacket complying with ASTM D1248, 30-volt rating. Soloshot™ extra high strength No. 1245 as manufactured by Copperhead Industries, LLC, or equal. Wire shall be secured to the pipe with tape at intervals not to exceed 10 feet.

1. Tracer wire installed on pipe by horizontal directional drilling shall be continuous without any splices.
2. Heat shrink splices are permissible only on tracer wire at connection pipe.

B. Tracer wires shall terminate inside all structures including but not limited to, air relief structures, valve box assemblies, indicated on plans. Tracer wire shall extend 4-feet above the opening on structures.

PART 3 EXECUTION

3.01 COORDINATION

A. Drilling operations shall not interfere with, interrupt or endanger surface features or surface activities.

B. When rock stratum, boulders, underground obstructions, or other soil conditions that impede the progress of drilling operations are encountered, the Contractor and Engineer shall review the situation and jointly determine the feasibility of continuing drilling operations, making adjustments or switching to an alternative construction method.

C. The Contractor shall familiarize himself with the geologic characterization of the soil stratum at the proposed drilling path. Contractor shall be responsible for informing the Engineer of any changes that are required in the directional drilling procedure due to geologic conditions.

D. If any obstruction is encountered that stops the forward progress of the drilling operation or the pullback process, the Contractor and Engineer shall review the

situation and jointly determine the feasibility of continuing drilling operations, making adjustments or switching to an alternative construction method.

E. Launching and recovery pits shall be as small as practicable. Dewatering of pits and excavations shall be done in accordance with the General Provisions and Specifications Section 02200. When water is encountered, the Contractor shall provide a dewatering system of sufficient capacity to keep any excavation free of water until the backfill operation is in progress. Dewatering shall be performed in a manner that removal of soil particles are held to a minimum. Water from the dewatering system shall be desilted before discharge. Methods of dewatering and desilting, including all costs shall be the Contractor's responsibility.

F. Utilities shown on the contract Drawings are approximate. In areas where there is potential conflict, the Contractor shall dig up and verify the location and elevation of the utility at no additional expense to the Owner. The Contractor shall assume full responsibility for the protection of all utilities, structures and their foundations which may be affected by the Work.

G. Prior to any alterations to Work site, the Contractor shall photograph or videotape the entire Work area, including entry and exit points. One copy of which shall be given to Engineer and one copy to remain with Contractor for a period of one year following the completion of the project. The Work site, as indicated on Drawings, within right-of-way or easements, shall be graded or filled to provide a level working area. No alterations beyond what is required for the Work are to be made. Contractor shall confine all activities to designated Work areas.

H. Before beginning the drilling operation, the field survey and drill log shall be completed as specified in Section 01800.

3.02 DRILL PATH SURVEY

A. Drilling path shall be walked in the presence of the Engineer, and Contractor with the guidance system that shall be used for each segment of drill path. The Contractor shall locate and record any surface and subsurface magnetic variations or abnormalities and all points of interference, as well as verifying all utility(ies) location and corresponding utility maps. Should any discrepancy arise between utility maps, field locations, and guidance system findings the Contractor shall clarify all discrepancies prior to beginning drilling operations. The drill path survey shall be performed no earlier than two days prior to commencing drilling operations. Provide Engineer 48-hour notice of drill path survey.

3.03 EQUIPMENT

A. Equipment:

1. The drilling equipment shall be capable of placing the pipe within the planned line and grade without inverted slopes.

2. The drilling equipment shall be capable of pulling product pipe from either the downstream or upstream manhole location. The equipment must be adequately sized for the application.

3. The guide system shall have the capability of measuring inclination, roll and azimuth. The guidance system shall have an independent means to ensure the accuracy of the installation. The Contractor shall demonstrate a viable method to eliminate accumulated error due to the inclinometer (pitch or accelerometer). The guidance system shall be capable of generating a plot of the borehole survey for the purpose of a record drawing. The guidance system shall meet the following specifications.

Inclination:	Accuracy	+ 0.05
	Range	+ 90
	Repeatability	+ 0.02
Roll:	Accuracy	+ 0.05
	Range	+ 90
Azimuth:	Accuracy	+ 0.05
	Range	+ 90

4. Equipment set-up requirements at the launch and recover locations shall be determined by the Contractor in accordance with the Contract Drawings and submitted to the Engineer per the requirements of Specification Section 01300.

B. Pilot Hole Drilling:

1. The entry angle of the pilot hole and the drilling process shall maintain a curvature that does not exceed the allowable bending radii of the product pipe. Unless the Contractor can demonstrate this, the minimum radius shall be 95% of the pipe minimum bend radius.

2. Alignment, Adjustments, and Restarts.

C. The Contractor shall follow the pipeline alignment as shown on the Drawings, within the specification requirements. The location and depth of the drill head in relation to the profile and centerline of the alignment shall be determined at a maximum of 10-foot intervals. Acceptable tolerance shall be 0.5 feet variation from the centerline of the pipe in both vertical and horizontal directions (1-foot window).

D. In the event of difficulties at any time during drilling operations requiring the complete withdrawal from the tunnel, the Contractor shall either be allowed to withdraw and abandon the tunnel and begin a second attempt at a different location; or excavate at the point of the difficulty and install the product pipe by an alternate method of installation. Either alternative shall be approved by the Engineer before the Contractor withdraws.

E. Access pits shall be at the beginning and end of the segments shown on the Drawings. Intermittent pits shall be approved by the Engineer prior to proceeding with drilling operations. No intermittent access pits shall be allowed in wetland areas.

F. Installing Product Pipe:

1. After the pilot hole is completed, the Contractor shall install a swivel to the reamer and commence pullback operations.
2. Reaming diameter shall not exceed 1.5 times the diameter of the product pipe being installed.
3. The product pipe being pulled into the tunnel shall be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation.
4. Tracer wire shall be attached to product pipe before pullback operations begin.
5. Pullback forces shall not exceed the allowable forces for the product pipe.

G. The Contractor shall allow sufficient lengths of product pipe to extend past the termination point to allow connections to adjacent pipe sections, manholes, or tees. Pulled pipe shall be allowed 24 hours of stabilization prior to making tie-ins. The length of extra product pipe shall be at the Contractor's discretion.

3.04 RESERVED

3.05 RESERVED

3.06 FIELD INSPECTION

A. All pipe sections, specials, and jointing materials shall be carefully examined for defects and no piece shall be laid that is known to be defective. Any defective piece discovered installed shall be removed and replaced with a sound one in a manner satisfactory to the Resident Project Representative at the Contractor's expense.

B. Defective material shall be marked with lumber crayon and removed from the job site before the end of the following day.

3.07 PRESSURE AND LEAKAGE TESTS FOR FORCE MAINS AND WATER LINES

A. Pressure and leakage testing shall be in conformance with Section 02555.

B. Contractor shall perform a hydrostatic test of pipe to be installed by horizontal directional drill prior to commencing pull back operation.

PART 4 SPECIAL PROVISIONS

4.01 PIPE SCHEDULE

Service	Size	Thickness Class	Material	Section	Comments
Force Main	12"	DR-18	PVC	2.02	

4.02 BORE AND RECEIVING PITS

A. The locations and dimensions of bore and receiving pits shown on the Drawings are recommendations. The locations and dimensions may be changed by the Contractor to accommodate the Contractors equipment and methods.

B. Modification of the location and dimensions of bore and receiving pit shall be permitted to the extent that the horizontal centerline alignment of the proposed pipeline is not changed.

4.03 FRAC-OUT CONTINGENCY PLAN

A. The Contractor shall provide a contingency plan to address the "frac-out" of any directional drilling fluids during the horizontal directional drilling operation.

B. The contingency plan shall address the following areas of concern:

1. Temporary Barriers installed at drilling entrance and exit point to contain drilling fluids.
2. List of materials available on site to control frac-out of drilling fluids including:
   a. Sand bags.
   b. Hand tools.
   c. Portable pumps and hoses.
   d. Straw bales.
   e. Silt fence.
   f. Spill kits.
   g. Backhoe or excavator.
3. In the event of a frac-out, the person discovering the release will notify the Contractor, Engineer and Owner. The Contractor shall coordinate notification of appropriate agencies and obtaining permission for clean-up operations.
4. Measures for monitoring for excessive fluid loss during drilling through terrestrial, wetland areas or streams.
5. Plans for addressing excessive fluid loss while drilling including:
   a. Measures to suspend forward progress of the drilling operations if excessive loss of bentonite circulation is observed.
   b. Measures to isolate areas where frac-out has occurred or to remove releases with a vacuum truck.
   c. Measures to restore affected areas to match conditions prior to commencing the Work.
6. If the frac-out occurs in a wetlands or stream area, Ohio EPA Northwest District Office shall be notified.

7. After containment has been achieved, the drilling contractor and the inspector will make every effort to determine why the frac-out occurred and develop corrective measures to minimize the chance of recurrence.

END OF SECTION

SECTION 02800
SODDING, SEEDING AND MULCHING

PART 1 GENERAL

1.01 SCOPE

A. This Section includes fine grading, placing sod, and seeding and mulching areas designated on the Drawings, specified, or ordered.

B. The Work consists of fine grading; furnishing and placing topsoil; sod seed, mulching material; and fertilizer; and watering seeded or sodded areas until growth is established.

C. The Contractor shall restore all grass areas damaged by his operations in construction of facilities included in the Contract.

D. Unless otherwise specified herein or directed, Work shall be in conformance with ODOT Item 659 Seeding and Mulching, and Item 660 Sodding.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturer's project information for materials.

2. Information for the Record:

   a. Submit to Resident Project Representative:

      1) Invoices showing the weight, brand, and composite analysis of all fertilizer used on the Project.

      2) Bag tickets showing weight and composition of all seed used on the Project.

PART 2 PRODUCTS

2.01 SOD

A. Sod shall conform to ODOT Item 660.02, unless otherwise specified in Part 4.

2.02 SEED

A. Seed mixtures shall be in conformance with the requirements of ODOT Item 659.07 and ODOT Item 659.09 Class 1, unless otherwise specified in Part 4.

2.03 FERTILIZER

A. Commercial fertilizers shall be from a dealer or manufacturer whose brands and grades are registered or licensed by the State of Ohio, Department of Agriculture. The content of nutrients shall be 12-12-12, unless otherwise approved by the Engineer.

2.04 MULCHING MATERIAL

A. Mulching material shall be straw, wood fiber, or compost reasonably free of weed seed, and other foreign materials. Mulch shall meet the requirements of ODOT Item 659.13, and either Item 659.14, 659.15, or 659.16.

2.05 MATTING MATERIAL

A. Matting material shall be in conformance with the requirements of ODOT Item 712.11 Type A or B.

2.06 TOPSOIL

A. Topsoil furnished by the Contractor shall be as specified in Section 02200.

PART 3 EXECUTION

3.01 FURNISHING AND PLACING TOPSOIL

A. Areas from which the top layer of soil has been removed or disturbed shall be recovered with a minimum of 4 inches of topsoil placed in conformance with ODOT Item 659.11.

3.02 PREPARATION

A. The operation of finish grading and sowing shall not be performed when the ground is frozen or muddy.

B. Areas to be Sodded:

1. Preparation of areas to be sodded shall be in conformance with ODOT Item 660.04.

C. Areas to be Seeded:

1. Unless otherwise shown on the Drawings or specified in Part 4, all areas of disturbed soils on the Site shall be seeded.
2. The area to be seeded shall be prepared in accordance with ODOT Item 659.
3. Fertilizer shall be applied at a standard dry application rate of 10 pounds per 1000 square feet. Either dry or liquid fertilizer may be used and shall be distributed in an even pattern over the specified area, then thoroughly disked, harrowed, or raked into the soil to a depth of not less than 1 inch.

3.03 INSTALLATION

A. Sodding:

1. Sod shall be placed in conformance with ODOT Items 660.05 and 660.06.

2. No sod shall be placed when the temperature is below 32 degrees F. No frozen sod shall be placed nor shall any sod be placed upon frozen soil. When sod is placed between the dates of June 1 and October 15, it shall be covered immediately with a straw mulch 1-inch thick, loose measurement.

B. Seeding:

1. The seed shall be mixed thoroughly and sown evenly at a rate specified in ODOT Item 659.09. The seed mixture may be sown dry or hydraulically unless directed otherwise in Part 4 of this Section.

2. The seed mixture shall be applied when the soil is in a workable condition and shall be raked into a depth of approximately 1/4 inch.

3. Seed shall be sown only between May 1 and October 15, unless otherwise permitted by the Engineer.

C. Mulching:

1. Within 24 hours after an area has been seeded, it shall be mulched in conformance with one of the following specified methods as designated in Part 4.

2. Mulch:

a. Mulching with straw shall be in conformance with ODOT Item 659.14, except that in front of residences, the mulching material shall be kept in place by an approved non-tracking adhesive or other approved method in lieu of the specified asphalt emulsion. Mulching with wood fiber shall be in accordance with ODOT Item 659.15 and mulching with compost shall be in accordance with ODOT Item 659.16.

b. Matting shall be used as mulch on slopes greater than 3:1 and shall be placed in conformance with the applicable portions of ODOT Item 671.

D. Seeded and sodded areas shall be watered and maintained as specified below until they are established.

1. The seed bed shall be thoroughly watered, as soon as the seed is mulched.

2. Water shall be applied by a hydro-seeder or water tank under pressure with a nozzle producing a spray that will not dislodge the mulching material.

3. Water applications shall be made at rates and at frequencies necessary to establish the growth of grass to its full density and to a minimum height of 2 inches.

4. The rate application shall be 120 gallons per 1,000 square feet.

5. The Contractor shall keep all sodded areas, including the subgrade, thoroughly moist for two weeks after sodding. After the two-week period, the Contractor shall water the sod as necessary to maintain its healthy condition until accepted by the Owner.
6. Matting areas shall be maintained until all Work on the Contract has been completed and accepted.
7. Seeded and sodded areas shall be maintained by the Contractor until acceptance by the Owner. The Contractor shall repair and restore any damaged areas. Repair of the damaged area shall be performed using the same materials and procedures as used for the original installation of the area.
8. The Contractor shall clean all surfaces coated with hydro-seeding overspray. Contractor shall be responsible for surface staining or damage caused by hydro-seeding and restoration damage or staining.

PART 4 SPECIAL PROVISIONS

4.01 ACCESS ROAD SEEDING

A. Disturbed areas along the permanent access roadway shall be seeded at the discretion of the Owner.

END OF SECTION

SECTION 03305
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE

A. This Section includes cast-in-place concrete along with formwork, , joint systems, , reinforcing, mix design, placement procedures, and finishes as indicated on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Concrete mix designs including substantiating data and test records.

   b. Product literature for admixtures, curing compounds, and miscellaneous materials.

   c. Locations of construction and control joints not shown on Drawings, and proposed changes in locations.

   d. Material certifications.

   e. Aggregate gradation and percentages of deleterious substances.

   f. Batch plant certification.

   g. Placing drawings shall indicate:

      1) Construction joints, splice locations, and splice lengths.

      2) Bending schedules.

      3) Accessories.

2. Information for the Record:

   a. Manufacturer’s application instructions for miscellaneous materials.

   b. Quality control test reports.

B. Copy of concrete delivery ticket shall be presented to Resident Project Representative for each batch. Delivery ticket shall indicate:

1. Name of ready-mixed company and plant designation.

2. Truck number.

3. Concrete class.

4. Quantity of concrete.

5. Date.
6. Time when batch was loaded.
7. Type and name of admixtures.
8. Actual batch weights of cement, fly ash, aggregates, and water.
9. Location of pour and time of unloading shall be added to the ticket at Site.

1.03 QUALITY ASSURANCE

A. Concrete work shall comply with provisions of the current editions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.

1. ACI American Concrete Institute.
2. CRSI “Manual of Standard Practice”.
3. AWS “Code for Welding in Building Construction”.

B. Concrete Manufacturer Qualifications - Manufacturer of ready-mixed concrete products complying with ASTM C94 requirements for production facilities and equipment.

C. Concrete Testing Service - A qualified independent testing agency shall perform material evaluation tests and shall design concrete mixes.

D. Maintain adequate supervision and control of dewatering operation to ensure that stability of excavated and constructed slopes are not adversely affected by water, erosion is controlled, and flooding of excavation or damage to structures does not occur.

E. Batch Plant:

1. Batch Plant shall be central batch plant with automatic or semi-automatic control. Concrete may be mixed using either central-mixed, shrink-mixed, or truck-mixed methods. If concrete is shrink-mixed or truck-mixed, the truck and concrete producer shall conform to ASTM C94.
2. Batch plant shall be certified by the Department of Transportation, National Ready Mixed Concrete Association (NRMCA) or an independent certification using NRMCA “Check list for Certification of Ready Mixed Concrete Production Facilities” executed and certified by independent Professional Engineer registered in state of Site. Evidence of current certification shall be submitted.

F. Pre-Installation Conferences:

1. Before beginning concrete work, Contractor shall hold a meeting to review detailed requirements for preparing concrete mix designs and to determine proper procedures for concrete construction.
2. A representative of Contractor, testing laboratory, concrete producer, and Engineer shall be in attendance.

1.04 DELIVERY AND HANDLING

A. Concrete shall be delivered in accordance with ASTM C94, except concrete shall be completely discharged within one hour after introduction of mixing water to cement.

B. Concrete shall be delivered in agitating trucks or in mixing trucks operating at agitating speed.

PART 2 PRODUCTS

2.01 MATERIALS –

A. Materials used in concrete construction shall meet all the requirements of applicable ASTM and other industry standards.

1. Portland cement - ASTM C150, Type I or II unless indicated otherwise.
2. Air-entraining Agent - ASTM C260, chloride ion free.
3. Chemical Admixtures (Water Reducing Agents, Superplasticizers, Accelerator) - ASTM C494, chloride ion free.
4. Pozzolan (Fly ASN) (Fly Ash) (GGBF Slag) - ASTM C618, Class F. ASTM C989 grade 100 or low and shall contain less than 12% alumina (C34).
5. Aggregates - ASTM C33.
6. Reinforcing Steel - ASTM A615, Grade 60, deformed.
7. Welded Wire Fabric; Plain - ASTM A185, (undeformed wires) with weld intersections not exceeding 12 inches.
8. Water - ASTM C94, clean and potable.
9. Membrane Curing Compound - ASTM C309, minimum 30% solids content, non-yellowing, moisture loss not to exceed .039 grams per square cm in 72 hours when applied at a coverage rate of 250 square feet per gallon, VOC compliant, water-based acrylic polymer resin. “Safe Cure & Seal – 30% by Dayton Superior or equal.
10. Sheet Curing Compound - ASTM C171.
11. Formwork - ACI 301 and ACI 347R.
12. Form Coating - Non-staining.
13. Preformed Expansion Joint Filler:
    a. Exterior Walks and Pavements - “Fibre Expansion Joint” by W. R. Meadows or equal; asphalt impregnated cellular fibers securely bonded together in conformance with ASTM D1751.
    b. Other Location - “Sealtight Self-Expanding Cork” by W. R. Meadows or equal: self-expanding cork type expansion joint filler in conformance to ASTM D1752, Type III.

c. Isolation Joints - “Ceramar Flexible Foam” by W. R. Meadows or equal; flexible foam expansion joint filler.

14. Joint Sealer, Vertical - ASTM C920, Type M, Cass 25, Grade NS, Dymeric 240, by Tremco or Sikaflex-2c NS by Sika Corp. or equal.

15. Joint Sealer, Horizontal - ASTM C920: THC-900 by Tremco or “Sikaflex - 2C SL” by Sika Corp. or equal.

16. Vapor Barrier - ASTM D2103 - 6 mil polyethylene.

17. Miscellaneous Metals - ASTM A36.

18. Anchor Bolts - ASTM A307.

19. Expansion Bolts - Hilti Kwik Bolt 3 or equal.

20. Anchor Bolt Sleeves - Sinco Products, Inc. or equal; high density polyethylene

21. Bonding Agent for New to Existing Concrete - “Sika Armatec 110 Epocem” by Sika or equal. (Epoxy modified cementitious product.)

22. Galvanizing - ASTM A123 or A153.

23. Epoxy Adhesive for Embedding Dowels into Existing Structures – 100% solids, 100% reactive epoxy conforming to ASTM C881, Type IV, Grade 3, Class B and C. The minimum bond strength per ASTM C882 shall be 1800 psi at 7 days. The adhesive shall be formulated to withstand the maximum allowable published loads permanently without creep or failure. The adhesive shall be Hilti “HIT-RE 500 V3” or equal. Power/Rawl “Power-Fast” epoxy with “Fast Set” formulation shall not be used.

24. Include spacers, chairs, bolsters, ties, and other devices that conform to CRSI specifications necessary for properly placing, supporting and fastening reinforcement in place. Metal accessories shall be plastic coated, galvanized or stainless steel where legs will be exposed in finished concrete surfaces. For slabs-on-grade, use supports with sand plates or horizontal runners for any areas where the base material will not support chair legs. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

25. Use one brand of cement throughout the entire project, unless otherwise approved by the Engineer.

2.02 CONCRETE MIX DESIGN

A. Mixture proportioning for concrete structures shall be in accordance with ACI 301, 318, and 211.1 but subject to the following requirements.

B. Two normal weight concrete mixes are generally required; Class A and Class B. Concrete mixes shall be as follows. Batch in accordance with ASTM C94 and the following:

	Class A	Class B
Type of Portland Cement:	I	I
28 Day Compressive Strength (psi):	4500	1750
Slump (inches) +/- 1 inch:	2-4	1-6
Air Content (%) +/- 1%:	6.0	(Not req'd)
Minimum Aggregate Size (inches):	1 (size #57)	1 (size #57)
Water Reducing Agent:	Yes	(Not req'd)
Minimum Cementitious Content (lbs) (Cement and Fly Ash):	550	375
Minimum Portland Cement Content	80% by weight of total Cementitious material.	
Maximum Fly Ash Content:	20% by weight of total cementitious material	
Maximum GGBF Slag Content	20% by weight of local cementitious material.	
Maximum Water/Cementitious Ratio:	0.45	0.70

C. Contractor shall design and be responsible for the performance of all concrete mixes of specified quality, consistency, and workability to permit concrete to be worked readily into forms and around reinforcement without segregation or excessive bleeding. Hardened concrete shall develop all characteristics required by contract documents.

D. Concrete mixes shall be proportioned to maximize durability and water tightness and to minimize shrinkage. To this end, total water content shall be kept to the lowest possible amount consistent with placing and consolidation methods. Water reducing and high range water reducing admixtures shall be used as required to maintain workability. Specified water/cementitious ratio shall not be exceeded.

E. Concrete proportions shall be established on the basis of previous field experience, or laboratory trial batches in accordance with ACI 301, ACI 211.1 and ACI 318. Proposed mix design shall be accompanied by complete standard deviation analysis or trial mixture test data.

F. Concrete proportions shall be subject to Engineer's approval. Substantiating data and test records shall be submitted.

PART 3 EXECUTION

3.01 COORDINATION

A. Reinforcement, sleeves, inserts, anchors, waterstops, and other embedded items shall be accurately placed, supported, and tied prior to concrete placement. Other trades and contractors required to furnish embedded items shall be given ample notice of concrete placement. Reinforcement and embedded items shall be subject to review of Resident Project Representative prior to placing concrete.

B. Contractor shall notify Resident Project Representative a minimum of 48 hours before placing concrete, excluding nonworking days.

C. Concrete shall be placed only between hours of 8:00 a.m. and 6:00 p.m., unless otherwise permitted. Concreting shall not be placed after 12:00 noon on the last working day of the week.

3.02 PREPARATION

A. Unless adequate protection is provided, concrete shall not be placed during rain, sleet, or snow, or when inclement weather is imminent.

B. Cold Weather - When the average temperature of surrounding air is expected to be below 40 degrees F during placing or within 24 hours thereafter, cold weather concreting in accordance with ACI 306R "Standard Specification for Cold Weather Concreting" shall apply.

C. Concrete shall be protected from extremes in temperature as specified. During periods not defined as cold weather, but when freezing outdoor temperatures are foreseen or occur, concrete surfaces shall be protected against freezing for the first 24 hours, minimum, after placement.

D. Hot Weather- When the ambient temperature is 90 degrees F. or above, or when conditions of concrete temperature, air temperature, wind velocity, and relative humidity combine to cause flash set, excessively low slump, cold joints, plastic shrinkage cracking, or otherwise impair the quality of concrete, hot weather concreting procedures in accordance with "Hot Weather Concreting - ACI 305R," shall apply.

E. When the evaporation rates of bleed water exceed 0.1 pounds per square feet per hour, steps shall be taken to prevent plastic shrinkage cracking. Evaporation rate shall be determined by method shown in "Hot Weather Concreting - ACI 305R."

3.03 INSPECTION, STARTUP, AND TESTING

A. Notify Engineer 48 hours prior to placement of concrete.

B. Engineer's approval is required for subgrade, formwork, and reinforcing prior to starting each placement.

C. Submit proposed concrete mix design to Engineer for review prior to commencement of any Work. Do not begin concrete production until the proposed mix design has been approved by the Engineer.

D. The following tests shall be performed by an independent testing laboratory acceptable to the Engineer during progress of the Work:

1. Compression Tests Cylinders - Strength test shall consist of three cylinders molded and cured. Cast three cylinders for each 50 cubic yards, or fraction thereof, for each class of concrete placed on any one day, but at least three for each day. Test one cylinder at seven days and two at 28 days in accordance with ASTM C39.

2. Slump Tests - ASTM C143. Slump shall be measured for first batch of each concrete class delivered in morning and afternoon, for each strength test, and whenever consistency of concrete appears to vary.

3. Air Entrainment - ASTM C173 or C231. Perform one test for every second ready-mix truck load.

4. Temperature ASTM C1064. Perform with each slump test.

E. If the measured slump or air content fall outside the specified limits, make an additional test immediately and on each successive batch until the specified requirements are met by two consecutive batches.

F. Materials and installed Work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed work shall be done at Contractor's expense.

G. Test Reports:

1. The testing laboratory shall submit test reports directly to the Contractor, the concrete supplier, and Engineer. Reports shall be identified by the project name and number, and the portion of the structure represented. Reports shall include the dates of casting and testing, air and concrete temperatures, specified strength and mix design, actual strength and mix design, slump, air content, and the name of individual making the test.

2. The testing laboratory shall notify the Engineer immediately by telephone when a low strength break occurs or specifications are not met.

3.04 FORMWORK

A. Formwork shall conform to ACI 347R.

B. Formwork shall be designed to safely support vertical and lateral loads, until such loads can be safely supported by concrete structure. Loads shall be carried to ground by formwork and in-place construction of adequate strength.

C. Formwork shall be designed for dead and live loads, weight of concrete, wind, construction loads including impact, and other loads which act or might act on formwork.

D. Formwork shall be designed for pressure of concrete giving due consideration to rate of concrete placement, methods of placement, method of consolidation, concrete mix design, temperature, and other factors pertinent to formwork design.

E. Forms shall have sufficient strength and rigidity to maintain specified tolerances.

F. Formwork shall be securely braced and anchored against deflection and displacement.

G. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to

place concrete with bottom forms only. Kerf wood insets shall be used for forming keyways, reglets, recesses, and the like for easy removal.

H. Form ties shall be adjustable in length to permit tightening of the forms and so made that no metal remains nearer than 1-1/2 inch to the concrete surface after the ends are removed. Spreader devices shall leave holes no greater than 7/8 inch in diameter. Washers or buttons leaving shallow depressions in the surface will not be permitted. Twist type ties may be used only for unexposed concrete.

I. Provide holes in the form for insertion of vibrators to properly consolidate concrete.

J. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

K. Chamfer exposed corners and edges using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

L. The maximum allowable tolerance in either the horizontal or vertical planes shall be 1/4 inch in 10 feet.

M. Provisions for Other Trades - Provide openings in concrete formwork to accommodate Work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

N. Oil temporary forms with non-staining form oil.

O. Cleaning and Tightening - Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.05 DOWELING TO EXISTING STRUCTURE

A. Dowels shall be embedded into existing concrete where shown on Drawings. Unsound concrete shall be reported to Engineer.

B. Adhesive dowels shall be placed in holes larger than the reinforcement diameter using a rotary percussion hammer and carbide bit. Hole diameters shall be as recommended by manufacturer for each specific reinforcing diameter.

1. Unless indicated otherwise, adhesive dowels shall be embedded as follows:

Stud Diameter	Minimum Embedment
#3	3-1/4 inches
#4	4-3/8 inches
#5	5-3/4 inches
#6	6 inches
#7	7-1/4 inches
#8	8-7/8 inches

C. Hole shall be cleaned of dust and residue by blowing the hole with dry and oil-free compressed air. Air nozzle shall be inserted to bottom of hole. The holes should also be brushed using a nylon brush to remove dust and other debris which may have been pressed into the walls of the hole.

D. Standing water and frost shall be removed immediately prior to injecting adhesive.

E. Adhesive shall be injected from bulk-loading caulking gun, disposable caulking tubes, or pneumatic dispenser. Adhesive shall be injected using extension on nozzle to reach bottom of hole. Adhesive shall be injected to pre-determined depth which will cause hole to be completely filled after bar is inserted.

F. Bar shall be inserted and slightly rotated to ensure adhesive completely surrounds bar.

G. Adhesive displaced from hole shall be removed immediately.

H. The manufacturer's installation guidelines for the specific adhesive chosen shall be strictly followed.

3.06 REINFORCEMENT

A. Place reinforcing to ACI recommended tolerances.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by the Engineer.

D. Unless shown otherwise in drawings, place reinforcement to maintain minimum coverages conforming to ACI standard practice for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Welding of reinforcement shall conform to AWS D1.4.

F. Unless otherwise specified on Drawings, reinforcing steel splices shall be lapped conforming to ACI 318, Class B splices.

G. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh plus 2 inches and lace splices with 16-gauge wire. Do not make end laps between supporting beams. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.07 INSERTS

A. Metal inserts such as anchor bolts, sleeves, embedded metals, etc. shall be free of scale, loose rust, oil, grease and other coatings. Remove protective film from cast iron with flame.

B. Ensure that items are accurately positioned and rigidly supported against displacement before placing concrete.

C. The location of anchor and foundation bolts must not vary from the dimensions shown on the Contract Drawings by more than the following:

1. 1/8-inch center to center of any two bolts within an anchor bolt group, where such group is defined as the set of anchor bolts which receives a single fabricated steel shipping piece.

2. 1/4-inch center to center of adjacent bolt groups.

3.08 JOINTS

A. Joints not shown on Drawings shall be made at locations that will least impair strength of structure, and shall be approved by the Engineer prior to construction.

B. Construction Joints:

1. Keyways at least 1-1/2-inch-deep by width, which is equal to 1/3-member thickness, shall be provided in all construction joints in walls, supported slabs, and between walls and foundation systems.

2. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints. Do not continue reinforcement through sides of strip placements.

3. Concrete slabs on grade shall be poured in strip pattern shown on the Drawings.

4. Roughen surfaces of set concrete at all joints. Clean surfaces of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner to expose bonded aggregate uniformly. Apply approved bonding adhesive or cement grout. Bonding cement grout shall be evenly spread and shall consist of 1-part cement and two parts fine aggregate. Fresh concrete shall be placed before grout or bonding adhesive has obtained initial set. Grout shall be approximately 2-inch-thick in walls.

C. Unless otherwise shown, provide isolation joints in slabs on grade at all points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, equipment bases and elsewhere as indicated.

D. Expansion Joints:

1. Provide preformed expansion joints as shown on Drawings or otherwise required.

2. Expansion joint material shall be 1/2 inch in thickness, unless otherwise indicated.

3. Concrete edges at expansion joints subject to vehicular traffic shall be tooled to a 1/8-inch radius.

4. When sealed expansion joints are called for on the Drawings, pourable approved joint sealants shall be placed along top edges of expansion joints per manufacturer's instructions.

E. Control Joints for Slabs:

1. Control joints shall be located and constructed as shown on the Drawings.

2. Within 24 hours of finishing concrete, cut joints to a depth of 1/4 slab thickness when it is firm enough to resist raveling, tearing, or dislodging of aggregates.

F. Clean joints thoroughly with compressed air, wire brushing, or sandblasting.

G. Fill joints with specified joint filler.

3.09 CONCRETE SCHEDULES

A. Unless indicated otherwise, concrete shall be furnished as follows:

Class A: Reinforced concrete structures and fill in manholes and chambers.

Class B: Buried pipe, saddles, and cradles, pipe bedding, pipe encasements, and mudmats.

3.10 PLACING CONCRETE

A. General - Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

B. Do not place concrete on frozen ground, mud, or debris. Dampen subgrade prior to placing concrete slabs on grade where vapor barrier is not required.

C. Inspection - Before placing concrete, inspect, and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Where necessary, notify other trades to permit installation of their work.

D. Convey concrete from the mixer to the place of final deposit by methods which will prevent the loss or separation of the materials:

1. When concrete placing is interrupted for more than 1/2 hour, place a construction joint.

E. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Avoid unplanned cold joints. Alternate equipment shall be immediately available for use in the event that primary placing equipment or system breaks down.

F. Use internal vibration to consolidate. Size at least one vibrator to work around closely spaced reinforcing. Provide a standby vibrator whenever working less than three vibrators in the pour. All equipment and procedures used to consolidate concrete shall comply with ACI 309R.

G. Concrete shall be thoroughly consolidated by vibrating, spading, rodding, or forking so that concrete is thoroughly worked around reinforcement and embedded items, and into corners, angles of forms, eliminating air and stone pockets.

H. Hot Weather Concreting – Follow recommendations of ACI 305R for preparation, placing, protection and curing during hot weather.

I. Cold Weather Concreting – Follow recommendations of ACI 306R for preparation, placing, protection and curing during cold weather.

J. Contractor shall keep good thermometer at Site for monitoring air or concrete surface temperature.

K. Where saw cutting and removal of existing concrete walls, slabs, etc. exposes the ends of reinforcing steel bars, the Contractor shall coat the exposed concrete surface with the specified epoxy coating.

1. Prior to application of the epoxy coating, the concrete surface to be coated shall be roughened and cleaned of all loose materials and dust.

2. Epoxy coating shall be water based rebar coating agent, moisture insensitive, 3-component, epoxy-modified cementitious product.

3. Application methods and thickness of coating shall be as recommended by the manufacturer.

L. Apply the specified bonding agent per the manufacturer's instructions at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

1. Prior to application of the bonding agent, the existing concrete surfaces to be coated shall be roughened and cleaned of all loose materials and dust, thus exposing the aggregate to provide a mechanical bond in addition to the chemical bond provided by the bonding agent.

2. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

3.11 DEFECTIVE CONCRETE

A. Defective concrete is defined as concrete in place which does not conform to specified design strength, required percent air, shapes, alignments and elevations, as shown on the Drawings and/or which presents faulty surface areas. Evaluation and acceptance of concrete shall conform to ACI 318, ACI 301, and ACI 350 as applicable.

B. All defective concrete shall be removed and replaced in a manner meeting with the Engineer's approval, or should surface imperfections only occur, may be patched at the discretion of, and in a manner satisfactory to the Engineer; however, permission to patch the Work shall not be considered as a waiver of the Engineer's right to require complete removal and replacement of such defective Work should the patching fail to

satisfactorily restore the required quality and appearance of the Work. All such Work shall be performed at the Contractor's expense, without extension of time.

C. If for any reason, in the opinion of the Engineer, the testing of any section of the completed structure is necessary, a superimposed load shall be applied by the Contractor and the test conducted in accordance with the current Building Code at the Contractor's expense irrespective of the results of the tests. In cases where failure is declared, the Engineer shall have the authority to order the defective construction removed. All expense of removing such defective construction and substituting new construction, including expense of removing and replacing the Work of others, or protecting and repairing the Work of others, shall be borne by the Contractor.

3.12 CURING

A. General - Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations.

B. Begin curing after finishing concrete but not before free water has disappeared from concrete surface in accordance with ACI 308 "Standard Practice for Curing Concrete" subject to the requirements specified herein.

C. Cure concrete at least five days at concrete temperatures above 70 degrees F or at least seven days at concrete temperatures between 50 degrees F and 70 degrees F. Maintain concrete temperature above 50 degrees F during the curing period. Tanks and other liquid retaining structures shall be cured for a minimum of 10 days.

D. For exposed surfaces, utilize one of the following methods:

1. Membrane Curing Compound - Apply in two coats at right angles to each other upon completion of the Work - each one in accordance with the manufacturer's instructions. Compounds must not be used on surfaces when surface treatments, such as tile, additional concrete, paint, liquid hardeners, and adhesive coatings are specified unless the compound is known not to interfere with adhesion.

2. Sheet Curing Materials - Place materials upon completion of the finishing work. Lap edges 6 inches and seal to create a moisture barrier that must remain intact for the duration of the curing period.

3. Sprinkling, Soaking, or Ponding - Maintain surfaces continuously wet for the duration of the curing period as described above.

E. If formed surface is exposed during the curing period, treat the surface as an exposed surface for the remaining duration of the curing period.

3.13 FINISHING SURFACES

A. Formed Surfaces - Finishing of formed surfaces shall be in accordance with the requirements of Section 5, ACI 301 subject to the following provisions specified herein:

1. Do not remove forms and shoring until the concrete has cured sufficiently to carry its own weight and remain in place without deformation. Remove forms with care to prevent spalling. Reshore concrete carrying superimposed load until the concrete has attained design strength.
2. Inspect honeycombed areas. Replace areas as directed by the Engineer.
3. On exposed vertical unpainted surfaces, building interior, and to 6 inches below grade on building exterior, remove fins and projections, fill holes, and produce smooth-rubbed finish per ACI 301 by wetting and rubbing surfaces with carborundum brick or other abrasive until uniform color and texture are produced.
4. Horizontal surfaces, such as at tops of walls, pedestals, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, shall be struck off smooth and finished with a texture matching the adjacent formed surfaces.

B. Slabs and Horizontal Surfaces - Finishing of unformed surfaces shall be done in accordance with the requirements of Section 5 of ACI 301 and Chapter 8 of ACI 302:

1. All slabs, whether receiving additional finishes or not, shall receive a float finish when concrete has stiffened sufficiently to permit the operation of a power drive float and all surface water has disappeared. Check and level slab surface to obtain a Class A finishing tolerance per ACI 117.
2. Interior slabs not receiving tile shall be given a hard trowel finish as follows:
   a. Follow initial finishing with a steel trowel worked flat to produce a fine, non-slip, sandy texture.
   b. Follow the first steel troweling with a second steel troweling to produce a dense, smooth surface after the surface has become hard enough to give a ringing sound from the trowel.
   c. Retool joints and edges as required.
3. Exterior slabs and concrete stair treads shall be given a non-slip broom finish with scored texture perpendicular to main traffic route. Retool joints and edges.

C. Roadway Repairs and Walkways:

1. Float Finish - Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.
2. Final Tooling - Tool edges of paving and joints formed in fresh concrete with a jointing tool to a radius of 1/4-inch Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

D. Tanks and Other Liquid Retaining Structures: Finishing for exposed surface shall be in accordance with the requirements of ACI 350, ACI 301 and ACI 302 subject to the following requirements:

1. Slabs - Floated finish.
2. Interior Formed Surfaces - Grout-cleaned finish.
3. Exterior Formed Surfaces - Grout-cleaned finish to 6 inches below grade.
4. Other Formed Surfaces - As-cast finish.

3.14 REMOVING FORMS

A. General - Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the Work, may be removed after curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 80% of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimen's representative of concrete location or members. Construction loads shall not exceed 80% of design live load until 28 days after concrete placement.

C. Form-facing material may be removed four days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.15 REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to the Engineer.

3.16 CONCRETE REPAIRS AND REPLACEMENT

A. Remove and replace, at Contractor's expense, any concrete that was part of the Work and that is broken, damaged, or defective, or does not meet the requirements of this Section.

B. Protect concrete from damage. Exclude traffic from slabs-on-grade and roadway/walkway paving for at least 14 days after placement. When construction traffic

is permitted, maintain slabs and paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Patching Defective Areas - Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to the Engineer.

D. Mix dry-pack mortar, consisting of one-part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

E. Repaired Formed Surfaces - Remove and replace concrete having defective surfaces if defects cannot be repaired to the satisfaction of the Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

F. Repairing Unformed Surfaces - The Contractor shall test unformed surfaces such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01-inch-wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

G. Repair isolated random cracks and single holes 1 inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

END OF SECTION

SECTION 03310
GROUT

PART 1 GENERAL

1.01 SCOPE

A. This Section includes non-shrink cementitious and epoxy grouts.

B. Masonry grout and bonding grout are specified in other Sections.

C. Additional product requirements are specified in Section 01350.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Contractor shall indicate variances from requirements of Contract Documents.

b. Product literature.

c. Material certifications of ASTM standard and grade.

d. Laboratory test reports for grout compressive strength tests.

2. Information for the Record:

a. Manufacturer's mixing, placing, and curing instructions.

1.03 PRODUCT HANDLING

A. Environmental limitations specified by manufacturer shall be observed. Heated enclosures shall be provided as required.

PART 2 PRODUCTS

2.01 NON-SHRINK GROUT

A. Grout shall be prepackaged, nonmetallic, noncorrosive, non-staining cementitious grout. Grout shall remain volume stable in both dry and wet conditions and provide a minimum of 95% effective bearing area.

B. Grout shall conform to ASTM C1107 Grade C when tested at fluid consistency of 25 seconds or more per ASTM C939 at temperature extremes of 45 degrees F and 90 degrees F and a working time of 30 minutes. Metallic grouts are prohibited.

C. Non-shrink property shall not be based on any gas generating additives such as aluminum oxide.

D. Minimum compressive strength: 1 day 3500 psi
(2-inch cube cured at 70 degrees F) 7 day 5500 psi
28 day 7500 psi

E. Non-shrink grout shall be Five Star "Fluid Grout 100", Master Builders "Masterflow 928 Grout", or equal.

2.02 EPOXY GROUT

A. Grout shall be non-shrink prepackaged epoxy grout which will achieve a minimum effective bearing area of 95%.

B. Max unrestrained linear shrinkage: 0.0005 inch per inch (ASTM C531)
Max coefficient of expansion: 27 x 10-6 inch/inch/degree F
Minimum compressive strength: 7 day 11,500 psi
(2-inch cube cured at 70 degrees F)

C. Epoxy grout shall be Five Star "HP Epoxy Grout", Master Builders "Masterflow 648", or equal.

2.03 MIXING

A. Grout shall be mixed with mechanical mixers in accordance with manufacturer's written instructions. A mortar mixer with moving blades shall be used to thoroughly blend the potable water into the mix.

B. Water used to mix non-shrink cementitious grout shall be potable. Water shall be added in just sufficient quantity to obtain desired consistency, but shall not exceed manufacturer's maximum recommendations. Grout shall be used in as stiff a consistency as possible. Grout shall not be re-tempered by addition of water. Grout manufacturer shall be consulted when additional flowability is required.

C. Materials other than those supplied by grout manufacturer shall not be added to grout.

D. Cementitious grout shall be mixed close to its placement site, and transportation and placement time shall be limited to less than 15 minutes. Mixed grout temperature shall be held between 45 degrees F and 70 degrees F using ice or hot water as required.

E. Epoxy Grouts - ingredients are prepackaged and pre-measured and shall be completely mixed in accordance with the manufacturer's instructions.

PART 3 EXECUTION

3.01 PREPARATION

A. Concrete to receive grout shall have minimum compressive strength of 3000 psi. New concrete shall be cured as specified prior to placing grout.

B. Defective or deteriorated concrete shall be removed. Laitance, grease, oil, and other substances which prevent bond shall be removed. Concrete shall be roughened by chipping, sand-blasting, or other mechanical means to assure the bond of the grout to the existing concrete.

C. Oil, grease, and dirt shall be removed from the underside of base plates and bearing plates. Air relief holes shall be provided in base plates to eliminate air entrapment.

D. Concrete to receive non-shrink cementitious grout shall be saturated with water for 24 hours prior to grout placement. Concrete to receive epoxy grout shall be dry.

E. Forms shall be constructed of coated wood or steel. Forms shall be constructed and anchored to resist hydraulic head of grout and shall be leak-tight when fluid grouts are used.

F. Unless otherwise specified, non-shrink, cementitious grout shall be used under column and equipment bases. Equipment such as stamping machines, compressors, crushers, etc., involving high impact or vibration, and applications requiring chemical resistance, shall use non-shrink epoxy grouts.

G. When placing more than 5.0 cubic feet of epoxy grout, contact the manufacturer for recommendations.

3.02 PLACING

A. Grout shall be placed in accordance with manufacturer's instructions.

B. Grout shall be placed from only one side of form to avoid air entrapment. Grout shall be placed in a continuous operation to avoid cold joints under base plates. Spaces and cavities below top of baseplate shall be completely filled without voids or air pockets.

C. Grout shall be rodded or vibrated to remove entrapped air.

D. Grout exposed to view shall be finished smooth after initial set.

E. Unless otherwise shown, cementitious grouts shall be placed in minimum 1 inch thickness and epoxy grouts shall be placed in minimum 2-inch thickness. Manufacturer's recommendations for minimum thicknesses required for specific situations shall override these specified minimum values.

F. If the grout extends up the side of a baseplate, it must be cut back to the lower level of the baseplate to avoid cracking of the grout due to possible movement of the baseplate caused by temperature changes, vibrations, etc.

3.03 CURING

A. Grout shall be cured and protected in accordance with manufacturer's instructions.

B. Non-shrink cementitious grout shall be wet cured for minimum of 7 days.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing, shop detailing, shop coating, fabricating, delivering, and installing all miscellaneous metals and accessories needed to complete installations as shown on the Drawings, whether or not specifically listed herein, except those items specified in other sections. This section includes design engineering where specifically called for by this Section.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Shop Drawings shall indicate:

1) Types of materials with ASTM designations.

2) Plan layouts, elevations and sections.

3) Connection details.

4) AWS weld designations and welding procedure.

5) Surface preparation and shop coatings.

6) Accessory materials.

b. Product literature for all materials and accessories required to complete the installation of the items covered in this Section.

c. Samples representative of materials and finished products.

2. Information for the Record:

a. Welder qualification certificates.

b. Inspection Reports and test certificates.

c. Required field measurements.

d. Manufacturer's installation instructions.

1.03 QUALITY ASSURANCE

A. Standards - Metal fabrications shall be designed, fabricated, and installed in accordance with following standards.

1. "Structural Welding Codes", American Welding Society.

2. "Specifications for Structural Steel Buildings" as approved by American Institute of Steel Construction.
3. "Specifications for the Design of Cold-Formed Steel Structural Members", American Iron and Steel Institute.
4. "Specification for the Design of Cold-Formed Stainless Steel Structural Members", ASCE 8.
5. "Code of Standard Practice for Steel Buildings and Bridges", as approved by American Institute of Steel Construction.
6. "Specification for Aluminum Structures", Aluminum Association.
7. "Specification for Structural Joints Using High Strength Bolts" as approved by the Research Council on Structural Connections of the Engineering Foundation.
8. "Surface Preparation Specification," Steel Structures Painting Council (SSPC).

B. Welders, welding operators, and tack welders shall be qualified by tests as prescribed in AWS Structural Welding Code.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall exercise particular care in handling materials to prevent damage to shop applied finishes and coatings.

B. Material shall be stored in a manner to prevent bending or warping. Material shall be stored away from uncured concrete and masonry.

C. Materials to be embedded in concrete or masonry shall be delivered in sufficient time to permit proper placement.

D. Fastening materials shall be delivered and stored in unopened boxes with labels clearly identifying fastener material, grade, and manufacturer. Only those fasteners which can be installed in same day shall be removed from storage.

1.05 PROJECT CONDITIONS

A. Prior to fabrication, Contractor shall field measure new and existing structures when required for proper fit.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel (Carbon Steel):

1. Wide Flange Shapes (W) - ASTM A992.
2. Other Rolled Shapes, Plate, and Bar - ASTM A36 or ASTM A572, Grade 50 as indicated on the Drawings. Where no indication is given, use ASTM A36.
3. Sheets - ASTM A570, Grade 36.

4. Hollow Structural Sections (HHS), tube and pipe - ASTM A500, Grade B.
5. Pipe - ASTM A53, type E or S, Grade B.
6. Floor and Tread Plate - ASTM A786 using ASTM A36 steel.

B. Stainless Steel:

1. Unless indicated otherwise stainless steel shall be AISI Type 304, except AISI Type 304L shall be used for welded construction. The minimum yield strength shall be 30,000 ksi.
2. Sheet, Strip, Plate, and Flat Bar - ASTM A666, annealed.
3. Round Bar and Structural Shape - ASTM A276, condition A.
4. Pipe and Tube - ASTM A312 or ASTM A554, annealed.
5. Floor and Tread Plate - ASTM A793.

C. Aluminum:

1. Unless specified otherwise aluminum shall be alloy 6061-T6.
2. Sheet and Plate - ASTM B209.
3. Rod and Bar - ASTM B211 or B221.
4. Pipe and Tube - ASTM B210 or ASTM B429.
5. Floor and Tread Plate - ASTM B632.

2.02 ASSEMBLY AND ERECTION FASTENERS

A. Bolts and Nuts:

1. High strength bolts - ASTM A325, Type 1 or ASTM A490, Type 1. When no indication is given, ASTM A325 shall be used.
2. Stainless Steel - ASTM F593, AISI Type 304.
3. High strength and stainless-steel bolts shall bear a distinctive head marking identifying bolt grade or material.
4. Nuts - Heavy hex style, ASTM A563, Grade C, for plain A325 high-strength fasteners and DH for galvanized bolts. For A490 bolts, heavy hex nuts conforming to ASTM A194 for Grade 2H, or ASTM A563 Grades DH or DH3.

B. Lock Nut - Prevailing torque type, IFI 100, Grade A.

C. Carbon Steel Washers - ASTM F436 plain with plain bolts and galvanized with galvanized bolts.

D. Lock Washer - Spring type of same material and coating as bolt.

E. Headed Studs - ASTM A108, Grade 1010 through 1020, and AWS D1.1, Section IV.

F. Screws:

1. Carbon Steel - SAE Grade 2, zinc plated.
2. Stainless Steel - IFI 104, Grade 304.

G. Nuts and washers of same finish and material as bolts shall be furnished

2.03 ANCHOR BOLTS

A. General Requirements:

1. Bolt and Stud Material:
   a. Carbon Steel - ASTM F1554 Grade 36, unless noted otherwise.
   b. Stainless Steel - ASTM F593, AISI Type 304.
   c. Heavy hex nuts and washers of same material and coating as anchor shall be furnished. Where lock nut is indicated, prevailing torque type lock nut shall be furnished in addition to standard nut.
2. Anchor Bolt Sleeves:
   a. Steel Pipe - ASTM A501, ASTM A120, or ASTM A53.
   b. Plastic - Wilson “Ankor Shield” or equal.

B. Cast-In Anchor Bolt (Type A):

1. Sufficient thread length shall be provided to permit installation of nuts on both sides of concrete form or template.
2. Anchor embedment, and hook dimension shall be as shown on Drawings.
3. Where sleeve is shown, sleeve shall be fabricated from material indicated above.

C. Adhesive Anchor (Type B):

1. Adhesive – 100% solids, 100% reactive epoxy (ester-based resins are not permitted) in conformance with ASTM C881, Type IV, Grade 3, Class B and C. Minimum bond strength to concrete, per ASTM C882, shall be 1800 psi at 7 days. Adhesive shall be mixed in accordance with manufacturer’s recommendations. The adhesive shall be formulated to withstand the maximum allowable published load permanently without creep or failure.
2. Where adhesive anchor is installed in hollow masonry, stainless steel screen tubes shall be furnished to contain adhesive until stud is inserted.
3. The anchor rods shall be threaded for entire length. Carbon steel rods shall conform to ASTM A193 B7 (high strength) and stainless-steel rods shall conform to AISI 304.
4. Stud shall be threaded full length.
5. Adhesive anchors shall be type “HIT-RE-500-V3” manufactured by Hilti, or equal. All formulations of the “Power-Fast Epoxy” as manufactured by Powers/Rawl shall not be used.

D. Expansion Anchor (Type C):

1. Wedge Type Anchors - FS A-A 1923A, Type 4.
2. All components shall be of same material.
3. Expansion anchors shall be type “Kwik Bolt TZ” manufactured by Hilti, or equal.

E. Sleeve Masonry Anchor (Type D):

1. Sleeve Type Anchors - FS FF-S-325, Group II, Type 3, zinc plated carbon steel.

F.

2.04 WELDING

A. Carbon Steel:

1. Welders, welding operators, and tack welders shall be qualified by tests as prescribed in AWS Structural Welding Code.
2. Welding shall be performed using only prequalified joint details in accordance with AWS Structural Welding Code.
3. Welding electrode shall conform to the requirements of AWS D1.1 and table 3.1 therein.
4. Welded fabrications which will be exposed to weather, submerged, or subject to sewage spray shall be continuously welded.
5. All welding processes and procedures and joint details shall be in accordance with the requirements of AWS D1.1. Weld quality shall conform to Section 8 of AWS D1.1.

B. Stainless Steel:

1. Stainless steel shall be welded with inert gas shielded process (GTAW, GMAW, or PAW). Inert gas protection shall be provided to top and under or backside of weld to ensure protection from atmospheric contamination.
2. Filler metal shall be extra low carbon (ELC) of appropriate type for base material being welded.
3. Residue, oxide, and heat stain in heat affected zone shall be removed.

C. Aluminum:

1. Aluminum shall be welded by process which does not require the use of welding flux.
2. Filler metal shall be as recommended by AA and AWS for base material and welding process used. Filler metal shall be selected to minimize crack sensitivity of weldment and to minimize discoloration of weldment on items to be anodized.

D. Welding shall be performed in such a manner to prevent warping and distortion.

E. Butt joints shall be made with full penetration welds. Weld reinforcement on back side shall be smooth, uniform, and no more than 1/16 inch in height.

F. Rough welds shall be ground to remove sharp edges, undercuts, pinholes and other irregularities. Chipping is permitted to remove sharp edges if followed by welding. Overgrinding, which would result in decreasing metal thickness or integrity of weld beyond limits of good welding practice shall be avoided.

G. Weld spatter shall be removed by chipping and grinding as required. Use of an anti-spatter coating applied adjacent to weld area prior to welding is permitted.

2.05 FABRICATION

A. Work shall be fabricated straight and true, free from warpage or other defects and assembled in a first-class workmanlike manner. Joints, copes, miters, and corners shall be accurately cut, machined, filed, and fitted with best methods as required for fabrication.

B. Work shall be fabricated as shown on approved Shop Drawings. Removable parts or members shall be carefully fitted and secured by screw fastenings or other methods as may be required.

C. Work shall be fabricated in as large as sections as practicable to minimize field connections. Field connections shall be designed and constructed in most practical locations for strength, appearance, and ease of installation. Field connections shall be mechanically fastened unless field welding is shown, specified, or permitted by Engineer.

D. Holes and other provisions for field connections shall be accurately located. Connections shall be shop checked for proper fit. Connection materials shall be match-marked when required for proper installation.

E. Holes produced by flame cutting shall be ground smooth.

F. Sharp edges of flame cut or sheared carbon steel fabrications shall be removed by power grinding.

G. Carbon steel surfaces to be coated or galvanized shall have gouges, handling marks, deep scratches, metal stamp marks, slivered steel and other surface flaws repaired. Surface flaws shall be repaired by welding and grinding as required.

2.06 SHOP COATING

A. Aluminum:

1. Anodizing - Where specified, provide Architectural Class I anodic coating, applied after fabrication.

2. Surfaces which will be in contact with concrete, masonry, or dissimilar metals shall receive a heavy coat of coal tar paint, Bitumastic Super Service Black, or equal.

B. Carbon Steel:

1. Steel fabrications wholly embedded in concrete or masonry and with a minimum of 2 inches of concrete cover shall be abrasive blasted in accordance with SSPC SP-6, but shall not be coated. Exposed portions of partially embedded steel shall be shop coated to a point 4 inches below the concrete surface.
2. Galvanizing - Component shall be hot dip galvanized after fabrication in conformance with ASTM A123. Threaded parts and hardware shall be galvanized in conformance with ASTM A153 or zinc-plated in conformance with ASTM B695.
3. Painting - Unless specified otherwise, non-galvanized fabrications shall be shop primed per Section 09900.
    a. Surfaces which will be inaccessible for field painting after installation shall receive two coats of primer.
    b. Contractor shall ensure primer is compatible with specified field coatings.

2.07 PIPE BOLLARDS

A. Metal pipe bollards shall be constructed as shown on the Drawings.

B. Metal pipe shall be hot dipped galvanized, unless noted otherwise on Drawings.

C. Plastic bollard guards shall be provided when specified in Part 4.

PART 3 EXECUTION

3.01 ERECTION

A. Metal fabrications shall be installed in accordance with manufacturer's instructions and as shown on Drawings.

B. Fabrications shall be installed level and plumb or as otherwise shown on Drawings. Shims shall be furnished when required.

C. Components shall be assembled as indicated on Drawings. Light drifting is permitted to draw parts together, but drifting to match unfair holes is not permitted. Where holes do not match, holes may be reamed slightly using a tapered reamer. Enlarging holes by burning is prohibited.

D. Contact surfaces between members and areas adjacent to bolt holes shall be free of dirt, oil, loose scale, burrs, pits, and other defects that would prevent proper seating and connection of the members.

E. Galvanized or anodized material shall not be field bent, cut, welded, or otherwise altered. Material so altered will be considered defective.

3.02 ASSEMBLY AND ERECTION FASTENER INSTALLATION

A. Washers shall be installed under turned element of bolts. Hardened washers shall be used for high strength and alloy bolts. Beveled washers shall be installed when bearing surface of the bolted parts have a slope of 1:20 or greater with respect to the bolt axis.

B. Fastener threads which have been contaminated with dirt shall be cleaned and lubricated.

C. Stainless Steel - Anti-seizing lubricant shall be applied to threads prior to installation.

D. Bolts shall be tightened progressing systematically from stiffest part of connection toward free edges.

E. Bolted connections shall be snug-tightened-joints, unless noted otherwise. All connected steel plies shall be free of dirt, oil, lacquer and burrs, and shall be in firm contact prior to bolting.

F. High strength and alloy bolts shall not be reused once tightened beyond snug-tight.

G. For bolted connections, at least one full thread shall project beyond the nut when tightened.

3.03 ANCHOR BOLT INSTALLATION

A. Non-cast-in type anchors shall be installed in predrilled holes of size specified or as recommended by manufacturer. Anchors shall be embedded to depth indicated below unless shown otherwise on the Drawings.

B. Anchor bolted connections shall be snug-tightened- in accordance with “Specification for Structural Joints Using ASTM A325 or A490 Bolts” as approved by the Research Council on Structural Connections of the Engineering Foundation or as otherwise specified by anchor manufacturer.

C. Expansion Anchor:

1. Unless indicated otherwise, expansion anchors shall have an effective embedment as follows:

Stud Diameter	Minimum Embedment
1/4 inch	2 inches
3/8 inch	2 inches
1/2 inch	3-1/4 inches
5/8 inch	4 inches
3/4 inch	4-3/4 inches
1 inch	6 inches

2. Unless indicated otherwise, expansion anchors shall be spaced as follows:

   Minimum center to center spacing: 2 times embedment.

   Minimum edge distance: 3 times embedment.

3. Unsound concrete shall be reported to Engineer.

D. Adhesive Anchor:

1. Adhesive anchors shall be placed in holes larger than stud diameter using a rotary percussion hammer and carbide bit. Hole diameters shall be as recommended by manufacturer for each specific anchor diameter.

2. Unless indicated otherwise, Adhesive anchors shall have an effective embedment as follows:

Stud Diameter	Minimum Embedment
3/8 inch	3-3/8 inches
1/2 inch	4-1/2 inches
5/8 inch	5 5/8 inches
3/4 inch	6-3/4 inches
7/8 inch	7-7/8 inches
1 inch	9 inches

3. Preparation Procedure:

   a. Hole shall be cleaned of dust and residue by blasting with dry and oil-free compressed air. Air nozzle shall be inserted to bottom of hole.

   b. Sides of hole shall be cleaned with a nylon bristle brush.

   c. Compressed air blast shall be repeated.

4. Standing water and frost shall be removed immediately prior to injecting adhesive.

5. Adhesive shall be injected from bulk-loading caulking gun, disposable caulking tubes, or pneumatic dispenser. Adhesive shall be injected using extension on nozzle to reach bottom of drilled hole.

   a. Anchoring to Concrete - Nozzle shall be inserted to back of hole and adhesive dispensed while slowly withdrawing nozzle. Hole shall be filled to pre-determined depth which will cause hole to be completely filled after stud is inserted.

   b. Anchoring to Masonry - Screen tube shall be filled with adhesive while slowly withdrawing nozzle. Screen tube shall be carefully inserted into drilled hole.

6. Stud shall be pushed into adhesive with gentle, uniform pressure while slightly rotated to ensure adhesive completely surrounds stud. Stud shall be inserted to full depth of hole.

7. Adhesive displaced from hole shall be removed immediately. Adhesive which has hardened on projecting portion of stud or on concrete surfaces shall be removed.

8. Nut shall not be tightened nor load applied until adhesive has fully cured as recommended by manufacturer.

9. Threaded anchors shall have at least one full thread projecting beyond the nut when tightened.

3.04 FASTENER AND ANCHOR SCHEDULE

A. Unless shown or specified otherwise, fasteners and anchors shall be as follows:

Base Metal	Fastener Metal and Coating
Stainless steel	Stainless Steel
Aluminum	Stainless Steel
Galvanized steel	Galvanized or zinc plated carbon steel
Field painted or uncoated carbon steel	Unfinished or zinc plated carbon steel

B. Where a connection involves dissimilar base metals, fastener shall be as required for most corrosion resistant base metal in connection, or dielectric material shall be installed.

C. Anchors bolts and fasteners in submerged applications shall be stainless steel.

D. Where anchor type is not shown or specified, anchor furnished shall be suitable for substrate material and specific application. Adhesive anchors are not permitted for anchoring to vertical or overhead surfaces inside of buildings or other fire rated locations.

Substrate Material	Suitable Anchor Type
Concrete	A, B, C
Solid or Grouted Masonry	A, B, D
Hollow Masonry	B, D

3.05 FIELD WELDING

A. Field welding when shown, specified, or otherwise permitted by Engineer shall be performed in accordance with the requirements specified for shop welding.

B. Areas adjacent to field welds shall not be shop primed. Primer shall be applied after welding.

3.06 COATING REPAIR

A. Welds, bolts, and damage to shop applied coatings shall be touched-up with same or equivalent materials used in original coating.

B. Minor scratches or defects in galvanized coating may be repaired with zinc-rich paint in accordance with ASTM A780 at Engineer's discretion.

C. Repair of anodized coatings in field is not permitted. Damaged materials shall be removed and re-anodized.

3.07 CLEANING

A. Metal fabrications shall be cleaned with mild detergents prior to final acceptance. Steel wool, harsh abrasives, or alkaline or acid cleaners are not permitted.

3.08 QUALITY CONTROL INSPECTION AND TESTING

A. The Contractor shall employ a laboratory to perform the following inspections and testing verifications: Where pretensioned or slip critical connections are indicated refer to Section 05120 for additional inspection requirements.

1. At the start of Work, the inspector at the Site of the project shall:

a. Verify that the material identification markings for structural members, high strength bolts, nuts and washers correspond to the appropriate ASTM designations.

b. Verify that on-site welders designated by the Contractor are certified to perform welding

c. Verify that the proper welding electrodes, equipment and procedures are being utilized

2. If inspections determine that a specific item does not comply with the Contract Documents the contractor shall make corrections until the item passes the inspection. The cost of corrections and additional inspections shall be paid for by the Contractor.

PART 4 SPECIAL PROVISIONS

4.01 DISSIMILAR MATERIALS

A. Where dissimilar materials come into contact, use neoprene washers, spacers, gaskets or other Engineer approved materials between them to provide insulation against electrolytic action.

4.02 CRITERIA FOR BASE METAL REPAIR OF STRUCTURAL STEEL

A. This criteria shall cover damage induced to existing structural steel during or subsequent to installation of steel. Injurious imperfections, such as voids and gouges, shall herein be defined as a base metal discontinuity which results in a reduction of the cross-sectional area of a member, and which exceeds the limiting depths specified below for various thicknesses of material. Except for discontinuities of 1/32-inch and less in depth which are acceptable without any repair, base metal shall be conditioned for the removal of discontinuities by chipping or grinding. Weld repair is not required, provided the excavated area is well faired without abrupt changes in contour and the depression does not extend below the rolled surface by more than:

1. 1/32 inch for material less than 3/8 inch thick.

2. 1/16 inch for material 3/8 inch to 2 inches (inclusive) thick.

3. 1/8 inch for material over 2 inches thick.

B. Voids and gouges greater in depth than the limits given above and all cracks and tears are considered injurious and shall be weld repaired using the methods given below; however, in no case shall the depth of excavations exceed 30% of the base metal

thickness without written approval of the Engineers. Prior to welding, the excavations shall be visually (and for cracks and tears, magnetic particle or liquid penetrant) examined to insure complete removal of defects. Excavations shall have a minimum root radius of 1/8 inch, a minimum included angle of 45 degrees F on the cross section, and shall be gradually tapered up to the base metal surface at the ends. Repair welding shall be performed in accordance with the parameters of an AWS D1.1 qualified backing bar weld procedure. Completed surfaces of all repair welds shall be visually examined to the acceptance criteria of AWS D1.1 Section 8.15.

4.03 CRITERIA FOR REPAIR OF WELD DEFECTS AND DAMAGED WELDS

A. Repair of damage or discontinuities in previously completed welds shall be in accordance with the criteria outlined below. In conjunction with the requirements outlined in weld procedure W200A, defects in welds shall be removed by chipping, arc-gouging, or grinding until sound metal is reached. Removal of indications such as cracks or tears, shall be verified by magnetic particle or liquid penetrant examination. Removal of other indications or damaged areas such as nicks, gouges or undercuts, shall be verified by visual examination. Oxygen gouging, where required, is acceptable providing welding preheat is applied. Rewelding shall be performed in accordance with the procedure originally used to make the weld, or an alternate procedure approved in writing by the Engineer. Removal of attachment welds, when required, shall avoid removal of base material. Any remaining rough edges shall be ground flush with the surrounding surface and visually inspected to assure soundness.

4.04 FABRICATOR APPROVAL

A. The fabricator of structural load bearing members and assemblies furnished under this Section, shall be registered and approved to fabricate these products without special inspections per the requirements of the current Building Code Section 1704. The approved fabricator shall submit evidence of such registration at the time that Shop Drawings are submitted. At the completion of production, the approved fabricator shall submit a certificate of compliance to the local building code official stating that the fabrication was performed in accordance with the Contract Documents and the approved Shop Drawings.

4.05 PLASTIC BOLLARD GUARDS

A. Pipe bollards cover shall be a closed top, 1/8-inch-thick HDPE with UV inhibitors and rated for outdoor environment. The bollard cover shall be integrally colored; Owner shall select color. A reflective striping, as specified, shown or required shall be a 3M #680 reflective self-adhesive tape which is compatible with the HDPE cover and exterior rated. The striping pattern and colors, shall be as specified, shown or as required. HDPE covers shall provide for a uniform height of bollards. Contractor shall coordinate bollard cover size with the metal pipe bollard as shown on the Drawings.

END OF SECTION

SECTION 05540
IRON CASTINGS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes manhole covers and frames, inlet grates and frames, stop plank grooves, and other iron castings shown on Drawings.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Product literature that shall be included; General Specifications, Surface Coating, Anchor Bolts, Machine Bearing Surface.

   b. Independent Shop Drawings shall be submitted for the frame and the cover.

   c. A submittal of a casting schedule that clearly notes either the structure number or in what circumstances the casting is intended to be installed, shall be included, i.e., roadway.

   d. All dimensions for both the frame and the cover/grate shall be included.

2. Information for the Record:

   a. Material certification.

   b. Proof-load test data.

   c. Manufacturer’s installation instructions.

   d. Manufacturing Capabilities and Quality Control Measures.

1.03 PRODUCT HANDLING

A. Castings shall be delivered in sufficient time to permit proper placement in pavement and slabs.

B. Castings shall be stored in such a way as to prevent warping prior to installation.

C. Additional product handling requirements are specified in Section 01350.

PART 2 PRODUCTS

2.01 MANHOLE COVER AND FRAME

A. All castings shall be rated for heavy duty service.

2.02 INLET GRATE AND FRAME

A. Castings shall be suitable for heavy duty service.

B. Unless indicated otherwise, inlet grate and frame shall be East Jordan No. 7045.

2.03 RESERVED

2.04 PERFORMANCE REQUIREMENTS

A. Castings shall be gray iron conforming to ASTM A48, Class 35.

2.05 FABRICATION

A. Castings shall be free from pouring faults, sponginess, cracks, blowholes, blisters, shrinkage strains, and other defects. Plugging of defective castings is not permitted.

B. Castings shall be true to pattern in form and dimension. Weight of castings shall not vary by more than 5% from published weight. Contractor shall submit invoices showing actual weight of casting as certified by manufacturer.

C. Castings shall have machined bearing surfaces.

D. All castings shall be coated with a non-toxic, nonflammable, water-based, asphalt paint.

E. Lettering shall be cast on covers. Unless indicated otherwise, the manufacturer's name shall be cast in cover.

F. Covers shall be furnished with bolts, locks, hinges, perforations, lifting rings, and pick holes as specified, shown on Drawings, or as directed.

PART 3 EXECUTION

3.01 PREPARATION

A. Contractor shall examine surfaces to receive castings and shall report unacceptable conditions to Engineer before proceeding with the Work.

3.02 ERECTION AND INSTALLATION

A. Castings shall be accurately set, aligned, and anchored as shown on Drawings.

B. Castings shall be installed in accordance with manufacturer's instructions or shown on the drawings. If any discrepancies exist, then the more stringent requirements shall take precedence.

PART 4 SPECIAL PROVISIONS

4.01 CONCRETE COLLARS

A. Concrete collars shall be provided for all manholes and valve boxes located in paved areas.

4.02 STANDARD SANITARY SEWER MANHOLE

A. Sanitary Sewer Manhole Castings shall be provided in accordance with the District's Standard Manhole Casting.

B. Covers for sanitary sewer manholes shall be stamped with the District's sanitary sewer logo.

END OF SECTION

SECTION 06682
SEWER PIPE DROP BOWL

PART 1 GENERAL

1.01 SCOPE

A. This Section includes polyester resin sewer pipe drop bowls.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Layouts and typical sections.

b. Connection details.

c. Accessory and mounting materials.

d. Required field measurements.

e. Product literature.

PART 2 PRODUCTS

2.01 DROP BOWLS

A. Sewer pipe drop bowls shall be manufactured by RELINER® / Duran Inc. 53 or approved equal.

B. The sewer pipe drop bowls shall be constructed of polyester resin. Polyester resin shall have the following minimum physical Properties

1. Flexural Strength (psi) per ASTM D-790: 27,100 psi

2. Flexural Modulus (psi) per ASTM D-790: 1,157,000 psi

3. Tensile Strength (psi) per ASTM D-638: 16,700 psi

4. Tensile Modulus (psi) per ASTM D-638: 1,457,000 psi

5. Tensile Elongation (%) per ASTM D-638: 1.54 %

6. Hardness per ASTM D-2583: 55 – 60 Barcol 934.1

2.02 DROP PIPE

A. The drop pipe shall be PVC SDR 35 Pipe per ASTM D3034 or approved equal.

B. See specification section 02500, 2.01,A.

2.03 HARDWARE & ACCESSORIES

A. All fasteners and anchors shall be 304 stainless steel.

B. Expansion anchors shall be sized as recommended by the drop bowl manufacturer.

C. All joint gaskets shall be neoprene.

D. Connection from Drop Bowl to drop pipe shall be by flexible external pipe connector, Fernco or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. The sewer pipe drop bowl be installed as shown on the Drawings and as recommended by the manufacturer.

B. Trim incoming pipe so that a maximum of 2-inches of the pipe protrudes into manhole or structure.

C. Cut a "V" shaped notch at bottom edge of incoming pipe to improve flow regime transition to vertical flow.

D. Center Drop Bowl directly under the incoming pipe, allow approximately 1" clearance between pipe and bowl

E. Cut and mount the drop pipe using RELINER adjustable stainless-steel clamping brackets. Use a minimum of 2 brackets with a maximum spacing of 4 feet

F.

PART 4 SPECIAL PROVISIONS

A. None.

END OF SECTION

SECTION 08320
FLOOR DOORS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing floor doors in the locations shown on the Drawings.

B. Floor doors shall be aluminum interior, exterior diamond plate or interior recessed to receive carpet, composition or resilient flooring specified under other Items.

C. Door arrangement shall be either single leaf or double leaf hinged as shown on the Drawings.

D. Additional product requirements are specified in Section 01350.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. The Contractor shall indicate all variances from the requirements of the Contract Documents.

   b. Manufacturer's literature.

   c. Door Schedule.

   d. Dimensional Drawing.

2. Information for the Record:

   a. Operation and maintenance manuals.

1.03 GUARANTEE

A. The manufacturer shall guarantee proper operation and against defects in material and workmanship for a period of one year from date of shipment. The provisions of this warranty shall not be construed as relieving or reducing the obligations of the Contractor outlined in General Conditions of these Specifications.

PART 2 PRODUCTS

2.01 EXTERIOR DOORS

A. Doors shall have channel frames and shall be 1/4-inch aluminum with an anchor flange around the perimeter.

B. Door leaf shall be 1/4-inch aluminum diamond pattern plate reinforced with aluminum stiffeners designed to withstand an H20 load rating and as required to prevent distortion of the leaf when in any position. Doors shall be equipped with heavy forged brass hinges, stainless steel pins, spring operators for easy operation, and automatic hold-open arm with release handle. A snap lock with removable handle shall be provided.

C. A 1-1/2-inch drainage coupling shall be provided in the door frame. Drainage shall be piped by the Contractor to outlet with 1-1/2-inch PVC pipe to drain or as shown on the Drawings.

D. Hardware shall be stainless steel throughout.

E. Factory finish shall be mill finish.

F. A bituminous coating applied by the manufacturer to the exterior of the frame and all aluminum in contact with concrete.

G. Doors shall be as manufactured by Bilco, Halliday Products or approved equal.

2.02 ACCESS DOOR FALL PROTECTION

A. Each hatch shall be designed to combine covering of the opening, fall-through protection per OSHA standard 1910.23 and controlled confine space entry per OSHA standard 1910.146.

B. The safety grate shall be made of 6061-T6 aluminum and designed per the “Specifications for Aluminum Structures”, by the Aluminum Association, Inc. 5th Edition, December 1986 for “Bridge Type Structures.”

C. The grating shall be designed to withstand a live load of 300 pounds per square foot. Deflection shall not exceed 1/150th of the span.

D. Grate openings shall allow for visual inspection, limited maintenance, and float adjustments while safety grate fall-through protection is left in place. The grating shall cover the full opening except for a maximum 6-inch width on each end of the opening.

E. Design must assure that the fall-through protection is in place before the doors can be closed, thereby, protecting the next operator.

F. Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90-degree position once opened.

G. Each grate supplied with a locking device (for Owner’s padlock) that will prevent unauthorized entry to the confined space. The grating system will allow anyone to make visual inspection and float adjustments without entering the confined space.

H. Grate shall be coated with an OSHA-type safety orange or yellow color, promoting visual awareness of the hazard. The aluminum safety grates shall receive a two-coat, powder coating system, applied by the electrostatic spray process. The base coat is a thermosetting epoxy powder coat finish with a minimum thickness of 2 to 4 mils. The

top coat is a mar-resistant, TGIC polyester powder coating with a minimum thickness of 2 to 4 mils. Each coat shall be baked at 450 to 375 degrees F until cured.

I. Welding shall be in accordance with ANSI/AWS D1.2-90 Structural Welding Code for Aluminum.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall install the floor doors in the locations shown on the Drawings. Installation shall be in accordance with the manufacturer's recommendations.

B. Doors shall be modified by the manufacturer as required when necessary to suit the installation shown on the Drawings.

C. Doors shall be installed to open in the direction shown on the Drawings or as ordered by the Engineer.

D. The bituminous coating on door frames shall be touched up by the Contractor if the coating has been damaged.

PART 4 SPECIAL PROVISIONS

4.01 FLOOR DOOR SCHEDULE

A. All access floor doors shown on the Drawings and scheduled below shall be provided:

Mark	Clear Opening	Type	Location	Hinge Side	Loading	Remarks
FD-1	48" x 42"	Floor Door	Wet Well	See Plans	H20	Single Door with Fall Protection
FD-2	48" x 42"	Floor Door	Wet Well	See Plans	H20	Single Door with Fall Protection
FD-3	30" x 30"	Floor Door	Flow Meter Chamber	See Plans	300 psf	Single Door
FD-4	30" x 30"	Floor Door	Pigging Manhole 1	See Plans	300 psf	Single Door
FD-5	30" x 30"	Floor Door	Pigging Manhole 2	See Plans	300 psf	Single Door

B. The clear opening dimensions provided is the minimum distance between all frame, strike plates, accessories, brackets, hinges, or structural components. It is understood the concrete opening will be larger than the clear opening.

END OF SECTION

SECTION 09900
PAINTING

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and application of protective coatings to all wood, concrete, and metal surfaces as specified or as shown on the Drawings.

B. Included in this Section is surface preparation, shop application inspection, and field touch up work as required to provide a complete protective coating system.

C. In general, the Work shall include the field painting of the following:

1. All exposed interior cast-in-place concrete (except floors) above ground floor.
2. All exposed concrete blocks and hollow core precast slabs.
3. All exposed plaster.
4. All exposed wood.
5. All exposed pipe insulation.
6. All exposed piping, including fittings, valves, couplings, flanges, and other in-line accessories.
7. All machinery, pumps, and equipment.
8. All metal surfaces except the following:
   a. Bronze surfaces.
   b. Stainless steel surfaces.
   c. Aluminum or galvanized steel not requiring color coding or otherwise specified to be coated.

D. Additional product requirements are specified in Section 01350.

E. A Coating Schedule appears in Part 4 of this Section.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:
   a. Coating manufacturer's product data and technical literature including:
      1) Catalog number.
      2) General classification.
      3) Coating material analysis.

4) Detailed surface preparation guidelines.

5) Mixing, thinning, and application instructions for each material.

6) Induction time, pot life, viscosity, and drying and curing times for acceptable ranges of temperature and humidity.

b. Abrasive manufacturer's information including:

1) Name, address, and phone number of manufacturer and local supplier.

2) Bulk density.

3) Mohs ranking.

4) Sieve analysis.

5) Chemical analysis including impurities.

6) Free silica content.

7) Grain shape (roundness).

c. Submittals of coatings by a manufacturer not named in these specifications shall include performance criteria on abrasion, adhesion, exterior exposure, hardness, humidity exposure, salt spray (fog), impact, immersion, etc., as applicable, per the appropriate ASTM standards. If requested by the Engineer, the Contractor shall submit manufacturers complete formula for the coatings which are proposed to be furnished. The Engineer may also require the submission, at the Contractor's expense, of test reports from private laboratories showing results of comparable tests on the coatings proposed and the coatings specified.

d. Details of application equipment and procedures.

e. Samples of manufacturer's standard colors.

2. Information for the Record:

a. Certification that materials meet or exceed Specifications and that coating systems are suitable for intended use.

b. Certification that coating systems are compatible with substrate, specified surface preparation, prime coats, sealants and existing finishes.

c. Safety Data Sheets (SDS) for coating materials, thinners, diluents, abrasives, cleansers, and other materials.

d. Schedule of coating work showing each phase and step of Work.

1.03 QUALITY ASSURANCE

A. Standards - Surface preparation, coating, and patching work performed under this Section shall conform to the applicable provisions and recommendations of the following standards.

1. SSPC Steel Structures Painting Manual, Volume 1, “Good Painting Practice.”
2. SSPC Steel Structures Painting Manual, Volume 2, “Systems and Specifications.”
3. SSPC Vis. 1 and 2, visual standards and written guidelines.
4. NACE Coatings and Linings Handbook.
5. Applicable NACE standards and recommended practices including RP0178 and RP0184.

B. Field Mock-ups - Where specified in the Coating Schedule, a field mock-up shall be done prior to performing the required Work.

1. Field mock-ups shall be a minimum of 4 square feet in area, in a location chosen by the Owner or his representative.
2. The mock-ups will serve as a standard of acceptance for applicable coating work under this Contract.
3. The coating manufacturer’s representative will be available to advise the Contractor.
4. Step-down mock-ups, showing the prepared substrate, primer, intermediate, and finish coats, as applicable, shall be used. Where the substrate is a ferrous metal, the portion remaining exposed shall be protected with a clear varnish.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be in accordance with Section 01350.

B. Include the following information on container labels or packing slips:

1. Manufacturer’s name.
2. Name or title of material.
3. Batch numbers.
4. Stock number and date of manufacture.
5. Shelf life or expiration date.
6. Contents by volume of pigment, binder, and vehicle.
7. Thinning instructions when recommended.
8. Application instructions.
9. Color name and number.
10. Safety Data Sheets (SDS).

C. Provide controlled storage for coating materials and abrasives. Store coating materials in environmentally controlled enclosure with minimum ambient temperature of 55 degrees F. Store abrasives in dry area.

D. Maintain inventory of coating materials, solvents, and cleaners.

1.05 SCHEDULING AND SEQUENCING

A. Notify Engineer two weeks in advance of surface preparation and coating application.

B. Work systematically in accordance with submitted schedule.

C. Sequence and coordinate abrasive blasting and coating application with Work of other sections. Do not interrupt plant process or interfere with Owner's operations.

D. Coordinate coating work with installation of sealants specified in Section 07900.

E. Furnish specified testing and inspection equipment to Owner a minimum of two weeks prior to beginning surface preparation and coating work.

1.06 MANUFACTURER'S RECOMMENDATIONS

A. Apply coatings in strict compliance with manufacturer's recommendations and instructions as to environmental conditions, surface preparation, mixing, application, and curing. Where Specifications are more stringent than manufacturer's recommendations, Specifications shall prevail.

B. Resolve conflicts between Specifications and manufacturer's recommendations and instructions by obtaining written agreement between Engineer and coating manufacturer prior to beginning Work.

1.07 DESCRIPTION

A. Shop Painting - Shop painting shall be performed to the extent and as required under Section 01350 and the various individual sections of the specifications. All metal surfaces shall be given a protective shop coat of primer compatible with the field coating. Shop primer color shall be beige where available. If a prime coat has not been applied in the shop, then a prime coat shall be applied in the field after proper surface preparation and prior to the application of the finish coats.

B. Compatibility - The Contractor shall ensure the primer or finish coating applied in the shop is compatible with the specified field coatings. If the coatings are incompatible, the shop coatings shall be removed by abrasive blasting and coatings applied in conformance with this Section.

PART 2 PRODUCTS

2.01 MATERIALS

A. The products shall be as specified in the Coating Schedule. Materials selected for each coating system shall be the product of one manufacturer. The Contractor shall be

responsible for the compatibility of all components of each coating system including primer, thinner, and solvents.

2.02 COATING SCHEDULE

A. The Coating Schedule included in Part 4 of this Section identifies the areas to be painted, the required materials, and number of coats required.

PART 3 EXECUTION

3.01 ENVIRONMENTAL REQUIREMENTS

A. Environmental Conditions:

1. Perform Work of this Section under the following environmental conditions.

   a. Abrasive blast only when surface contamination can be prevented. Abrasive blast only when surface temperature is more than 5 degrees F above dew point and relative humidity is less than 85%.

   b. No coating shall be applied when the air temperature, as measured in the shade, is below 40 degrees F or above 90 degrees F. No coating shall be applied when the temperature of the surface to be painted is below 35 degrees F or as recommended by the paint manufacturer, whichever is greater. Coatings shall not be applied to wet or damp surfaces, when the relative humidity exceeds 85%, or when the surface to be painted is less than 5 degrees F above the dew point.

2. Coating work may proceed during inclement weather in environmentally controlled enclosures. Environment within enclosure shall comply with Specifications and manufacturer's recommendations. Provide adequate ventilation and illumination. Minimum illumination shall be 150-foot candles.

B. Interior Painting may be done only when the building has been thoroughly dried, by natural or artificial heat, and when the Work area is properly heated and ventilated, clean, and as nearly dust free as possible. Room temperature shall be maintained within the manufacturer's recommendations during application and until coatings are dry.

C. Dust - Coating shall not be applied in areas where dust is being generated.

3.02 PROTECTION

A. During the construction period, all electrical and mechanical equipment and other equipment and apparatus shall be protected from paint drippings by means of tarpaulins, burlap, wooden housings, or other protection.

B. Finished work of other trades, surfaces not being painted concurrently or not to be painted, and factory finished lockers, toilet partitions, etc., that will not require field painting shall be protected at all times from paint spots and damage to the finish.

C. Perform cleaning and coating operation in manner which prevents dust and contaminants from falling in newly applied coating.

D. Protect portions of Work which are partially or entirely completed and which are adjacent to surfaces being prepared by abrasive blasting.

E. Protect completed Work from solvents, contaminants, or other substances which may damage coating.

F. Prominently display “Wet Paint” signs in sufficient number to protect newly applied coating.

3.03 PREPARATION OF SURFACES

A. General - All surfaces, of whatever material, which are to be painted shall be thoroughly cleaned of dirt, grease, rust scale, or other injurious substance, and, at the time of application of the coating, shall be clean and dry.

B. Metal Surfaces:

1. Remove weld spatter and other projections. Grind sharp edges to a minimum radius of 1/8-inch. Grind rough welds smooth. Grinding shall be in accordance with SSPC Surface Preparation Commentary. Surfaces shall be smooth and contoured in compliance with SSPC-SP 12.

2. Surfaces which have not been shop coated shall be abrasive blasted prior to any prime coats. Abrasive blasting shall be done in accordance with the Coating Schedule.

3. Shop primed surfaces shall receive a field sweep blast prior to the application of subsequent coats.

4. Abrasions or defects on shop coated surfaces shall be spot primed.

5. Surfaces which are to receive a high heat coating shall be Near White Blast Cleaned (SSPC, SP-10) and painted within eight hours; or, if recommended by the manufacturer of the approved high heat coating, the surfaces may be thoroughly cleaned to bare metal and given wash coats or a cold phosphatizing treatment as recommended by the manufacturer and as approved by the Engineer.

C. Clean up all debris from the surface preparation operation.

3.04 ABRASIVE BLASTING

A. Abrasives shall be expendable coal slag or aluminum oxide, free of silica, or a steel shot/grit mixture. Maintain abrasives free from dust, salts, and other impurities. Select the type and size of abrasive to yield a surface as specified in the Coatings Schedule.

B. Provide moisture and oil separators or traps of adequate size in compressed air system to provide dry and clean air supply. Drain traps automatically during blasting operation. Remove oil and moisture accumulated in air receiver by regular purging.

C. Remove weld splatter, slivers, laminations, and underlying mill scale which become visible after abrasive blasting, by grinding in accordance SSPC SP-3 and NACE RP0178. Follow grinding by final abrasive blast.

D. Surfaces which cannot be properly cleaned by abrasive blasting because of their location may be prepared by power tool cleaning in accordance with SSPC SP-11 (Power Tool Clean to Bare Metal) in lieu of abrasive blasting, subject to Engineer's approval.

E. After surface preparation but prior to priming inspect surface for corrosion. Remove corrosion products which become visible when viewed without magnification by re-blasting.

F. Remove dust and blasting residue by blowing with clean, dry air, and vacuum cleaning with clean tools.

3.05 MIXING AND THINNING

A. All mixing shall be performed by mechanical paint shakers or mixers in strict accordance with the manufacturer's printed instructions.

B. Do not use coating material which has livered, gelled, or otherwise deteriorated during storage. Thixotropic materials which obtain normal consistency when stirred are acceptable. Where a skin has formed in container, cut skin loose from sides of container and discard prior to mixing.

C. Each component of multi-component materials shall be mixed individually before use. The material shall be mixed in a manner which will insure the break-up of all lumps, complete dispersion of pigment, and a uniform composition. Materials shall be inspected after mixing for uniformity and to verify that no unmixed pigment remains at the bottom of the container.

D. The individual parts shall be mixed together in the proportions recommended by the manufacturer. The materials shall be mixed thoroughly before use and shall be agitated often enough during application to ensure a uniform composition.

E. Mixed coatings shall be strained after mixing unless the application equipment is provided with strainers. Strainers shall be of a type to remove skins and undesirable matter without removing pigment.

F. Thinner shall not be added unless required for proper application. Thinning shall be in strict accordance with the manufacturer's recommendations.

G. Mixed coatings shall have pot life stated on label and indicated in approved Shop Drawing. When pot life limit is reached, discard material, clean equipment, and mix and induct new material.

H. Store materials not in actual use in tightly covered containers. Maintain containers and equipment used in storage, mixing, and application in clean condition, free of foreign materials and residue.

3.06 COATING APPLICATION

A. Apply prime coat within eight hours of completion of surface preparation. If surface is degraded, contaminated, or wet by rain or moisture subsequent to surface preparation and prior to coating, restore surface in accordance with Specifications.

B. Prior to applying each coat, remove dust with industrial vacuum cleaner using new filters, clean tools, and clean hopper. Remove residue or foreign matter on coating before applying additional coats by pressure rinsing with 1800-2000 psi water, when required by Engineer's representative.

C. Apply coatings in accordance with applicable provisions of SSPC Paint Application Specification PA 1. Use equipment best suited for the coating material.

D. Cloudiness, spotting, laps, brush marks, roller marks, runs, sags, drips, ropiness, voids, discontinuities, pinholes, and other surface imperfections are unacceptable.

E. When spray application is approved by Engineer. Spare fittings, gun tips, gun parts, and other spray equipment shall be acceptable to Engineer.

F. Stripe coat edges, welds, corners, crevices, and other surfaces difficult to coat before applying full coat in accordance with SSPC-PA 1.

G. Coverage shall be in conformance with the manufacturer's instructions. The dry mil thickness of coatings shall be as specified in the Coating Schedule.

3.07 APPLICATION BY SPRAYING

A. Application of coatings by spraying may be permitted in locations and on surfaces approved by the Engineer. The Contractor must submit for approval a written request giving the proposed locations and the coating manufacturer's instructions for spray application. Applicator and equipment must conform to the following paragraphs:

1. Spraying shall conform to the manufacturer's recommendations.

2. Equipment:

   a. The spray equipment used shall be suitable for the intended purpose, capable of properly atomizing the coating, and equipped with suitable pressure regulators and gages. The equipment shall be in good working order.

   b. Spray equipment shall be kept sufficiently clean so that dirt, dried coating, and other foreign substances are not deposited with the coating.

   c. All solvents used in cleaning the equipment shall be completely removed before use.

   d. The equipment manufacturer's instructions for proper use shall be strictly followed.

3. Air Spray:

a. Air caps, nozzles, and needles shall be those recommended by the manufacturers of the coating system and spray equipment being used.

b. Moisture and oil separators or traps shall be used in the compressed air system to provide a dry and clean air supply. The traps or separators must be of adequate size and must be drained periodically during the coating application.

4. Airless Spray:

a. Fluid tips shall be of the proper orifice size and fan angle, and the fluid control gun of proper construction, as recommended by the manufacturer of the coating system and the spray equipment being used.

3.08 CURING

A. Each coat shall be in a proper state of cure or dryness prior to the placement of the succeeding coat. Coating shall be considered sufficiently dry for recoating when an additional coat can be applied without the development of any detrimental film irregularities such as lifting, wrinkling, or loss of adhesion of the undercoat. Where an overcoat will not properly adhere to an overly cured undercoat, it shall be applied within the time period recommended by the manufacturer.

B. The curing times for the coatings shall conform to the coating manufacturer's recommendations considering ambient temperature and relative humidity.

3.09 FIELD QUALITY CONTROL

A. Thickness - The Contractor shall furnish the Engineer a suitable thickness detector of a type recommended by the coating manufacturer. Dry film measurements shall be taken in accordance with SSPC-PA 2.

B. The color of the prime coat shall be beige when available. It shall be inspected before application of intermediate or finish coats.

C. Intermediate Coats shall be the approximate shade of final coat; however, each coat shall be of a slightly different tint. Each coat shall be inspected and approved before the next coat may be applied; otherwise, credit will not be given and the Work shall be recoated.

3.10 PATCHING AND REPAIRS

A. All defective coatings shall be removed or repaired as the Engineer may direct. Surfaces with defective shop primer shall be repaired per the manufacturer's recommendations of the system in the Coating Schedule.

B. Before final approval of the Work all damaged coating surfaces (field or factory applied) shall be cleaned and repainted or touched up as directed.

3.11 CLEANING

A. Remove coating and splatter inadvertently placed on items not scheduled to be coated. Remove splatter by washing or scraping, taking care not to scratch or otherwise damage finished surfaces.

B. Remove and dispose spent abrasives, discarded coating materials, rubbish containers, rags, and other debris at the end of each work day.

3.12 MARRED EXISTING FINISHES

A. Existing buildings, pipelines, plumbing, etc., marred during construction by the Contractor shall be repainted to match the existing coating. Repainting shall be carried far enough to match the newly painted area with the existing coating.

B. Surface preparation, primer, and finish coats shall be in accordance with the Coating Schedule.

PART 4 SPECIAL PROVISIONS

4.01 COLORS

A. The colors used shall be selected by the Owner and the Engineer, from the manufacturer's standard colors.

B. All pipelines and associated equipment shall be color coded and banded as follows.

C. Banding shall consist of 3-inch wide painted bands at 30-inch center to center.

D. Color Schedule:

Item	Color
Raw Sewage Piping in Control Building or Wet Well	Light Gray
Vent Pipes	Safety Yellow.
Pipe Bollards	Safety Yellow

4.02 COATING SCHEDULE

A. The following coating schedules is not guaranteed to be complete. The coating systems manufacturers are listed in no particular order, any of the four listed systems, or equal may be used.

Wastewater					
		Carboline	**Tnemec**	**AkzoNobel (International, Devoe, Glidden Professional)**	**Sherwin Williams**
A.	Ferrous metals, except galvanized or stainless steel, submerged or partially submerged in wastewater or non-submerged exposed to splash or spill, including all tank mechanisms and tank mechanism support structures; clips, beams, and walkway supports; pipes, valves, sluice gates, scum baffles, and weirs: Project Specific Components: Wet Well Piping				
	Surface Preparation:	SSPC-SP 10 (NACE 2) Near White Blast Cleaning with a 1.5-2.0 mil Profile	SSPC-SP 10 (NACE 2) Near White Blast Cleaning with a 2.0 mil Profile	SSPC-SP 10 (NACE 2) Near White Blast Cleaning with a 1.5-2.0 mils Profile	SSPC-SP 10 (NACE 2) Near White Blast Cleaning with a 1.5-2.0 mil Profile
	Primer:	1 coat, Carboguard 890 (4.0-6.0 mils DFT)	1 coat, N140 Pota-Pox Plus (DFT 3.0-5.0 mils).	N/A	1 coat, Macropoxy 240 (DFT 3.0-5.0 mils)
	Field Finish:	2 coats, Bitumastic 300m (8.0-16.0 DFT per coat)	2 coats, 46H-413 HB Tneme-Tar, (DFT 8.0-10.0 mils per coat).	N/A	2 coats, Targuard Coal Tar Epoxy (DFT 8.0-16.0 mils per coat)
B.	Exterior nongalvanized, ferrous metal surfaces not submerged: Project Specific Components: Vent Pipe				
	1. Subject to splash or spills or atmospheric:				
	Surface Preparation:	SSPC-SP 6 (NACE 3) Commercial Blast Cleaning, surface profile 1.5-2.0 mils	SSPC-SP 6 (NACE 3) Commercial Blast Cleaning, surface profile 1.5- 2.0 mils	SSPC-SP 6 (NACE 3) Commercial Blast Cleaning, surface profile 1.5-2.0 mils	SSPC-SP 6 (NACE 3) Commercial Blast Cleaning, surface profile 1.5-2.0 mils
	Primer:	1 coat, Carbozinc 859 (3.0-5.0 mils DFT)	1 coat, 90-97 Tneme-Zinc, (DFT 2.5-3.5 mils).	1 coat, CathaCoat 313 (DFT 2.0-4.0 mils)	1 coat, Corothane I Galvapac (DFT 2.0-4.0 mils)
	Intermediate:	1 coat, Carboguard 60 (4.0-6.0 mils DFT)	1 coat, 27 Typoxy, (DFT 2.5-4.0 mils).	1 coat, Devran 224HS (DFT 4.0-8.0 mils)	1 coat, Macropoxy 646 (DFT 3.0-5.0 mils).

	Final:	1 coat, Carbothane 134HG (2.0-2.5 mils DFT)	1 coat, 72/73 Endura-Shield (DFT 2.5-5.0 mils).	1 coat, Devthane 359 (DFT 3.0-5.0 mils)	1 coat, Hi-Solids Polyurethane (DFT 3.0-5.0 mils).
C.	Interior, nongalvanized, ferrous metal surfaces of items such as pipe; machinery, equipment; doors and door frames; rolling doors; exposed ductwork; hoppers, chutes, pipe supports, trays, and hangers; walkway platforms; stairs; structural members; floor frames and covers; miscellaneous metal tanks shall be finished as follows: Project Specific Components: Piping in the Control Building				
	Surface Preparation:	SSPC-SP 6 (NACE 3) Commercial Blast Cleaning, surface profile 1.5-2.0 mils.	SSPC-SP 6 (NACE 3) Commercial Blast Cleaning, surface profile 1.5-2.0 mils.	SSPC-SP 6 (NACE 3) Commercial Blast Cleaning, surface profile 1.5 to 2.0 mils.	SSPC-SP 6 (NACE 3) Commercial Blast Cleaning, surface profile 1.5-2.0 mils.
	Primer:	1 coat, Carboguard 60 (DFT 4.0-6.0 mils)	1 coat, 27 Typoxy (DFT 2.0-4.0 mils).	1 coat, Devran 201H (DFT 2.0-3.0 mils)	1 coat, Recoatable Epoxy Primer, Macropoxy 646 (DFT 3.0-5.0 mils).
	Finish:	2 coats, Carboguard 60 (DFT 4.0-6.0 mils per coat)	2 coats, N69 H.B. Epoxoline II, or equal (DFT 4.0-6.0 mils per coat).	2 coats, Devran 224 HS (DFT 4.0-6.0 mils per coat)	2 coats, Macropoxy 646, (DFT 4.0-6.0 mils per coat).

END OF SECTION

SECTION 11050
COMMON EQUIPMENT REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

A. The Section includes the general requirements for all equipment installed under this Contract.

B. Equipment items shall meet the requirements specified herein, plus the specific requirements noted in the technical sections.

C. The specific requirements included under a particular section shall take precedence.

D. Additional product requirements are specified in Section 01350.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Specific equipment submittals are specified in the related sections.

b. Equipment shop drawings shall include outline and dimension drawings of the actual equipment being furnished.

c. With the shop drawings, the complete motor nameplate data shall be furnished as well as all information requested below which may not be on the motor nameplate:

1) Manufacturer.

2) Rated Horsepower.

3) Operating Speed Range*.

4) Operating Voltage(s).

5) Current Draws at Operating Voltage(s)*.

6) Operating Frequency (Hz).

7) Service Factor.

8) Type Enclosure.

9) Frame Size.

10) NEMA Design Designation.

11) Locked Rotor Code Letter.

12) Duty Rating.

13) Minimum Full Load Efficiency.

14) Nominal Efficiency*.

15) Power Factor*.

16) Maximum Size Capacitor Permitted to be Connected to Motor.

17) Insulation Class.

18) Location of motor terminal housing (F1 or F2).

19) Motor no load sound pressure level of dB(A) weighted at 3 feet from motor.

20) Motor Full Load Sound Pressure Level of dB(A) - weighted at 3 feet from motor.

21) Bearing Ratings.

22) Full Load Torque.

23) Break Down Torque.

24) Locked Rotor Torque.

* Provide data at following loads: Service factor (if greater than 1.0) times full load (i.e., 1.15 x full load), 100%, 75%, 50%, 25%, and no load.

d. Minimum full load efficiency shall be tested in accordance with IEEE Standards 112 Test Method B as described in Section 6.4 of IEEE Standard 112. Polyphase motors larger than 125 horsepower shall be listed in accordance with IEEE Standard 112 with stray-load loss determined by direct or indirect measurements.

2. Information for the Record:

a. Operation and maintenance manual.

1.03 QUALITY ASSURANCE

A. Manufacturer's name, make, model number and other designations provided in the contract documents are to establish the significant characteristics, including but not limited to, type, function, dimensions and physical properties, performance, and appearance for the purpose of evaluating comparable products. Contractor shall verify product, equipment or system proposed meets or exceeds the requirements as specified or shown on the drawings.

1.04 ELECTRICAL AND CONTROL COORDINATION

A. If the current requirement of any motor or piece of equipment is increased to such an extent that the wiring, conduit, and/or starter for that motor or equipment must be increased from that shown on the Electrical Drawings, the Contractor shall furnish and

install the larger items. The increased wiring, conduit, and/or starter cost shall be included under the Contract and no additional compensation will be allowed.

B. All electrical, instrumentation, and control equipment and panels furnished under this Contract shall conform to appropriate Sections of Division 16 of these Specifications. Equipment and panels shall be NEMA 4X, unless otherwise shown on the Drawings or Specifications.

C. Certain equipment items shall be connected to the plant control system as shown on the Control (P&ID) Drawings. Those connections and any remote control connections shall be wired to clearly labeled terminal strips within the equipment control panel.

D. Analog signals for input to a programmable controller system or other device shall be 4-20 mADC and where required, current to current transducers or other device shall be furnished to produce an isolated signal to the programmable controller analog input module.

E. Digital input signal sources shall provide an isolated contact rated at 5-amp minimum, 115 VAC for AC programmable controller inputs or devices and 1 amp minimum 28 VDC for DC rated inputs or devices.

1.05 PRODUCT HANDLING

A. Unless otherwise specified in the individual sections, the Contractor shall deliver, handle, store, and maintain materials and equipment in accordance with the requirements of the manufacturer.

B. Materials, equipment, and articles to be incorporated into the Work shall be stored so as to facilitate inspection and inventory and, in such manner, as to ensure the preservation of their quality and fitness for the Work. Stocked materials shall be subject to test and shall meet the requirements of the Specifications at the time of substantial completion of the Work.

C. Where construction is in roads or streets, that portion of the right-of-way not required for public travel may be used for temporary storage purposes unless otherwise prohibited. Materials shall not be stored in areas where such storage creates a hazard. Any other additional space required for construction or storage of materials and equipment shall be obtained by the Contractor at his expense.

D. The Contractor shall confine his equipment, the storage of materials and equipment, and the operations of his workers to areas permitted by law, ordinances, permits, and the requirements of the Contract Documents, and shall not unreasonably encumber the premises with materials or equipment.

E. Switchgear, motor control centers, panelboards, instrument control panels, fixtures, and like equipment shall be received and stored in a dry, clean, dust-free, heated area. If no such area is available at the time such equipment is received, such space shall be provided by the Contractor at no expense to the Owner. If equipment is stored in an area conducive to the formation of condensation, heaters shall be provided to prevent

condensation. Once the equipment is installed in its final position, suitable protection shall be provided to prevent damage by falling material, dust, paint, dirt, and moisture.

PART 2 PRODUCTS

2.01 GENERAL

A. AC motor(s) shall conform to the latest applicable NEMA, IEEE, and ANSI standards.

B. Motor installation shall not exceed 88 dB(A) weighted maximum level at 3 feet from the motor throughout the entire speed range and load range.

C. Motor bearings shall be antifriction type, grease lubricated with a minimum L-10 rating of 17,500 hours for belted duty and 100,000 hours for direct coupled duty.

1. Thrust bearings in vertical motors shall be adequate for the loading encountered.

2. Belt-driven power systems with jackshafts, and couplings, to isolate the belt loadings from the motor bearings shall be regarded as direct coupled duty.

D. Motor conduit boxes shall be sized with capacity to meet the requirements of the National Electrical Code. Motors shall be furnished in an “F1” terminal housing assembly (facing connection box, motor shaft extension is to the right) unless otherwise shown on Drawings or specified.

E. Motor frames shall be cast iron construction with corrosion resistant hardware.

F. Each motor shall be continuous duty rated NEMA Design B with normal starting torque, unless otherwise shown or specified.

G. Output torque and speed characteristics of each motor shall be suitable to operate the connected load over the full range of operating speeds and load conditions without exceeding the nameplate current rating or temperature rise on a continuous duty basis.

H. Insulation shall be Class F or Class H.

I. Each polyphase squirrel-cage induction motor shall meet or exceed minimum and nominal efficiencies listed in NEMA MG-1, Table 12-10.

2.02 AC MOTORS UNDER 1 HP

A. Unless otherwise shown or specified, each fractional motor under 1/2 hp shall be designed for single phase, 115 and 230 volt, 60 Hz service.

B. Unless otherwise shown or specified, each fractional motor 1/2 through 3/4 hp shall be designed for 3 phase, 208, 230, and 460 volt, 60 Hz service.

2.03 INTEGRAL AC MOTORS

A. AC motor(s) 1 hp and larger shall have a 1.15 service factor at a 40 degrees C ambient temperature. Motor shall be capable of operating at the 1.15 service factor rating on a continuous basis per NEMA MG1-12.42 Item 1b.

B. Motor enclosure types shall be as specified in the equipment specifications and shall be of one of the following designations.

1. Open drip-proof protected (ODP).
2. Totally enclosed non-ventilated (TENV), or totally enclosed fan cooled (TEFC).
3. Explosion proof Class 1, Division 1, Group D.
4. Submersible water cooled.

C. Multi-speed motors shall have the energy efficient design designated for the high-speed winding operation.

2.04 SPECIAL APPLICATION MOTOR(S)

A. Special application motor(s) are defined as those used on such devices as appliances, tools, unit heaters, door operators, refrigeration units and sump pumps.

B. Manufacturer's standard motor may be approved by the Engineer where a redesign of the unit would be required to furnish energy efficient motors.

2.05 DEFINITE PURPOSE MOTORS

A. Equipment requiring a motor drive with unusual characteristics shall be equipped with a definite purpose motor to meet the necessary requirements.

1. Definite purpose motors are hermetic refrigeration compressors, jet pumps, shaft mounted fans and blowers, submersible deep well pumps, submersible mixers, elevator, crane, close coupled pumps, and torque motors.
2. If available, an energy efficient design motor shall be furnished on this application.

2.06 MOTORS ON VARIABLE FREQUENCY DRIVES

A. Motors for use with a Variable Frequency Drive (VFD) shall be TENV, TEFC, or submersible, water cooled.

1. Design to meet or exceed the efficiencies listed in NEMA MG-1, Table 12-10.
2. Motor shall be "Inverter Duty Rated", and so stamped on the nameplate.
3. Motor shall have an insulation system that meets or exceeds the requirements of NEMA MG-1, Part 31.40.4.2, and is rated at 1600 volts peak to ensure that the motor is rated for operation with non-sinusoidal waveforms at 1.0 service factor.
4. Bearings in motors greater than NEMA Frame size of 300 and controlled by variable frequency drives must be guaranteed against premature bearing failure caused by discharge current. All such motors shall be provided with a shaft grounding device.

B. AC motor used with a VFD shall have internal thermal protectors guaranteed by the motor manufacturer to protect the motors against overheating from stalled or slow turning due to lack of adequate cooling at low motor speeds.

1. Thermal protection devices shall be imbedded within the motor windings with normally closed contacts to be used in series with the coil of the motor's magnetic bypass starter and the stop circuit on the VFD.

2. Thermal protection devices shall all be provided and housed within the motor housing, unless otherwise specified.

C. Explosion proof motors shall use thermal protectors required by UL as covered by 2.08, and meet the requirements of 2.06 preceding, and shall be rated and labeled for "Inverter Duty".

D. Tachometer generators when required by the Specifications or the P&ID Drawings shall be DC generators of the enclosure required for the particular motor location.

2.07 DIRECT CURRENT MOTORS ON VARIABLE SPEED DRIVES (VSD)

A. Each motor shall be equipped with internal thermal protectors as covered in 2.06. Permanent magnet field DC motors are not acceptable.

B. Motors and tachometer generators shall be in totally enclosed non-ventilated or totally enclosed fan cooled enclosures except where required to be explosion proof motors.

2.08 EXPLOSION PROOF MOTORS

A. AC motors for use in a Class I, Division 1, Group D location shall meet the requirements of paragraph 2.01 above.

B. Explosion proof motors 3 hp and larger shall have a 1.15 service factor. Such motors shall be capable of operating at the 1.15 service factor rating on a continuous basis per NEMA MG1-12.42 Item 1b.

C. Each motor shall be furnished with internal thermal protectors with normally closed contacts that will open should the safe operating motor temperature be exceeded per UL requirements. These contacts shall be placed in series with each other and with the coil of the magnetic motor starter, and/or the VFD enable circuit if used with a VFD, on all applications.

2.09 MOTOR SPACE HEATERS

A. Space heaters as specified or shown on the Drawings shall be factory installed by the motor manufacturer.

2.10 V-BELT DRIVES

A. Belts for V-belt drives shall be provided with a minimum service factor of 2.0.

B. Drives shall be submitted with manufacturer's data supporting the horsepower rating of the V-Belt drives being used.

C. Assembled cog belts and other assembled belt drives are not acceptable.

D. V-Belts on multiple V-Belt drives shall be provided in matched sets.

E. The Contractor shall provide one spare belt or one spare matched set of drive belts, whichever is applicable, for all belt-driven equipment supplied under this Contract. The spare belts shall be the same size, type, and quality as supplied by the equipment manufacturer.

2.11 COUPLED DRIVES

A. Coupled drives shall have the service factor recommended by the coupling manufacturer.

B. Coupled drives shall be submitted with engineering data supporting the horsepower rating of each coupling.

2.12 SAFETY GUARDS

A. Installed equipment shall be equipped with all guards, shields, and devices to meet OSHA requirements.

B. Chain and belt guards shall be totally enclosed steel construction, 14-gauge minimum for guards up to 60-inch center distance and 12-gauge minimum for larger guards.

C. Guards shall include expanded metal inspection panels. Removable access panels shall be provided to perform routine maintenance.

2.13 MANUFACTURER'S NAMEPLATE

A. Equipment shall be identified by permanently attached nameplate of corrosion-resistant metal. Plates shall bear the following information:

1. Manufacturer's name.
2. Serial and model numbers.
3. Rated capacity.
4. Temperature, pressure, or other limitations.

2.14 ANCHOR BOLTS

A. Equipment anchor bolts shall be as specified in Section 05500.

PART 3 EXECUTION

3.01 INSTALLATION

A. Equipment shall be installed in accordance with the manufacturer's instructions and Contract Documents. Required anchors, grout, and leveling shims shall be provided by the Contractor.

B. Alignment procedures and acceptable runout tolerances on couplings shall be submitted.

3.02 ROTATING EQUIPMENT ALIGNMENT

A. To aid in the field alignment of all equipment base plate mounted rotating equipment, push bolts (jacking bolts) shall be furnished and welded to the base plate.

B. All rotating equipment shall be field checked for alignment after installation and initial operation. The equipment shall be at operating temperature. The minimum method of indicating alignment will be the "16-point" method. Other proposed methods must be submitted for approval to the Engineer.

C. The alignment results are to be submitted for record. They are to include the final set of indicator readings and a plan view sketch of the motor and driven machine base, and the thickness of shims for each shimmed anchor bolt. The thickness of shims shall not exceed 0.25 inches.

3.03 INITIAL LUBRICATION

A. Initial lubrication required for start-up, field test operation, and normal operation prior to substantial completion shall be furnished and applied in accordance with the manufacturer's recommendations.

B. Where lubricating points are not easily accessible, provide extensions as required for easy access with normal grease gun.

3.04 PACKING

A. Each shaft containing a packing gland shall be checked for condition by backing the packing gland off and examining for proper grade, amount, and type of packing as recommended by the manufacturer.

3.05 MAINTENANCE

A. The Contractor shall perform and log all preventive maintenance tasks as recommended by the manufacturer while the equipment is in storage and after installation until the equipment has been accepted by the Owner.

3.06 TROUBLESHOOTING

A. Should a problem occur before acceptance, the Contractor shall determine the cause and recommend corrective actions to the Engineer. The Contractor shall correct equipment and installation deficiencies.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 11735
PUMPING EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the furnishing and installing of pumping equipment as shown on the Drawings, as scheduled in Part 4, and as specified herein.

B. The pumping equipment shall be furnished with all drives, drive shafts, couplings, steady bearings, belts, drive shaft and belt guards, drive bases, pump bases, anchor bolts, anchor bolt sleeves, and other appurtenances as specified or required for a complete installation and satisfactory operation.

C. All Work performed under this Section shall be in accordance with all approved trade practices and manufacturers' recommendations.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:
   - a. Manufacturer's warranty.
   - b. Manufacturer certification/affidavit.
   - c. Manufacturer's literature.
   - d. Manufacturer's certified test curves
   - e. Information and data concerning the materials of construction, salient components and details of construction of equipment and components.
   - f. Motor data in accordance with Section 11050.
2. Information for the record.
   - a. Manufacturer's installation instructions.
   - b. Operation and maintenance manuals.
   - c. Manufacturer's certification of installation.

1.03 QUALITY ASSURANCE

A. Manufacturer Warranty and Service Packages:

1. Warranty Submittals - At the time of shop drawing submittal, the Contractor shall submit a written warranty from the manufacturer(s) covering workmanship and materials on all pumps

2. Warranty period shall be a prorated five-year term.

3. The warranty period shall commence on the date of Substantial Completion.

4. Under terms of this warranty, the manufacturer shall furnish and install all replacement parts for any defective component at no cost to the Owner. The provisions of this warranty shall not be construed as relieving or reducing the obligations of the Contractor outlined in the General Conditions of these Specifications.

PART 2 PRODUCTS

3.01 PUMPS

A. General:

1. Each pump shall be designed and furnished to meet the operating conditions specified in Part 4 of this Section. The type of pump for each service is given in the Schedule in Part 4.

2. Each pump shall be of the manufacturer and model listed in Part 4 or equal.

3. Each pump shall be shop tested in accordance with standards of the Hydraulic Institute. Certified test curves shall indicate discharge rate, head, efficiency, brake horsepower, and speed. No pump shall be shipped to the job site until the test curves have been reviewed by the Engineer.

B. Submersible Pumps and Accessories

1. Submersible centrifugal pumps shall be in accordance with the requirements described in the following paragraphs and in Part 4 of this Section.

2. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities.

3. The motor shall be explosion proof and conform with Section 11050 and the following.

a. The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T.

b. The motor shall be fitted with tandem mechanical shaft seals with two seal sets each set with independent springs. The lower (primary) seal between the pump and seal chamber shall contain one each stationary and positively driven rotating corrosion and abrasion resistant tungsten carbide ring. The upper seal located between the seal chamber at the inspection chamber shall be a leak-free seal.

c. The motors shall have moisture sensors to detect moisture from a primary seal failure.

d. The motors shall have thermal overloads imbedded in the motor windings.

e. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

f. Stainless steel nameplates shall be attached to the pump and drive motor giving the manufacturer's model and serial number, rated capacity, head, speed, and all pertinent data.

g. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The rotor bars and short circuit rings shall be made of aluminum.

h. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable.

i. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C.

j. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out.

k. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

4. The pump impeller shall be constructed of Flygt's trademark "Hard-Iron" material (ASTM A-532 (Alloy III A) 25% chrome cast iron), dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design.

5. Manufacturer Provided Accessories – The following accessories shall be provided by the pump manufacturer.

   a. Control Panel

      1) Duplex Pump Control Panel with MultiSmart Pump Station Manager.

      2) 480V, 3 Phase NEMA 4X SST Control Panel with Inner Door

      3) Main Disconnect.

      4) Circuit Breakers Pump Disconnects.

      5) 480 V Phase Monitor.

      6) Pilot Lights.

      7) Hand Off Auto Selector Switch.

      8) Flygt Mini Cas Relays.

      9) Intrisically Safe Terminal Strip.

      10) The Multismart shall be factory programmed with a copy of the programming provided to the District.

      11) Variable Frequency Drives.

      12) Installation and wiring outside of the panel will be performed by the Contractor.

   b. Level Sensors

      1) Primary Level Sensor – MJK Expert 2100 Level Transmitter or approved equal pressure transducer. The measurement range shall be 0 to 30-feet corresponding to MJK Order No. 209925.

      2) Backup Level Sensor - Flygt Level Probe – Multitrode. The Multitrode shall be 224-inches in length with 10 sensors.

   c. Guide Rail System including cast iron base elbow, stainless steel guide rail brackets, stainless steel intermediate brackets and stainless-steel lifting cables. The base elbow and shall support the pump when the pump is in operational position. The pump shall be easily removed from its chamber to ground level for inspection or service without requiring dewatering of the chamber. This shall be accomplished by utilizing a sliding guide bracket attached to the pump, two guide bars adequately braced, a stainless steel chain reaching ground level, and a specially formed discharge flange that will automatically and firmly connect and disconnect with the discharge pipe without bolts, nuts, fasteners, or extreme force.

6. The Contractor may wish to reference the Engineer's Quote number #032-081021-JM1 obtained from Flygt's representative, John Miller, 614-561-1770,

John.Miller@buckeyepumps.com, Buckeye Pump, 1311 Freese Works Place, Galion, OH 44833 .

7. The Contractor should be aware that the pump manufacturer may not include all the required accessories as part of a standard bill of materials and will be required to provide those items not supplied by the pump manufacturer.

2.02 VARIABLE SPEED DRIVES AND CONTROLS

A. Variable Frequency Drive:

1. Variable frequency drives shall include a combination fused-disconnect starter, controller, controller enclosure, and motor.

2. The controller and motor shall be standard products, furnished as matched components, by a single manufacturer.

3. The controller input and output current shall be three-phase, 460 volts, ungrounded, and 60 Hz. All drive components shall be sized to operate the pump at any point on the family of speed curves from 25% to 100% of the pump base speed without exceeding the nameplate rating of the motor and controller, and without requiring external cooling.

4. In addition to the standard controller features, the following accessories (mounted and wired) shall be provided:

a. Plug-in tester card for use during start-up and for simplified trouble shooting. The tester card shall allow monitoring the different signals within the controller.

b. A through-the-door incoming line circuit breaker.

c. An output contactor.

d. A process controller interface to allow remote speed control from a process controller.

e. Operator control devices:

1) Start-stop push-buttons.

2) Speed adjustment.

3) LOCAL-REMOTE selector switch for selection of speed control. In the remote position, provide a separate contact block for a signal to the Plant Control System.

4) Pilot light push to test type (running).

f. Auxiliary contacts to provide signals to a remote panel of the following occurrences:

1) Fault condition (IET trip).

2) Motor running.

3) Motor stopped.

4) Out of service (auxiliary contact on circuit breaker).

5) Speed control selector switch in remote position.

g. Voltage to current transducer to provide an isolated 4-20 mA speed signal for remote monitoring.

h. Control transformer of sufficient capacity to operate all furnished accessories plus an additional capacity of 100 VA for external use.

i. All connections for the remote panel shall be wired to terminal blocks with positive identification of the function.

5. The controller and all accessories shall be mounted in a floor standing NEMA 12 enclosure.

6. It is intended to control the speed of the motors remotely. The converter signal circuits shall be isolated from the power circuits and designed to accept a speed signal from the future process controller. The signal shall control the motor speed between adjustable minimum and maximum speed settings. Maximum speed shall be field adjustable to 100% of rated speed. A motorized reversible potentiometer (or equivalent) with adjustable speed control shall be provided to accept separate increase and decrease speed control signals from the proceeds controller. All equipment and devices necessary to interface the variable speed control with the process controller shall be furnished and installed. A 4-20 mA signal, proportional to speed, shall also be provided.

2.03 RESERVED

PART 3 EXECUTION

3.01 ERECTION AND INSTALLATION

A. The equipment shall be erected and installation in accordance with the manufacturer's recommendations. Required grout and leveling shims shall be provided by the Contractor.

3.02 INITIAL LUBRICATION

A. Initial lubrication required for start-up and field test operation shall be furnished and applied in accordance with the manufacturer's recommendations.

3.03 INSPECTION, START-UP, AND TESTING

A. The Contractor shall furnish a qualified representative of the manufacturer to perform inspection, start-up, and training services. The manufacturer's representative shall be experienced in the installation, start-up, operation, and maintenance of the equipment.

B. The representative shall check the installation and supervise final adjustments and initial start-up of the equipment. The representative shall certify that the installation is correct and that the equipment is operating satisfactorily.

C. Within two weeks of start-up, the manufacturer shall submit to the Engineer a written report (minimum 4 copies) covering the representative's inspection and start-up of the equipment. This report shall include the manufacturer's certification that the installation is correct and that the equipment is operating satisfactorily.

D. After the installation and operation of the equipment has been certified, the manufacturer's representative shall train the Owner's personnel for one, eight-hour day in the proper operation and maintenance of the equipment. The Owner may videotape the training.

PART 4 SPECIAL PROVISIONS

4.01 PUMP SCHEDULE

A. The following tables provide the operating conditions, type of pump, manufacturer name and model number, along with salient features specific to each manufacturer. The pumps listed are selected for the specified service and acceptable to the owner.

B. The listed pumps, for the specified service, are intended to match the Owner's parts inventory. No equals will be permitted.

Description	Specification
Quantity	2
Type	Submersible
Manufacturer	Flygt
Model No.	NP 3202 MT 3~643
Impeller Diameter	7-7/8-inch (314 mm)
Impeller Material	Flygt Hard Iron
Motor Number	3202.095 30-18-6AA-W
Motor HP	35 hp
Drive Type	Variable Speed Drive
Maximum Operating Speed	1165 rpm
Voltage	460 V
Phase	3
Design Point (gpm/ft TDH / Speed)	2000 gpm at 39 ft and 60Hz
Certified Test Curve (Yes/No)	Yes

4.02 SPARE AND MAINTENANCE PARTS

A. Any special tools required for adjustment or maintenance. Special tools would be any tools that can only be purchased from the pump manufacturer.

B. No spare parts required.

4.03 PUMP OPERATING SCHEME

A. The pumps shall be initially programmed to function according to the following:

1. Pumps shall be programmed to operate in a conventional alternating lead / lag order
2. The Pump shall turn on at 40 Hz and run for 30 seconds (delivering roughly 1500 gpm).
3. After 30 seconds the pumps shall increase speed to 55 Hz (delivering roughly 2100 gpm).
4. The pump shall run at 55 Hz until the following occurs
   a. The Pump Off Level is reached
   b. 4 minutes of running at 55 Hz passes
5. If the pump runs longer than 4 minutes at 55 Hz the pumps shall increase in speed to 60 Hz. The pump shall run at 60 Hz until the Pump Off level reached.

END OF SECTION

SECTION 13665
PREFABRICATED PRECAST CONCRETE BUILDING

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the design, furnishing, and installation of a complete package Prefabricated, Precast Concrete Building.

B. The Prefabricated Precast Concrete Building shall include, but not be limited to, the following items as specified here in:

1. Precast concrete composite structure assembly (building), factory-fabricated to the nominal dimensions shown on the Drawings.
2. Design in accordance with local codes.
3. Exterior and interior finishes.
4. Accessories and appurtenances as specified or shown on the Drawings.
5. Insulation.

C. The Section shall include a precast concrete building.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Submittals for Review:
   a. General arrangement and scaled dimensional drawings.
   b. Materials of construction.
   c. Manufacturer's product literature for each component or product incorporated into the building.
   d. Manufacturer’s Warranty(s); five-year warranty on quality and workmanship on the precast concrete building. One-year warranty on all other items.
2. Information for Record:
   a. Design certifications and calculations sealed by Professional Engineer responsible for enclosure design. The Professional Engineer shall be licensed in the state where the enclosure is to be constructed.

1.03 QUALITY ASSURANCE

A. Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.

1. American Society for Testing and Materials (ASTM).
2. NPCA - National Precast Concrete Association.
3. Building Code requirements for structural concrete (ACI 318), American Concrete Institute.
4. Minimum design loads for buildings and other structures (ASCE-7), American Society of Civil Engineers.
5. Precast and prestressed concrete design handbook, Precast Concrete Institute.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE BUILDING ENCLOSURE

A. Provide a complete, integrated set of mutually dependent components and assemblies that form a precast concrete building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include roof and wall panels, insulation, and accessories complying with requirements specified and shown on the Drawings.

B. Structural Performance - Provide building systems capable of withstanding the effects of dead loads and the following loads within limits and under conditions indicated:

1. Design Loads Criteria:
   a. Building Category: III (per building code)
   b. Ground Snow Load: 25 psf
   c. Snow Exposure Factor, Ce: 1.00
   d. Snow Importance Factor: 1.10
   e. Roof Live Load: 20 psf (minimum)
   f. Collateral Roof Load: 10 psf
   g. Basic Wind Speed: 90 mph
   h. Wind Exposure Category: C
   i. Wind Importance Factor: 1.15
   j. Seismic Design Category: B
   k. Seismic Site Class: D
   l. Seismic Importance Factor: 1.25
   m. 0.2 sec Spectral Response Acceleration: 0.16

n. 1.0 sec Spectral Response Acceleration: 0.05

o. Auxiliary loads: See drawings.

2. Wind Loads - Include horizontal and vertical loads induced by a basic wind speed corresponding to a 50-year mean-recurrence interval at Project site to develop both stress and deflection calculations.

3. Seismic Loads - Include horizontal and vertical loads induced by the seismic accelerations at Project site to develop both stress and deflection calculations.

C. Design and engineer building systems capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project or ASCE 7, “Minimum Design Loads for Buildings and Other Structures” - Section 9, “Earthquake Loads,” whichever is more stringent

D. Provide roof and wall panel assemblies with permanent resistance to air leakage through assembly.

E. Water Penetration for Roof and Wall Panels - Provide roof and wall panel assemblies with no water penetration.

F. Insulation Materials:

1. Insulation shall be provided on the interior surface of all wall and roof panels.

2. Insulation shall be 2-inch (minimum) of P-2000 performance rated R-20 insulation board covered with 1/2-inch plywood with white FRP paneling.

G. Precast Panels:

1. The roof shall have a 4 to 12 pitch extend a minimum of 4-inch beyond the wall panel on each side and have a Drip Edge on Underside of Roof Panel to prevent water migration into the building along top of wall panels.

2. Roof and wall panels system must each be produced as single component monolithic panels. No roof, floor, or vertical wall joints will be allowed. Wall panels shall be set on top of foundation as shown on drawings.

3. Exterior wall panels shall be a minimum of 4 inches thick and shall be UL Level 4 "test method" rated bullet resistance.

4. Roof and floor panels shall be a minimum of 5 inches thick.

H. The Owner will select Precast Concrete Wall and Roof Panel Exterior pattern from all manufacturer’s options available. The roof and wall panel patterns may be different patterns as selected by Owner. Owner shall select colors from all options available from manufacturer for exterior walls and roof, internal walls, and ceiling, painting colors.

I. Concrete shall be steel-reinforced, 5,000 psi minimum 28-day compressive strength, air-entrained (ASTM C260). Reinforcing Steel: ASTM A615, grade 60 unless otherwise specified.

1. The concrete mix design is designed to ACI 211.1 to produce concrete of good workability.

2. Cement will be low alkali Type I-II or Type III conforming to ASTM C-150

3. Air-entrained admixtures will conform to ASTM C620. Water reducing admixtures will conform to ASTM C494, Type. A. Plasticizing admixtures will conform to ASTMC 1017. Other admixtures will not be used without customer approval.

4. Interior surfaces of concrete walls, roof, and slabs shall have smooth finish.

5. All exterior building walls shall have a brick pattern finish integral with the concrete panel.

6. All exterior surfaces of the roof panels shall be a troweled finish unless otherwise specified. The underside of the overhang will have a smooth finish.

7. Panel repair shall not be allowed on defective areas if the structural integrity or appearance of panel is adversely affected. Panels with large cracks or chips as determined by the structural engineer shall be replaced at no additional cost to the Owner.

8. Concrete surfaces will not be allowed to dry out from exposure to hot, dry weather during the initial curing period. Curing compounds will not be used on interior walls as they will prevent paint adhesion.

J. Post-Tensioning Strand:

1. 41K Polystrand CP50, 0.50, 270 KSI, 7-wire strand, enclosed within a greased plastic sheath, (ASTM A416). Roof and floor are to be each post-tensioned by a single, continuous tendon. Said tendon shall form a substantially rectangular configuration having gently curving corners wherein the positioning of the cable member results in a pattern of one or more loops and a bisecting of the loop(s). The cable member starts from one corner of the concrete building panel, forms a gentle perimeter loop(s) returning to a point where the cable member entered the concrete building panel. The tendon then turns 90 degrees and follows the cable member(s) to a point midway along the “Y” axis of the concrete building panel and then turns 90 degrees along the “X” axis of the concrete building panel. This bisects the concrete building panel and crosses the opposite parallel portion of the cable member and exits from an adjacent side of the concrete building panel.

K. All joints between panels shall be caulked on the exterior and interior surface of the joints.

L. Structural Joints:

1. All welding shall be performed by Certified Welders in accordance with AWS D1.1 Standards.

2. Roof, walls, and floor panels shall be connected with pairs of embedded plates, field-welded together. Connection plates shall be located at a minimum at each corner and each mid-span of building. Connection plates and their components that are exposed shall be stainless steel.

3. All panel joints shall have a integral gasket seal to make building weather tight. The joints between floor and slab panels shall have a butyl mastic sealant per Section 02551.

4. All exterior joint shall be sealed with sealant per Section 07900. Sealant color shall be matched to exterior finish color.

M. Materials or Products or Equipment:

1. Available Manufacturers - Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Norwalk Concrete Industries

b. Approved equal.

2.02 OTHER ITEMS

A. The building shall come with rough openings to accommodate items from other trades; such as doors, windows, louvers and piping. Refer to Drawings and other Specifications for these items. The building manufacturer shall coordinate the rough opening sizes with the General Contractor.

2.03 ENTRY DOORS AND FRAMES

A. Aluminum doors shall be as manufactured by Cross Aluminum Products and be of a standard size of 3 feet by 7 feet.

B. Door sections to be 4-inch tubular shapes of 6063-T5 alloy. Joinery shall be steel tie rod bolted through stiles, where applicable a minimum of three 3/8-inch diameter cadmium plated steel rods a door.

C. The finish of doors and door parts shall be free of scratches, defects, die lines, and blemishes and shall have a natural anodized finish in conformance with AA Specification M12C22A41.

D. Minimum wall thickness 0.100-inch with 0.187-inch minimum at lock and hinge stiles.

E. Door sections are to interlock a minimum of 3/8-inch and form a 1/4-inch thick vertical reinforcement every 4 inches.

F. Exterior doors to be insulated with urethane boardstock.

G. Fluted No. 10 pattern extruded in door section.

H. Exterior doors shall be fully weather-stripped.

I. Aluminum Frames:

1. All sections of frames shall be fabricated from aluminum alloy 6063 and T-6 temper with a minimum thickness of 0.125-inch. Screws shall be 18-8 stainless steel.

2. All framing members shall be accurately milled with flush hairline joints. Frames shall be closed back or open back as detailed on the Drawings.

3. Door frame corner members shall be heavily reinforced with channel type corner gussets fastened with concealed stainless-steel screws.

4. Frames shall be reinforced in the areas to receive locks, hinges, and door closers.

5. Door frame finish shall match that of the door. The finished product shall be free of scratches, defects, and blemishes.

6. Doorstops shall be attached to the frame with concealed fastenings with vinyl inserts for weatherproofing and silencing.

J. Door Hardware:

1. All hardware shall be made of stainless steel or bronze with finish as scheduled. Concealed parts of hardware shall be of nonferrous metal unless otherwise specified.

2. All door closers shall have cast iron bodies with scheduled finish and of proper size for the doors on which they will be mounted. Door closers shall be applied indoors and equipped with brackets if necessary. All door closers shall have hold-open features unless otherwise indicated or required.

3. Locks shall be heavy duty. Each cylinder shall have six pin tumblers. Strikes shall be of the box type. Locks shall be master keyed to existing doors according to instructions provided by the Owner. Four keys shall be furnished for each lock.

4. The manufacturers' names and catalog numbers shown on this schedule have been used as a guide to type, style, and materials of construction only.

5. The Contractor shall furnish all hardware of whatever nature as necessary to complete the buildings whether or not shown on this hardware schedule.

6. Hardware Schedule:

Quantity	Item	Finish	Acceptable Manufacturer
1	Continuous Hinge SL-11-HD	Clear	Select Products
1	Closer DC 2410 w/Hold open	US26D	Corbin Russwin
1	Continuous threshold 513	Aluminum	National Guard
1 set	Weather Strip FS160A	Aluminum	National Guard
1	Door Bottom Seal 35	US26D	National Guard
1	Kick Plate	US26D	Hiawatha
1 set	Heavy Duty Lock Set (Series CL 3500) CL 3561 with lever trim inside/outside, inside lever always free	US26D	Corbin Russwin

2.04 BUILDING HEATING VENTILATION AND AIR CONDITIONING (HVAC)

A. Control Philosophy:

1. The packaged terminal air conditioning unit shall be located as shown on the Drawings

B. Packaged Terminal Air Conditioner (PTAC):

1. Furnish and install UL Listed unit heaters with voltage, phase, number of steps, heating and air delivery capacities as scheduled. Include chassis, elements, fan, cabinet housing, motor, and insulation.

2. Unit Heater / Air Conditioner shall be an 11,000 BTU heater and 10,000 BTU air conditioner, Friedrich Model WE10D33 with integral thermostat or approved equal."

2.05 ELECTRICAL

A. Electrical and lighting shall be in accordance with Division 16 Electrical specifications and as specified herein.

B. The load center shall be on the interior of the structure and be NEMA 3R. The load center shall have a main disconnect. The electrical panel and equipment shall be sized for the electrical loads as require for the assembly. In addition, there shall be spare capacity for future use.

C. Wiring shall be installed in PVC conduit, surface mounted. With minimum of No. 12 wire size.

D. Interior service shall include a minimum of 6 duplex convenience receptacles in the enclosure.

E. Exterior service shall include four GFI receptacles.

F. Interior Lighting shall be four 2 bulb, 48-inch fluorescent, vapor tight, fixture with acrylic lens covers. Installation of lights shall be coordinate with the equipment located in the building.

2.06 EXTERIOR LIGHTING SHALL BE TWO PHOTOCELL CONTROLLED TWR1 LED WALL LUMINAIRES BY LITHONIA LIGHTING RATED FOR 2126 LUMENS OR APPROVED EQUAL. FINISHES

A. Exterior Walls: Sherwin Williams H&C or approved equal - Color to be determined.

B. Interior Walls: Sherwin Williams H&C or approved equal - Color to be determined.

C. Interior Floors: Sherwin Williams Armorseal Floor-Plex 7100 or approved equal - Color to be determined.

D. Roof: Sherwin Williams Uniflex per ASTM D 6083 or approved equal - Color to be determined.

E. Finishes shall comply with the requirements of Section 09900.

PART 3 EXECUTION

3.01 ERECTION

A. The structure shall be erected in accordance with the manufacturer's recommendations. Required grout and leveling shims shall be provided by the Contractor.

B. The structure shall come with steel foundation anchoring plates with holes that can be used to bolt the structure to the concrete foundation walls. There shall be a minimum of four anchor points.

PART 4 SPECIAL PROVISIONS

4.01 BUILDING SIZE

A. Refer to the plans for building dimensions.

4.02 CONNECTION DETAILS

A. The building manufacturer will provide connection details.

4.03 BUILDING MANUFACTURER'S SCOPE OF WORK

A. Is described on the following page.

B. The Contractor shall include all work not included in the building manufacturer's quote.

END OF SECTION

NCI
Norwalk Concrete Industries
80 Commerce Drive P. O. Box 563
Norwalk, Ohio 44857
800.733.3624 Toll Free
419.668.8167 Phone
419.663.0627 Fax
www.nciprecast.com

QUOTATION # 20-3028

DATE: 06-04-20

JONES & HENRY ENGINEERS
ATTN: KATIE WAMBO
EMAIL: kwambo@jheng.com
PHONE: 567-661-0273

BID DATE:
JOB NAME: EQUIPMENT BUILDING

LOCATION: PERRYSBURG
COUNTY: WOOD

QTY.	REF.	DESCRIPTION	UNIT PRICE
1		16' – 0" wide X 16' – 0" long X 10' – 0" Eve Height I.D. Easi-Set Precast Concrete Building.	$75,775.00

SCOPE OF WORK

- Roof is 6" thick, steel reinforced and post-tensioned, concrete
- Building will come in panels and roof sections to be assembled onsite by NCI
- All brackets, caulk, grout to assemble and seal building
- Concrete mix design is minimum 5,000 psi 28 day strength
- Sandwich wall and roof: Walls and roof to have 3" Thermomass R-18 insulation, covered with 2" precast concrete. Interior wall thickness is 4" thick, total wall thickness is 9", roof thickness is 10".
- Exterior walls are UL 752 Level 4 " test method" rated bullet resistance
- Misc openings in walls
- Wind Load: 130 mph
- Roof Load capacity: 60 psf
- Fire resistant: standard fire rating of one (1) hour
- Roof has 3" overhang and ½" drip edge
- Exterior finish to be Brick, stained one (1) color.
- P.E. stamped calculation & drawings
- Freight to Perrysburg, OH, truck must be able to set up next to foundation with clear access to jobsite.
- Building to have seven (7) year warranty on quality and workmanship on the precast concrete building. One (1) year on all other appurtenances.
- Total Weight: 80,850 lbs.
- NCI field labor to offload and set wall panels, roof section, post-tensioned roof, seal walls, roof, provide crane, all material, crane must be within 30' of foundation with clear work area.

CONTINUED ON PAGE 2

QTY.	REF.	DESCRIPTION	PRICE

CONTINUED FROM PAGE 1

- **One (1) single 3'-0" x 6'-8" x 1 ¾", aluminum door and frame, closure, drip edge, hardware, lockset, painted one (1) one standard color.**
- **Interior walls and ceiling to be smooth, painted one (1) color**

PRICE EXCLUDES:

- **Site work of any kind**
- **Applicable sales taxes or permits, if any**
- **Design foundation**
- **Stable foundation to support weight of building**
- **Connection of power to building at site**
- **Electrical Ø HVAC Systems**
- **Louvers and exhaust fan**

TIME LINE FOR DRAWINGS AND PRODUCTION:

- **Shop drawings 15 business days after NCI has signed sales order, 10% down payment.**
- **P.E. stamped drawings, calculations within 10 business days after shop drawing approval.**
- **Production lead time is 18-20 weeks after final approval of shop drawings.**

NCI is designated as a qualified HUBZone small business concern (SBC)

EXCESSIVE DETAINMENT CHARGE

TERMS. Ten percent mobilization is due with order. Net upon delivery of buildings per predefined schedule: No retention shall be withheld from payment to Seller. No claims for Customer back charges will be accepted unless Seller is given immediate notice, in writing, and an opportunity to investigate.

NORWALK CONCRETE INDUSTRIES

Name: Scott Kinnamon

Email: skinn@nciprecast.com

Position: Sales Representative

Signature _____

Date: _____

Accepted By Customer:

Customer:_____

Name: _____

Position: _____

Signature _____

Date:_____

SECTION 15010
GENERAL MECHANICAL PROVISIONS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing mechanical accessories and requirements necessary for the completion of the Work whether or not specifically shown or specified.

B. Items include, but are not limited to:

1. Piping Hangers and Supports.
2. Insulation Fire Retardant Requirement.
3. Accessibility and Access Panels.
4. Power Actuated Anchors.
5. Rotating Equipment Alignment.

C. Additional requirements are specified in Sections 01350 and 11050.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:
   a. Descriptive information on all mechanical items.
   b. Drawings locating anchors, inserts, and supports for piping, including vendor data for each component.
2. Information for the Record:
   a. Alignment procedures and acceptable runout tolerances for each piece of connected equipment.
   b. Shaft and bore sizes and tolerances for couplings and instructions for coupling installation.
   c. A report of coupling alignment readings for each coupling and driven machine combination, and sizes of all anchor bolt or equipment base shims.

PART 2 PRODUCTS

2.01 PIPING HANGERS AND SUPPORTS

A. The manufacturer's names and catalog numbers shown in the following paragraphs have been used as a guide to type, style, and materials of construction only. Anvill, Unistrut, or equal.

B. Contractor shall furnish and install all pipe supports, hangers, harnessing, expansion joints, expansion loops, and inserts required to support the piping and valves. Supports shall be designed and spaced to secure pipe in place without sag or undue stress on any pipe, fitting, equipment, or valve. Piping that is close to the floor may be supported on concrete piers. Piping near walls may be supported by wall brackets. Piping at equipment and valves, etc., shall be supported so that the equipment and valves can be removed without additional pipe supports. Piping shall not introduce any strains or distortion to connected equipment. Overhead lines shall be installed directly on supports, or suspended by hangers or hanger rods. Where piping is supported from the ceiling, inserts shall be poured in the concrete slab flush with the bottom of the slab. Adequate lateral support shall be provided to prevent noticeable lateral movement of the piping either during operation, or from a lateral load of 300 pounds applied at any point. All hanger design, anchoring, support, etc. shall be the responsibility of the Contractor. Design loads shall not exceed the manufacturer's recommended loads.

C. Types of Supports:

1. All horizontal piping 4-inch and larger with inverts 2-feet or less from a finished floor shall be supported by concrete saddle supports, unless otherwise specified in Part 4 of this Section.

2. Beam clamps shall be used where piping is supported from steel structure of building. Clamps shall be selected on basis of load to be supported. Beam clamps shall be malleable iron with bolt, nut, and pocket threaded for rod connection as required to fit beams. C-clamp type shall only be hung from truss panel points unless otherwise approved by the Engineer.

3. In precast slab areas supports shall be hung from tabs. Tabs shall not be overloaded. Contractor shall not drill into precast slabs unless approved by the Engineer.

4. Cast-in inserts shall be used for suspending hangers from concrete. For heavier loads, insert shall be ceiling type, individual inserts; Anvill CB - Universal concrete inserts, Figure 282, or equal. For lighter loads, inserts shall be Unistrut P-3200 series, or equal. The preformed channel members shall be 1-5/8-inch by 1-3/8-inch with a 12-gauge (.105 inch) material thickness. Anchors shall be at 4-inch on center maximum, and extend into concrete a minimum of 2-3/4-inch. End caps and/or end cap anchors shall be provided to prevent concrete seepage into channels. All channels shall have a pre-galvanized finish, and all accessories shall be electro-galvanized. Insert shall not be overloaded.

5. Vertical piping shall be supported at base by hanger placed in horizontal line near riser, or by base fitting set on pedestal or foundation. Risers shall be laterally supported at intermediate points with riser clamps with two-point bearing as required to make rigid. Riser clamps shall be wrought steel, with extension lugs, bolt, and nuts; Anvill Figure 261, or equal. Offset pipe clamps, Anvill Figure 103, or equal, may also be used. Use only in unfinished areas where approved by the Engineer. Anvill Figure CT-121, or equal, shall be used for copper pipe.

6. Unless otherwise noted, hangers shall be as follows:

   a. Uninsulated piping 2-inch and smaller, Anvill Figure 97, or equal malleable iron adjustable nut and steel band.

   b. Uninsulated piping 2-inch and larger, Anvill Figure 260, or equal, galvanized steel adjustable clevis type.

   c. Uninsulated copper tubing, Anvill Figure CT-69, or equal, carbon steel ring and knurled swivel iron adjusting nut completely copper plated.

   d. Insulated piping, Anvill Figure 260, Elcen, or equal, clevis hangers. An insulation protection shield, Anvill Figure 167, or equal, shall be installed over the insulation in 180-degree segment, minimum 12-inch long. The shield shall be galvanized steel and shall vary in thickness from 18-gauge to 12-gauge, according to pipe size, as required to prevent crushing of the insulation. Anchors and guides shall be installed as required. Where roller supports are required due to expansion or contraction, Anvill Figure 171 roller hangers, Anvill Figure 175 roller chairs, Anvill Figure 271 pipe roll stands, or equal shall be used.

7. Trapeze Hangers and Brackets:

   a. Where several pipes occur at the same elevation, trapeze type hangers or other equivalent types may be used.

   b. For heavier loads, trapeze hangers shall be structural steel channels suspended from threaded rods. Channels shall be galvanized and sized for specific loads. For 12-inch piping and larger, short pieces of angle (1/4-inch minimum thickness) shall be welded to the channel such that pipe circumference will be supported at 3 points approximately 30 degrees apart. Fabricated saddles supporting a 60-degree minimum segment of the pipe may also be used. Standard black carbon steel “U”-bolts, Anvill Figure 137, or equal, shall be used to secure piping up to 36-inch diameter to structural channels. For lighter loads, trapeze hangers shall be preformed channels. Channel members shall be 1-5/8-inch by 1-5/8-inch with a 12-gauge (.105) material thickness. They shall be Unistrut Series P-1000, or equal, with a pre-galvanized finish. All fittings, spring nuts, nuts, and bolts shall be electrogalvanized. Steel threaded rod hangers shall be galvanized.

c. Brackets shall be Anvill Figure 195, or equal, as required for weight of pipe. Brackets for use with preformed Unistrut or equal channels shall be fabricated from 12-gauge material, compatible with the 1-5/8-inch square channel members. Unistrut or equal brackets shall be galvanized. All fabricated steel brackets used to support piping in or above tanks, channels, and flumes shall be hot dip galvanized after fabrication and all fasteners shall be galvanized.

d. The following general rules shall be followed for attachments:

1) Uninsulated steel piping, use Unistrut Series P-1109 through P-1126, or equal clamps.

2) For copper tubing, use Unistrut Series P-2024CC through P-2070CC clamps, or equal.

3) Insulated piping 2-inch and smaller, use Anvill Figure 167, 18-gauge galvanized steel shield over the insulation, in 180-degree segments minimum 12-inch long with Anvill Figure 271, or equal, clamps.

4) Insulated piping 2-1/2-inch and larger, use a protection saddle, Anvill Figure 160 through 166, or equal, with Anvill Figure 271, or equal, roller supports.

8. In tunnels, pipe galleries, and where piping is racked on multiple hangers, supported with the use of prefabricated structural support channels, the piping attachments shall be as specified for Trapeze Hangers.

D. Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead ending. Anchors shall be located as required to force expansion and contraction movement to occur at expansion joints, loops or elbows, and as required to prevent excessive bending stresses and opening of mechanical couplings. Anchors shall be suitable for the location of installation and shall be designed to withstand not less than five times the anchor load. Vertical pipes shall be anchored by means of clamps welded around pipes and secured to wall or floor construction. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints. Anchorage for bellow type expansion joints may be located adjacent to the joint.

1. Pipe guides shall be provided adjacent to bellows type expansion joints. Guides shall be placed on both sides of expansion joints except where anchors are adjacent to the joint. Unless otherwise indicated on the drawings, one guide shall be within four pipe diameters from the joining and a second guide within 14 pipe diameters from the first guide. Pipe supports shall allow adequate movement; pipe guides shall not be used for support. Guide and spider shall be of sufficient size to clear pipe insulation and long enough to prevent overtravel of spider and cylinder. Pipe guides shall be Anvill Figure 255, or equal, and shall be installed as recommended by the manufacturer.

2. Unless closer spacing is indicated on the drawings, the maximum spacing for pipe supports and expansion joints shall be:

Type of Pipe	Pipe Support Max. Spacing, ft	Max Run Without Expansion Joint, Loop, or Bend, Ft	Expansion Joint Max. Spacing, ft	Type of Expansion Joints
Cast Iron/Ductile Iron	10 (Note 4)	80	80	Mechanical Couplings
Steel for hot water heating				
1-1/4-inch and smaller	7	30	100	Note 1
1-1/2- to 4-inch	10	30	100	Note 1
Over 4-inch	15	30	100	Note 1
Steel for other services				
1-1/4-inch and smaller	7	30	100	Note 1
1-1/2- to 4-inch	10	30	100	Note 1
Over 4-inch	15	80	80	Mechanical Couplings
Copper for hot water				
1-inch and smaller	5	20	100	Note 1
Over 1-inch	7	20	100	Note 1
Copper for other services				
1-inch and smaller	5	--	--	None required
Over 1-inch	7	50	100	Note 1
PVC				
1/8- to 1-inch	Continuous Support (Note 2)	20	60	Note 1
1-1/4- to 2-inch	4	20	60	Note 1
Over 2-inch	6	20	60	Note 1
Fiberglass reinforced plastic				
3-inch and smaller	6	60	100	Note 1
Over 3-inch	8	40	100	Note 1
Acid Waste				
Tempered glass	8 (Note 3)	--	--	None required
High silicon iron	15 (Note 4)	--	--	None required
Cast iron soil	10 (Note 4)	--	--	None required

Notes:

1. Expansion joint fittings as specified in the applicable miscellaneous piping section.
2. Hanger and bracket spacing may be increased where PVC pipe is provided continuous support.
3. At least two properly padded supports for each pipe section.
4. At least one support for each pipe section.

3. Pipe expansion joints shall be installed within 5-feet of all structural isolation or expansion joints. Expansion joints shall be as specified in the appropriate Section of this Contract, and submitted for approval.

E. Expansion Loops - Where fabricated expansion loops are shown on the drawings or deemed by the Contractor to control the system, expansion loops shall be designed by the Contractor and submitted for approval.

F. Use correct size hanger to allow for increased diameters of line caused by pipe covering. The Contractor will not be allowed to cut or reduce specified covering to allow application of hangers, unless otherwise specified.

G. Galvanic Protection - A dielectric material shall be placed between pipe and supports when dissimilar metals are used. A flexible elastomer material, Unistrut unicushion P-2600, or equal, may be used. A thermoplastic elastomer cushion, the Unistrut Cush-A-Clamp or equal, may also be used. In general, if galvanized supports are used, all accessories shall be galvanized. If carbon steel supports are used, all accessories shall be carbon steel.

H. Support mechanical coupling pipe at each joint.

I. Other means of pipe supports not be used unless approved by the Engineer.

J. Pipe supports shown on the Drawings shall be provided and do not relieve the Contractor of any of the requirements in this Section.

2.02 FIRE RETARDANT INSULATIONS

A. All insulation material (insulation, jackets, adhesives, cements, mastics, sealers, coatings, and finishes) shall have composite Fire and Smoke Hazard ratings as tested under ASTM E84, NFPA 255, and UL 723, not exceeding as follows: (unless noted otherwise in UBC)

Flame Spread 25 Smoke Developed 50

B. All surfaces shall be clean, dry, and free of oil and grease before insulation, adhesives, or mastics are applied.

C. All joints shall be tight with insulation lengths and segments tightly butted against each other. Where lengths or segments are cut, cuts must be smooth and square. All insulation shall be continuous through wall and ceiling openings. Insulation shall be continuous through pipe hangers. At pipe hangers, use rigid pipe covering finished the same as the adjacent pipe covering.

D. Where vapor barrier jackets are used on cold surfaces, insulation must be applied with vapor seal integrity maintained throughout the entire system.

E. All pipe insulation shall be pre-molded, and be split ready for application.

PART 3 EXECUTION

3.01 ACCESSIBILITY AND ACCESS PANELS

A. Install work to be readily accessible for operation, maintenance, and repair. Minor deviations from Drawings may be made; however, major changes shall not be made without approval of the Engineer.

B. Where valves, traps, or other specialties are concealed in the construction or behind a wall or ceiling surface, the Contractor shall furnish and install an access panel of adequate size to permit adjustment or service of concealed device. Panels shall be of a design suitable for installation in the material forming the finished surface in which each is mounted. Provide access doors in ductwork and equipment housing and wherever required for access to internals. Minimum door size shall be 24-inch by 24-inch unless duct is less than 24-inch wide, then door size to be same as duct width.

C. Wherever practical, the Contractor shall group valves, traps, dampers, etc., in such a way as to be accessible from a single panel and eliminate as many access panels as possible.

D. Ceiling access shall be required in gypsum wallboard, plaster, and other ceilings, etc., and in all locations as required to gain access or service mechanical components. Frames shall be constructed of 16-gauge steel. Panels shall be of the material used in the ceiling construction in which they are installed.

E. Access doors in insulated walls, floors, or ceilings shall be insulated equally to their surroundings.

3.02 POWER ACTUATED ANCHORS

A. Power actuated anchoring devices shall not be used at floors, columns, beams, precast concrete, where so using causes cracking, spalling, or other deformation to these members. In no case, will such anchors be used less than 4-inch from any corner nor change in direction of concrete surface to which anchor is attached.

3.03 ROTATING EQUIPMENT ALIGNMENT

A. To aid in the field alignment of all equipment base plate mounted rotating equipment, push bolts (jacking bolts) shall be furnished and welded to the base plate.

B. All rotating equipment shall be field checked for alignment after installation and initial operation. The equipment shall be at operating temperature. The minimum method of indicating alignment will be the “16-point” method. Other proposed methods must be submitted for approval to the Engineer.

C. The alignment results are to be submitted for record. They are to include the final set of indicator readings and a plan view sketch of the motor and driven machine base, and the thickness of shims for each shimmed anchor bolt. The thickness of shims shall not exceed 0.25 inches.

PART 4 SPECIAL PROVISIONS

4.01 SUPPORT MATERIAL SCHEDULE

A. Exterior – All exterior supports shall be 304 stainless steel.

B. In Chamber or Exposed to Wastewater – All supports shall be 304 stainless steel.

END OF SECTION

SECTION 15210
PIPING

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the furnishing and installing of all pipelines 4-inch diameter and larger shown on the Drawings or as required to complete the Work.

B. Piping less than 4-inch diameter, will be included under other Sections unless otherwise specified.

C. Material to be furnished and installed, but not limited to:

1. All pipe, fittings, specials, bends, beveled pipe, adapters, bulkheads, stoppers, plugs, joint restraints, joints and jointing materials.
2. Pipe supports other than those specified in Section 15010.
3. Install temporary plugs and/or stoppers and harnessing.

D. The Contractor shall make adequate field measurements before new piping is fabricated.

E. All wall, floor, and roof penetrations and any building modifications which are required for the installation of the Work under this Section shall be included in this Section.

F. Instruments which are to be located in pipelines 4-inch in diameter and larger shall be furnished under Division 16 and installed under this Section.

1.02 QUALITY CONTROL

A. Field Inspection:

1. All pipe sections, specials, and jointing materials shall be carefully examined for defects and no piece shall be laid that is known to be defective. Any defective piece discovered installed shall be removed and replaced with a sound one in a manner satisfactory to the Resident Project Representative at the Contractor's expense.
2. Defective material shall be marked with lumber crayon and removed from the job site before the end of the following day.

B. Field Testing:

1. All materials, process of manufacturing, and finished pipe shall be subject to inspection and approval.
2. The Resident Project Representative may select one sample of pipe on the job site of each production run of each size and type of pipe to be tested by the laboratory. The Contractor shall furnish the first test piece or pipe core and any

additional samples required because of failures. Should the sample fail to meet specifications, retests shall be conducted by the laboratory in conformance with the specifications.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 01300 showing: layout plan and dimensions, schedule of pipe fittings and specials, materials and class for each size and type of pipe, joint details, and any special provisions required for assembly.

B. Drawings shall show the position and elevation of valves, pumps, and/or other equipment served by the various pipe systems.

C. If directed by the Engineer, each certificate shall be accompanied by a report showing test results compared to specification requirements.

PART 2 PRODUCTS

2.01 PROCESS AND PRESSURE PIPE

A. Ductile Iron Pressure Pipe (DIP):

1. Ductile Iron Pressure Pipe (DIP) shall conform to ANSI A21.51 or AWWA C151 and shall be pressure class 350 psi for sizes 12-inch and below, and pressure class 300 psi for larger sizes unless otherwise specified herein.

2. Flanged fittings shall be ductile iron and conform to ANSI A21.15 or AWWA C115. All fittings shall have a pressure rating of 250 psi for all pipe sizes unless otherwise specified.

3. Ductile Iron pipe inside buildings or structures shall be joined with flanged, or mechanical joints as shown on the Drawings, or as indicated in the pipe schedule. All mechanical joints shall have retainer glands. Flanges shall comply with ANSI 21.15 or AWWA C115 and shall be ANSI 125-pound drilling, unless otherwise specified. Flanged joints shall have full face 1/8-inch rubber gaskets or of thickness and type approved by the Engineer. The pipe shall not be threaded or flanged in the field. Flanges shall be firmly bolted with machine, stud, or tap bolts of the proper size and number. Within buildings the bolts and nuts shall be of the best quality mild steel, with true threads, meeting the requirements of ANSI B16.1.

4. Flange adapters for plain end pipe (not fittings), where specified, shown on Drawings, or approved by Engineer shall be a restrained flange adapter. The restraining mechanism shall be multiple gripping wedges set against the pipe wall. Twist off nuts shall be used to ensure proper actuation of the restraining device. The restrained flange adapter shall be Series 2100 Megaflange by Ebaa Iron, Inc., or equal.

5. Couplings, if required or permitted, shall be Dresser Style 38, Rockwell, or equal. Restrained coupling shall be Dresser Style 167 Lock Coupling, Rockwell, or equal.

B. RESERVED

C. RESERVED

D. RESERVED

E. RESERVED

F. RESERVED

2.02 PROCESS AND PRESSURE PIPE NUTS AND BOLTS

A. Nuts and bolts used on buried pressure pipe and fittings in contact with earth shall be Cor-Blue coated low alloy steel and have a minimum yield strength of 45,000 psi complying with ANSI A21.11 and AWWA C111.

B. Nuts and bolts encased in grout on concrete pressure pipe shall conform to recommendations of the pipe manufacturer.

C. All other nuts and bolts shall be low carbon steel in conformance with the chemical and mechanical requirements of ASTM A307, Grade B. Higher strength bolts will be acceptable.

2.03 PIPE HANGERS AND SUPPORTS

A. Pipe hangers and supports shall be as specified in Section 15010.

2.04 COATINGS AND LININGS OF PROCESS AND PRESSURE PIPE

A. Coatings and linings where required shall conform to the following requirements unless otherwise indicated in Part 4 of this Section or on the Drawings.

B. Ductile Iron Pipe:

1. Ductile iron pipe, and fittings unless otherwise specified, shall be lined on the interior with a standard thickness cement lining meeting ANSI A21.4 and AWWA C104. A seal coat of bituminous material shall be applied in conformance with the above Specifications. Piping used for compressed air shall not receive a cement lining.

2. All pipe used within buildings and structures and which are to receive field coats of paint shall not be coated with any black bituminous paint. Such pipe, after proper cleaning, shall be painted with one coat of primer paint that is compatible with the field coats. Painting specifications shall be followed for cleaning and painting.

C. RESERVED

2.05 RESERVED

2.06 WALL PIPE AND SLEEVES

A. Type A Wall Pipe:

1. Cast iron wall pipe shall be used where noted on the Drawings.
2. Wall pipe shall be cast in place with joints as indicated on the Drawings.
3. Where wall pipe is flush with wall, bolt holes shall be tapped for studs.

B. Type B Sleeve:

1. Type B sleeves are for use in exterior walls.
2. Type B sleeves consist of casting in place a cast iron sleeve two sizes larger than the service pipe with couplings on both ends of the sleeve.
3. Service pipe shall be caulked in place with oakum. The oakum shall be covered with a minimum of 1-inch of lead wool on both ends.

C. Type C Sleeve:

1. Type C sleeves are used in exterior walls and other walls as designated on the Drawings.
2. Type C shall be a modular mechanical type seal of interlocking synthetic rubber links.
3. Unless otherwise indicated, the seal shall be suitable for corrosive service in a temperature range of minus 40 degrees F to 250 degrees F. The pressure plates shall be of delrin plastic for good resistance to organic compounds. The bolts and nuts shall be of 18-8 stainless steel. The sealing elements shall be of EPDM rubber which has high resistance to most organic and inorganic materials.

D. Type D Floor Sleeve:

1. Type D sleeves are used for pipes passing through floors.
2. Type D sleeves consist of casting in place a Schedule 40 steel sleeve with four anchors in the floor slab. The sleeve shall be one size larger than the service pipe or 1-inch larger than the flange on the service pipe. The sleeve shall extend 1-inch above the finish floor surface.

E. Type E Sleeve:

1. Type E wall sleeves shall be used where noted on the Drawings.
2. Type E sleeves consist of casting in place a mechanical joint, cast iron wall sleeves meeting the requirements of AWWA C110 and C111.
3. Each Type E sleeve shall be sealed using plain rubber gaskets, follower glands, and mechanical joint studs meeting the requirements of AWWA C111 on both ends.

F. Type F Sleeve:

1. Type F sleeves shall be used for passing through existing masonry walls.

2. Type F sleeves shall be constructed as detailed on the Drawings using 15-pound felt paper and sealant.

G. Type G Sleeve:

1. Type G sleeves used for passing through gastight floors shall be similar to Type C sleeves with the addition of non-shrink grout as shown on the Drawings.

H. Type H Sleeve:

1. Type H sleeves shall be similar to Type G sleeves and used for passing through gastight walls.

2. Type H sleeves shall be as detailed on the Drawings.

I. All wall pipes and sleeves shall be coated or lined in accordance with the appropriate materials for its service.

2.07 EXPANSION JOINTS

A. Expansion joints as specified below shall be installed as per Section 15010.

B. Expansion joint construction shall include a neoprene inner tube extending through the bore to the outside edge of both flanges. The inner tube shall be covered with a flexible multiple layer fabric carcass of high strength rubber impregnated synthetic fibers with steel wire or reinforcement rings integral with the fabric to assure sufficient rigidity for vacuum service and high pressure. An outer cover coated with Hypalon paint shall cover the carcass and provide full protection against ozone and weathering.

C. Flange faces shall be neoprene covered and drilled to match drilling in mating flanges. Flange faces shall also be backed by split steel flange retaining rings.

D. All expansion joints shall be suitable for service temperatures of 225 degrees F.

E. All expansion joints used for vacuum service shall be capable of withstanding a 30-inch Hg vacuum.

F. Expansion joints shall have recommended working pressures compatible with the service for which they are installed.

G. All expansion joints shall be equipped with control units to restrict excess axial compression and elongation. Control units shall consist of plates bolted to pipe flanges on each end of the expansion joint and long control bolts extending between pipe flanges.

H. Expansion joints on pipes used for digester gas service shall be the open arch type.

I. Expansion joints on sludge piping shall be of filled arch construction to prevent solids accumulation at the joint.

J. Expansion joints on pipes used for fuel oil and digester gas service shall have Buna-N tubes.

K. For those locations where expansion joints are used to replace valves, spool pieces, or other short sections, standard single arch expansion joints may be of insufficient length. At these locations double, triple, and quad arch expansion joints shall be used as required.

L. Expansion joints shall be Mercer Rubber Company Style 500-700 or equal.

PART 3 EXECUTION

3.01 PRODUCT HANDLING

A. Care shall be taken in handling and transporting to avoid damaging pipes and their coatings. Loading and unloading shall be accomplished with the pipe under control at all times and under no circumstances shall the pipe be dropped. Pipe shall be securely wedged and restrained during transportation and supported on blocks when stored in the shop or field.

B. Store all pipe on a flat surface so as to support the barrel evenly. It is not recommended that pipe be stacked higher than 4-feet. Plastic pipe, if stored outside, shall be covered with an opaque material to protect it from the sun's rays.

3.02 PIPE INSTALLATION

A. General:

1. All pipe shall be laid to lines and grades in conformance with Section 01800.
2. Wherever piping passes through walls or floors, a wall casting pipe or sleeve of the type indicated on the Drawings shall be installed. Escutcheons shall be provided for pipe passing through finished walls, floors, or ceilings.
3. Pipe Anchoring:
   a. Approved joint restraints shall be installed for the distance from each side of each bend, valve, plug, tee, or wye in locations shown or scheduled on the Drawings.

B. Connections to Existing Pipes

1. Unless otherwise specified, shown on the Drawings, or directed, connections to existing sewers shall be made in conformance with the jointing materials manufacturer's recommendations and as directed by the Resident Project Representative.
2. Where new piping is to be connected into an existing joint, said joint shall be cleaned sufficiently to result in a liquid- or gastight seal. If applicable, a new gasket shall be supplied and installed.

C. Process and Pressure Pipe:

1. Pipe and appurtenances shall be installed true to line, grade, and location; with joints centered, spigots home; pipe properly supported and restrained against movement; and all valve stems plumb.

2. All elbows, tees, plugs, etc., shall be properly anchored, blocked, or otherwise restrained to prevent movement of the pipe in the joints due to internal or external pressure.

3. The open ends of all pipes and special castings shall be plugged or otherwise closed with a watertight plug to the approval of the Resident Project Representative before leaving the Work for the night, and at other times of interruption of the Work. All pipe ends which are to be permanently closed shall be plugged or capped and restrained against internal pressure.

4. Where new or existing pipe requires cutting in the field it shall be done in a manner to leave a smooth end at right angles to the pipe centerline. The finished cut must be approved by the Resident Project Representative.

5. Joints:

a. Gaskets - Just prior to joining the pipes, the surfaces of the joint rings shall be wiped clean and the joint rings and rubber gaskets shall be liberally lubricated with an approved type of vegetable oil soap. The spigot end, with the gasket placed in the groove, shall be entered into the bell of the pipe already laid, making sure that both pipes are properly aligned. Before the joint is fully “home,” the position of the gasket in the joint shall be determined by means of a suitable feeler gauge supplied by the pipe manufacturer. If the gasket is found not to be in proper position, the pipes shall be separated and the damaged gasket replaced. The pipe is then forced “home” firmly and fully. In its final position, the joint between the pipes shall not be deflected more than 1/2-inch at any point.

3.03 SLEEVES AND WALL PIPE

A. Type A wall pipes shall be provided for all pipes passing through the exterior walls unless other sleeve types or wall pipes are designated on the Drawings. Type C sleeves shall be provided in interior walls unless designated otherwise on the Drawings.

B. At all points where piping passes through floors, Type D sleeves shall be provided, unless otherwise designated on the Drawings.

C. Other sleeve types and wall pipe shall be provided as indicated on the Drawings.

D. All wall pipes and sleeves shall be coated or lined in accordance with the appropriate materials for its service.

3.04 RESERVED

3.05 RESERVED

3.06 INSTRUMENTATION CONNECTIONS

A. The Contractor shall make all necessary allowances for and install all controls and instrumentation furnished under any Contract Division and which require in-line connection to process and pressure piping.

B. The Contractor shall provide all necessary mounting bosses, pipe and boss taps, plugs, tees, and any miscellaneous appurtenances to allow connection of Instrumentation and Controls and their associated piping to process and pressure piping.

C. Thermowells complete with all appurtenances listed in Division 16 shall be furnished and installed under that Division. Thermowells complete with all appurtenances which are not included in the list in Division 16 and are to be installed in piping under this Section, shall be furnished and installed under this Section.

D. Instrumentation and Controls are furnished and specified under various Sections including Section 16902. Any schedules shown in Section 16902 are not guaranteed to be complete.

PART 4 SPECIAL PROVISIONS

4.01 LEAKAGE TESTING

A. The leakage testing requirements of this section are waived. A visual inspection of the piping placed into service shall be performed to test the pipe for leakage

4.02 PIPE LAYOUTS

A. The final pipe layouts shall be prepared based upon piping measurements, field confirmed by the Contractor and submitted for approval by the Engineer in the form of a shop drawing.

4.03 PIPING SCHEDULE

A. Schedule:

Service	Size	Pressure Class / Thickness Class	Material	Remarks
Wastewater	6” – 12”	Class 350	Ductile Iron Pipe	See Section 2.01,A

B. See Section 02555 for buried pipe.

4.04 PIPE HARDWARE

A. All fastening hardware and brackets within the wet well shall be 304 or 316 stainless steel.

B. Connections shall be made using similar materials with proper insulation provided.

END OF SECTION

SECTION 15211
SMALL PIPING AND VALVES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing all pipelines and valves less than 4-inch in diameter as shown on the Drawings or as required for a complete piping system for each service or combination of services except the piping and valves included in Section 15400 and Section 15500.

B. Each piping system shall be adequate to conduct and control the flow of process water, plant water, non-potable water, instrument air, compressed air, vacuum, natural gas, sewage gas, propane, fuel oil, chemicals, sewage, sludge, sampling or other uses as specified or shown on the Drawings.

C. This Section includes, but is not limited to:

1. All pipe, fittings, and connections for water supply to equipment and waste to drains.
2. Valves less than 4-inch in diameter, control devices, pipe hangers, anchors, supports, and sleeves for the piping systems covered under this Section.
3. Hose bibbs, sill cocks, and hydrants.
4. Non-potable water supply, drain lines, and connections to boilers, pump priming systems, pump gland seals, valve operating cylinders, or other equipment requiring these services.
5. Compressed air piping, valves, connections to valve operators, and other equipment requiring compressed air.
6. Compressed air, non-potable water, natural gas, propane, vacuum, deionized water, and other services as required for laboratory service.

D. The Contractor shall remove all existing pipelines and valves less than 4-inch in diameter that are indicated on the Drawings to be removed except as specified elsewhere. Removals shall be done in accordance with the requirements of Section 02110.

E. The Contractor shall furnish, install, and remove all temporary piping and valves that are required to maintain processes in operation during construction.

F. All wall, floor, and roof penetration and any building modifications which are required for the installation of the Work under this Section shall be included in this Section.

G. Instruments which are to be located in pipelines to be furnished under Division 16 shall be installed under this Section.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Drawings shall include plan dimensions to and elevations of sleeves, inserts, and anchors, the size and location of each run of pipe, and the location of valves and unions.

   b. Manufacturer's literature, catalog data, specifications, and illustrations shall be bound in a brochure which includes a complete bill of materials.

2. Information for the Record:

   a. Operation and maintenance manuals.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Stainless Steel Pipe:

1. Stainless steel pipe less than 4-inch in diameter shall be designed and fabricated in accordance with ASTM A312. The interior surface of the pipe shall be smooth with no protrusions, stiffeners, or bracing. The pipe and fittings shall be constructed of 304L stainless steel, or as specified on the Drawings.

2. Stainless steel pipe shall be minimum Schedule 40S, unless otherwise noted on the Drawings.

3. Fittings shall conform to ASTM A403 and shall have the same wall thickness and structural properties as the pipe. All bends shall be long radius smooth type. Mitered bends will not be acceptable.

4. Flanges where required shall be ASTM A182-F304L flanges with full facing gaskets and centering rings. Flange bolts shall be stainless steel.

5. Wherever possible, butt weld fittings shall be used for field welding. All welds shall be made by a certified welder and shall conform to procedures for which the welder has been certified. The Contractor shall submit certification statements for the welders and the methods employed. Belled end fittings may be used in lieu of butt weld fittings on air lines.

6. All welds shall have full penetration and be smooth and without protrusions on the interior of the pipe. Weld metal shall be equal to or greater than the parent metal. Any cracks or blow holes appearing on the surface of a welding bead shall be ground away before depositing the next bead.

7. All stainless-steel surfaces shall be passivated by the following procedures:

   a. All outside weld areas shall be wire brushed to remove weld splatter. Brushes shall be stainless steel and used only on stainless steel.

b. All stainless-steel assemblies and parts shall be completely immersed in a pickling solution of 6% nitric acid and 3% hydrofluoric acid at 140 degrees F for a minimum of 15 minutes. Parts shall be free of iron particles or other foreign material after this procedure.

c. Previously pickled parts shall be neutralized by immersion in a trisodium phosphate rinse.

B. PVC Pipe and fittings shall be composed of Class 12454-B rigid PVC compound in conformance with ASTM D1784 (formerly classified Type I, Grade 1). Pipe shall be Schedule 80 with a design stress of 2000 psi in conformance with ASTM D1785. All joints, unless otherwise shown on the Drawings, shall be solvent welded in conformance with ASTM D2855. Joint solvent shall be as recommended by the pipe manufacturer and shall comply with ASTM D2564. In pressure or vacuum lines and in gravity drains 1-inch diameter and less, the fittings shall be Schedule 80 and shall conform to ASTM D2467. For gravity drains greater than 1-inch diameter, the fittings shall conform to the requirements of ASTM D2665. PVC pipe shall be used for acid-resistant services and all lines carrying chlorine solution, sodium hypochlorite, De-ionized (DI) water and other chemicals unless otherwise shown on the Drawings or specified.

C. CPVC Pipe shall be composed of Class CPVC 23447-B plastic as defined in ASTM D1784 (formerly classified Type IV, Grade 1). Pipe shall be Schedule 80 chlorinated polyvinyl chloride pipe in accordance with ASTM F441. Fittings shall be schedule 80 and shall conform to ASTM F439. All joints, unless otherwise shown on the Drawings, shall be solvent welded in conformance with ASTM D2896. Joint solvent shall be as recommended by pipe manufacturer and shall comply with ASTM F493. CPVC pipe shall be used where designated in Part 4 or on the Drawings.

2.02 VALVES

A. Unless otherwise specified or shown on drawings, valves installed in pipelines 3-1/2-inch diameter and smaller for process water lines shall be gate valves; for compressed air and vacuum, globe valves; for natural and sewage gas lines, lubricated plug or eccentric nonlubricated plug valves; and for gas lines less than 2-inch diameter tapered nonlubricated plug cocks; for fuel oil, ball valves; for sludge, eccentric nonlubricated plug valves. Valves for other types of services when required will be specified under that Section.

B. Gate Valves shall be 150-pound, all bronze, rising stem, solid wedge disc furnished with screwed or flanged ends as required. Gate valves shall be Crane No. 431, Jenkins No. 47-U, Powell No. 514/515, or equal.

C. Quick Opening Gate Valves shall be used at locations as shown on the Drawings. Quick opening gate valve shall be Crane 432 or equal.

D. Globe Valves shall be 150-pound, all bronze body with renewable plug-type disc of 500 Brinell Hardness Stainless Steel. The seat ring shall be screwed-in and of the same material as the disc. Globe valves shall be Powell No. 2600, Crane No. 14-1/2P, Jenkins No. 2032, or equal.

E. Ball Valves through 2-inch shall be screwed end bronze, two-piece, 125 psi, Teflon seats, bronze trim, and blowout-proof stem, Nibco No. T-580-BR-Y-20, or equal.

2.03 SLEEVES

A. Type B Sleeve:

1. Type B sleeves are for use in exterior walls.
2. Type B sleeves consist of casting in place a black wrought iron sleeve two sizes larger than the service pipe with couplings on both ends of the sleeve.
3. Service pipe shall be caulked in place with oakum. The oakum shall be covered with a minimum of 1-inch of lead wool on both ends.

B. Type C Sleeve:

1. Type C sleeves are used in exterior walls and other walls as designated on the Drawings.
2. Type C shall be a modular mechanical type seal of interlocking synthetic rubber links by Link-Seal, or equal.
3. Unless otherwise indicated, the seal shall be suitable for corrosive service in a temperature range of minus 40 degrees F to 250 degrees F. The pressure plates shall be of Delrin plastic for good resistance to organic compounds. The bolts and nuts shall be of 18-8 stainless steel. The sealing elements shall be of EPDM rubber which has high resistance to most organic and inorganic materials.

C. Type D Floor Sleeve - Type D sleeves consist of casting in place a steel sleeve with four anchors in the floor slab. The sleeve shall be one size larger than the service pipe or 1-inch larger than the flange on the service pipe. The sleeve shall extend 1-inch above the finish floor surface.

D. Type E Sleeve:

1. Type E wall sleeves shall be used where noted on the Drawings.
2. Type E sleeves consist of casting in place mechanical joint, cast iron wall sleeves meeting the requirements of AWWA C110 and C111.
3. Each Type E sleeve shall be sealed using plain rubber gaskets, follower glands, and mechanical joint studs meeting all requirements of AWWA C111 on both ends.

E. Type F Sleeve:

1. Type F sleeves shall be used for passing through masonry walls, except as otherwise noted on the Drawings.
2. Type F sleeves shall be constructed as detailed on the Drawings using 15-pound. felt paper and sealant.

F. Type G Sleeve - Type G sleeves used for passing through gastight floors shall be similar to Type C sleeves with the addition of non-shrinking grout as shown on the Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cutting of all pipe shall be done with sharp tools. The ends of each pipe shall be reamed until all burrs or fins are removed. Full tapered threads shall be used throughout and threaded joints shall turn up perfectly tight without the use of filling substances. A standard pipe joint paste or tape suitable to use of pipe shall be used on the male threads only, and none shall be allowed to accumulate on the inside of the pipes. All connections between pipe, pipe hangers, and equipment shall be made with an approved dielectric insulating material. Dielectric unions or insulated couplings shall be installed between any dissimilar metallic piping materials or at connections between dissimilar metallic pipes and equipment, tanks, etc.

B. Pipe joints shall conform to respective industry standards.

C. Expansion and contraction of the piping system shall be provided for by the use of swing joints, right angle loops, or approved expansion joints. Branch connections shall have three elbow spring pieces to allow for movement. Unless specified in Part 4, the piping system shall provide for the expansion as required in Section 15010. An expansion joint is also required at all building isolation or expansion joints.

D. Interior and exterior pipelines shall be installed and graded in accordance with State and/or Local Codes. Interior pipes shall run at right angles or parallel to building walls, placed as close as practicable to the ceiling and/or walls, and supported according to Section 15010. Drain valves shall be installed at all low points.

E. Pipe groups shall be run parallel with pipes of other trades, and wherever practicable, all piping shall be supported on common group hangers unless pitch of pipe as hereinbefore mentioned is required.

F. The piping shall be installed in a workmanlike manner and shall avoid interference with columns, beams, equipment, and other piping or fixed construction. A minimum of 7-feet of headroom shall be maintained at any point including stairs.

G. Type C wall sleeves shall be provided for all pipes passing through exterior walls unless other sleeve types are noted on the Drawings. Type C sleeves shall also be provided in interior walls where indicated on the Drawings, Type D floor sleeves shall be used where piping passes through floor. Other sleeve types shall be used where shown on the Drawings.

H. Unless shown otherwise on the Drawings, all buried pipe carrying liquids shall be installed with a minimum cover of 48-inches.

I. Buried pressure piping which carries gases shall be installed with a minimum cover of 3-feet.

J. When new piping crosses existing utilities and other obstructions which force a change in elevation or horizontal alignment, the Contractor shall install the new piping at a deeper elevation or new alignment to avoid the obstructions unless otherwise instructed by the Engineer. Such changes in elevation or alignment shall be made either by installing fittings or by deflecting joints in accordance with the pipe manufacturer's recommendations. Such Work shall be performed at no additional cost to the Owner. To the extent possible, pressure and process piping shall be installed at a constant grade. All changes in grade shall be approved by the Engineer.

K. Where PVC piping is laid in a trench, the bottom of the trench shall be well graded and compacted to insure even bearing for the full length of the pipe and the pipe shall be snaked at approximate 50-foot intervals to provide for expansion or contraction. Prior to testing the pipe, the pipe shall be center loaded with backfill between joints before testing to prevent the pipe from arching or whipping under pressure. During backfill the line shall be pressurized to 25 psi to minimize impact damage.

L. All valves shall be installed with their stems horizontal or above. As far as possible, all valves of the same type shall be of the same manufacturer.

M. Solenoid operated valves shall be installed in horizontal lines with the solenoid mounted vertically and upright.

N. The T-drill method for manufacturing tees in continuous copper tubing is not acceptable.

3.02 EQUIPMENT CONNECTIONS

A. The Contractor shall make all connections where required between the various piping systems and all pieces of equipment. This shall include adapters, traps, backwater valves, or other fittings required when not furnished with the equipment.

B. Unions - Provide a union or flange in piping connections to each valve, device, or item of equipment, and elsewhere as required to makeup or disconnect piping. Each union shall be so installed as to permit the removal of parts and equipment for inspection and cleaning, and shall be installed in a position which will permit the valve device or part to be removed without disconnection of any piping except unions. Union and flange shall be installed in such a position as will be accessible for disconnection items which are to be screwed. All ground joint unions on copper lines shall be cast brass or bronze. Wrought copper unions are not to be used. All unions, where possible, shall be brass to MPT type.

3.03 INSTRUMENTATION CONNECTIONS

A. The Contractor shall make all necessary allowances for and install all controls and instrumentation furnished under any Contract Division and which require in-line connection to process and pressure piping.

B. The Contractor shall provide all necessary mounting bosses, pipe and boss taps, plugs, tees, and any miscellaneous appurtenances to allow connection of Instrumentation and Controls and their associated piping to process and pressure piping.

C. Instrumentation and Controls are furnished and specified under various Sections including Section 16902. Any schedules shown in Section 16902 are not guaranteed to be complete.

PART 4 SPECIAL PROVISIONS

4.01 PRESSURE AND SUCTION GAUGES

A. Pressure gauges shall be 4-1/2-inch in size with fiberglass reinforced polypropylene case, phosphor bronze bourdon tube, 6-inch or 4-1/2-inch dial faces with black lettering, micrometer type pointers and an accuracy of plus 1% of scale range. Pressure gauge shall be H.O. Trerice No. 450 series, Ashcroft 2462 series, or equal.

B. Gauges shall read in feet with graduations as listed below.

1. Range: 0 – 100 feet
2. Major Graduation: 10-feet
3. Minor Graduation: 1-foot

C. All pressure gauges unless otherwise directed shall include a brass pressure snubber and a needle type shut-off valve.

D. For sanitary sewer applications, pressure gauges shall have diaphragm seals. The gauges, seals, and snubber shall be factory assembled and filled with fluid. The diaphragm seal shall be Type 316 stainless steel with a stainless-steel housing. Diaphragm seal shall be an Ashcroft 101 series, H.O. Trerice 877-2 series, or equal.

END OF SECTION

SECTION 15250
VALVES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes the furnishing and installing valves, flap gates, and shear gates 4-inch and larger.

B. Floor stands, floor boxes; valve boxes; gears, manual, hydraulic, and electric operators; extension stems; stem guides and supports; brackets; gaskets; bolts and nuts; and other accessories shall be provided as necessary to complete the Work.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. The Contractor shall indicate all variances from the requirements of the Contract Documents.

b. Scaled dimensional drawings.

c. Wiring schematics with termination point identification.

d. Piping schematics.

e. Materials of construction.

f. Manufacturer's catalog data.

g. General Arrangement Drawings.

h. Motor information per Section 11050.

2. Information for the Record:

a. Operation and maintenance manual.

PART 2 PRODUCTS

2.01 GENERAL

A. All valves and appurtenances shall be of standard make approved by the Engineer and shall have the name, monogram, or initials of the manufacturer cast thereon. They shall be built and equipped for the type of operation shown on the Drawings, specified herein, or as directed by the Engineer.

B. Opening Direction - Unless otherwise specified in Part 4, valves with screw stems shall open by turning counterclockwise, the direction being indicated by an arrow cast where easily visible to operator.

C. Connections - Valves shall be provided with hubs, spigots, flanges, mechanical groove-type, screw, or other connections compatible with the pipe in which they are installed or scheduled in Part 4.

D. Unless otherwise specified, a stuffing box packed with O-ring seals shall be used to seal the stem of the valve. The seal system used shall be replaceable without removing bonnet or rotating element. Gaskets shall be of either Buna or a rubber composition.

E. Bolts and nuts on buried valves shall be a low alloy steel cathodic to the valve body and having a minimum yield strength of 45,000 psi. All other nuts and bolts shall be low carbon steel conforming with the mechanical and chemical requirements of ASTM A307, Grade B.

2.02 RESERVED

2.03 CHECK VALVES

A. Check valves shall close water-tight to prevent return flow in the piping system.

B. Valve is to be tested by the manufacturer as a complete assembly per AWWA C508.

C. Valve shall be a full body flanged type check valve with domed access cover and two moving parts, a flexible disc and disc accelerator.

D. Body and cover shall be ductile iron ASTM A536 Grade 65-45-12 coated with fusion bonded epoxy per NSF-61 on all internal and external surfaces.

E. Disc shall be flexible Buna-N rubber per ASTM D2000-BG with steel and nylon reinforcement. Disc accelerator shall be an internal one-piece type of stainless steel 302. No springs are allowed. Flanges shall be drilled in accordance with ANSI B16.1, Class 125 and rated for 250 psi minimum cold working pressure (CWP).

F. A threaded port shall be provided in the bottom of the valve and in the access cover fitted with a threaded backflow actuator.

G. The valve shall be tight seating and shall operate without hammer and shock through a 35-degree disc stroke, 45-degree seat angle and disc accelerator. The disc shall be cycle tested 1,000,000 times and the flex portion warranted for 25 years.

H. Valve shall provide 100% unrestricted flow at any flow rate and be suitable for both horizontal and vertical pipelines with flow upward.

I. Valve shall be the Series 500A Swing-Flex Check Valve as manufactured by Val-Matic Valve & Mfg. Corp., APCO CRF-100A Rubber Flapper Swing Check Valve manufactured by DeZurik, or equal.

2.04 RESERVED

2.05 PLUG VALVES

A. Plug Valves shall close tight for pressures as specified to stop flow in the piping system.

B. Valve Bodies and covers shall be Cast Iron ASTM A126 Class B or ASTM A536 Grade 65-45-12. Ports shall be rectangular and 100% Port. The valve port area shall meet or exceed standard pipe area per ASME/ANSI B36. 10M. Round ports are not acceptable.

1. Bearings shall be sleeve type and made of sintered, oil impregnated permanently lubricated type 316 stainless steel for sizes 4-18”

2. Bearings shall be ASTM A473 Grade CF8M for sizes 20-36”.

3. In valves larger than 36”, the upper and lower plug journals shall be fitted with ASTM A 240 type 316 stainless sleeves with body bearings of ASTM B30, Alloy C95400 aluminum bronze.

C. Plugs shall be solid one piece, Cast Iron ASTM A126 Class B or Ductile Iron ASTM A536 Grad 65-45-12. The plug shall have a cylindrical seating surface eccentrically offset from the center of the shaft. Plug shall not contact the seat until at least 90% closed. Resilient plug facing shall be Chloroprene (CR). Spherical shaped plugs are not acceptable.

D. Seats shall be 1/8” thick welded overlay of not less than 95% pure nickel. Seat shall be at least ½” wide, 1/8” thick through entire width and raised. The raised surface shall be completely covered with nickel to ensure that the resilient plug face contacts only the nickel seat.

E. Adjustable packing shall be Acrylonitrile-Butadiene (NBR) multiple V-ring type with a packing gland follower. Packing gland shall permit inspection, adjustment, or complete replacement of packing without disturbing any part of the valve or actuator assembly, expect the gland follower. Non-adjustable packing or packing requiring actuator removal to replace the packing, is not acceptable. Both the packing and bearings in the upper and lower journals shall be protected by Buna-N shaft seals located on the valve shaft to minimize the entrance of grit into the bearing journal and shaft seal areas.

F. Pressure ratings shall be 175 psi on valve sizes through 12” and 150 psi for 14” and larger. Every valve shall be given a certified hydrostatic shell test and seat test, with test reports being available upon request.

G. All valves larger than 6” shall be installed with worm gear actuators. All gearing shall be enclosed in a cast iron housing, with outboard seals to protect the bearings and other internal components. The actuator shaft and gear quadrant shall be supported on permanently lubricated bronze bearings.

H. Plug Valves shall meet or exceed the latest revisions of AWWA C517 and other applicable standards. End Connections shall be flanged drilled per ASME B16.1 per AWWA C111.

I. When specified, valves shall be NSF/ANSI 372 certified lead-free and NSF/ANSI 61 certified for drinking water.

J. Handwheels shall be 12-inches in diameter, positioned as show on the design plans.

K. Valves shall be clearly marked with the seat end.

L. All valve bolts shall be 316 stainless steel.

M. Plug valves in wastewater applications shall be mounted with the plug in the horizontal position to prevent the accumulation of debris in the bottom of the valve.

N. Plug Valves shall be Dezurick PEF Full Port eccentric plug valves, Val-Matic 100% Port Plug Valve or approved equal.

O. Seats shall be placed on the higher-pressure side of the valve.

P. All valves shall be shop coated with 4 mils (minimum) of epoxy paint on the exterior with SP10 surface preparation.

2.06 MANUAL OPERATION

A. Valves shall be equipped with nut, hand wheel crank, chain, gears, floor stand, and other appurtenances as required for manual operation as specified or scheduled. Operators shall be in accordance with AWWA specifications except as modified herein.

B. Each valve with a manual operator within a building which is more than 5-feet-6-inch above the floor to the rim of the manual operator shall have a chain wheel with galvanized chain looping 3-feet-6-inch from the floor. The valve shall be oriented to permit chain wheel operation or intermediate pulleys shall be installed to facilitate chain operation.

C. Operation shall be designed so that the effort required to operate the hand wheel, lever, or chain shall not exceed 25 pounds applied at the extremity of the wheel or lever. The hand wheels on valves 4-inch and larger shall not be less than 12-inch in diameter.

D. Gears for valve operation shall be installed in such a manner that the stuffing box will be accessible for packing.

2.07 COMBINATION WASTEWATER AIR/VACUUM RELIEF VALVES – LOW HEAD

A. Combination wastewater air / vacuum relief valves shall perform the following functions:

1. Exhaust large quantities of air from the force main during filling of the piping.
2. Allow air to enter the force main thereby preventing a vacuum condition in the force main.
3. Provide continuous valve operation by allowing accumulated air in force main to escape during force main operation.

B. Combination wastewater air / vacuum relief valves shall be manufactured and tested in accordance with AWWA C512 and shall be designed for wastewater service.

C. Combination wastewater air / vacuum relief valves shall be designed for operating pressures up to 140 psi.

D. Inlet and outlet orifices shall be a minimum of 2-inches in diameter.

E. Combination wastewater air / vacuum relief valves with inlets 4-inches and diameter and smaller shall have NPT inlets and outlet. The body inlet connections shall be hex for wrench tightening. The valve body shall have a 2-inch NTP cleanout and 1-inch minimum NTP drain connection 3 additional pipe plugged locations for cleaning access.

F. Acceptable Models – Low Head Conditions – Type LH

1. Combination wastewater air / vacuum relief valves shall be Vent-Tech Model SDG – Series C or approved equal.

2. To achieve consideration as an approved equal material the air release and vacuum considerations shall be equal to the specified unit.

a. 2-inch inlet and outlet

b. Exhaust Flow Rate = 270 SCFM.

c. Vacuum Flow Rate = 270 SCFM.

d. Minimum sealing pressure 1 psi.

e. Floats shall be UHMW material.

G. Acceptable Models – Low Head Conditions with Exterior Venting Capabilities – Type LHSP

1. Combination wastewater air / vacuum relief valves shall be Vent-Tech Model SDG – Series B with Biased Vertical Tee Top Flange for Hard Pipe Connections or approved equal.

2. To achieve consideration as an approved equal material the air release and vacuum considerations shall be equal to the specified unit.

a. 2-inch inlet and outlet.

b. Exhaust Flow Rate = 270 SCFM.

c. Vacuum Flow Rate = 270 SCFM

d. Minimum sealing pressure 1 psi.

e. 2-inch Female PVC NPT Vertical Tee Connection

H. Materials of Construction

1. The valve body shall be constructed of 316L.

2. The flanges shall be constructed of 316L

I. Structure

1. Contractor shall provide precast concrete structures as specified in Section 02552 and shown on the drawings.

J. Accessories

1. Each air/vacuum relief valve shall be furnished with an isolation valve on the connection the force main.

2. The isolation valve shall be a ball valves of the sizes shown on the plans. The ball valve shall be screwed end stainless steel, two piece, Teflon seats, and blowout-proof stem, Nibco No. T-580-S6-R-66-LL, or equal. Isolation valves 3 inches and larger shall be gate valves meeting the requirements or this Section.

2.08 SHOP PAINTING

A. All iron parts shall be painted before leaving the shop.

B. Unless otherwise specified, all internal ferrous surfaces of each valve except finished or bearing surfaces shall be shop painted with two coats of epoxy paint.

C. Unless otherwise specified, all exterior ferrous surfaces of each valve except finished or bearing surfaces shall be shop painted with two coats of a universally compatible primer or in the case of valves buried or submerged, with two coats of epoxy paint.

2.09 SOURCE QUALITY CONTROL

A. Each check, gate, butterfly, and ball valve shall be submitted to operation and hydrostatic tests at the manufacturer's plant as specified in applicable AWWA Standards.

B. Other valves shall be tested in conformance with applicable specifications in Part 4 of this Section.

PART 3 EXECUTION

3.01 INSTALLATION

A. All valves shall be carefully installed in their respective positions free from distortion and stress. Connecting joints shall conform to applicable requirements of Section 15210.

B. Stem guides shall be accurately aligned.

C. Double disc gate valves shall not be installed with the bonnet more than 90 degrees from an upright position.

D. Accessories:

1. Valve Boxes shall be installed in a plumb position and in alignment with the operating nut.

2. Extensions stems and stem guides shall be in alignment with operating nut and prevent binding and stresses on connecting pins.

3. When there is a change to the grade elevation, valve boxes new and existing shall be adjusted to the new grade elevation.

3.02 COMBINATION WASTEWATER AIR/VACUUM RELIEF VALVES

A. Air valves shall be placed at the location and elevations shown on the plans unless otherwise directed by the Engineer.

B. The Contractor shall notify the Engineer of changed conditions that require the pipe elevation to be changed, possibly requiring the location of the value to be adjusted.

3.03 TESTING

A. All valves shall be tested in place by the Contractor as far as practicable under the conditions for the pipelines in which they are placed, and defects revealed in valves or connections under test shall be corrected at the expense of the Contractor to the satisfaction of the Project Field Representative.

PART 4 SPECIAL PROVISIONS

4.01 VALVE SCHEDULE

A. The following letter designations are used in the Valve Schedule:

Type Designation	Connection Designation	Operator Designation
CV - Check Valve	F - Flanged	FB -Floor Box
GV - Gate Valve	W - Wafer	TW - Tee Wrench
PV - Plug Valve	MJ - Mechanical Joint	G - Gear
BV - Butterfly Valve	PE - Plain End	HW - Handwheel
3PV - 3-Way Plug Valve	C - Clamp	C - Chain
MV - Mud Valve		M - Motor
PR - Pressure Relief Valve		L - Lever
FG - Flap Gate		VB - Valve Box
SG - Shear Gate		FS - Floor Stand
A – Air Vacuum Valve - (See 2.07 for Extensions)		ON – Operating Nut
DB - Duckbill		

Use Designation	Service Designation
RW - Raw Wastewater	O-C - Open-Close
D - Drain	M - Modulation

B. The Valve Schedule is as follows:

Valve Number	Size (in.)	Type	Connection	Operator	Use	Service	Location
PV-1	10	PV	F	HW	RW	O-C	Control Building
PV-2	10	PV	F	HW	RW	O-C	Control Building
PV-3	6	PV	F	HW	RW	O-C	Control Building
PV-4	10	PV	F	ON	RW	O-C	Pigging Manhole 1
PV-5	10	PV	F	ON	RW	O-C	Pigging Manhole 2
CV-1	10	CV	F	-	RW	O-C	Control Building
CV-2	10	CV	F	-	RW	O-C	Control Building
DB-1	3	DB	C	N/A	D	N/A	Control Building
DB-2	4	DB	C	N/A	D	N/A	Control Building
ARV-1	2	A-LHSP	T	N/A	RW	O-C	Control Building
ARV-2	2	A-LH	T	N/A	RW	O-C	Manhole
ARV-3	2	A-LH	T	N/A	RW	O-C	Manhole

Valve Number	Size (in.)	Type	Connection	Operator	Use	Service	Location
ARV-4	2	A-LH	T	N/A	RW	O-C	Manhole
ARV-5	2	A-LH	T	N/A	RW	O-C	Manhole

C. Schedules are not guaranteed to be complete. All valves shown on the Drawings or specified shall be furnished and installed by the Contractor whether or not listed in the above schedule.

D. This procurement is subject to the requirements of American Iron & Steel.

E. Handwheels shall be positioned as shown on the design plans. Handwheels shall be 6-inches in diameter for valves 4-inches and smaller and 12-inches in diameter for valves larger than 4-inches in diameter.

4.02 DUCKBILL CHECK VALVES

A. Duckbill check valves shall be Tideflex TF-1 or approved equal.

B. Duckbill check valves shall open with 3-inch head pressure.

4.03 CHECK VALVE ACCESSORIES AND SPARE PARTS

A. One backflow actuator for the 10-inch Val-matic Series 500 Swing-Flex Check Valves shall be provided.

B. Two sets of spare parts to include discs, disc hinges, o-rings and grease packet shall be provided.

END OF SECTION

SECTION 15400
PLUMBING

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing all necessary plumbing components, connecting piping, and accessories, and a complete plumbing system for each service or combination of services.

B. Each system shall be adequate to conduct and control the flow of hot and cold potable water, sanitary lines, vents, roof drains, or other uses as specified or shown on the Drawings.

C. Plumbing is defined to include all potable water and all building sanitary drainage and vents and all building storm drainage of every size located in all buildings and up to a point, 5-feet -0-inch outside each building.

D. Work includes, but is not limited to:

1. Securing and bearing the cost of all permits, certificates, and inspection as required by local regulations and state plumbing codes.
2. All pipe, fittings, and connections to sanitary fixtures for potable water supply and waste, including vents, roof drains, floor drains, equipment drains, traps, cleanouts, and backwater valves.
3. Pressure gauges, thermometers, control devices, pipe hangers, anchors, supports, hose bibbs, sill cocks, and sleeves.
4. Potable water supply to boiler makeup water stop valves, or other equipment requiring these services.
5. Pipe insulation complete with jacket as required by Section 15504.
6. Sanitary fixtures, sinks, lavatories, backflow preventer valves, water coolers, acid neutralizing basins, oil and grease separators, and water heaters.

E. Additional product requirements are specified in Section 01350.

F. All equipment, materials, and Work shall comply with Federal, State, and local plumbing codes. Equipment materials and Work specifically required by Federal, State, or local plumbing codes whether or not shown on the Drawings or specified shall be provided by the Contractor at no change in Contract Price.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:
   a. Manufacturer's literature.
2. Information for the Record:
   a. Material certificates.
   b. Operation and maintenance manual.

1.03 CONTRACT DRAWINGS

A. All Drawings are diagrammatic and are intended to show the approximate location of equipment and piping.

B. The exact location of apparatus, fixtures, equipment, and piping shall be ascertained by the Contractor in the field, and the Work shall be laid out accordingly. Should the Contractor fail to ascertain such locations, the Work shall be changed at his own expense when so ordered by the Engineer. The Engineer reserves the right to make minor changes in the location of piping and equipment up to the time of installation without additional cost to Owner.

1.04 PROTECTION FROM DAMAGE

A. Delivery, Handling, and Storage:
   1. Material delivery, handling, and storage shall meet the requirements of Section 01350.
   2. All valves and appurtenances shall be crated before shipment.
   3. All plastic fixtures and pipe, if stored outside, shall be covered with an opaque material to protect them from the sun's rays.

B. After Installation:
   1. Suitable covers and guardrails shall be placed to protect against chipping enamel or denting the surfaces of any equipment after it is installed and during the final days of construction.
   2. Before acceptance, all covers and protective material shall be removed and the fixtures and equipment cleaned and ready for use.

PART 2 PRODUCTS

2.01 RESERVED

2.02 VALVES

A. Ball valves through 2-inch shall be screwed end bronze, two-piece, 125 psi, Teflon seats, bronze trim, and blowout-proof stem, Nibco T-580-BR-Y-20 or equal.

2.03 PRESSURE AND SUCTION GAUGES

A. Pressure gauges shall be 4-1/2-inch in size with fiberglass reinforced polypropylene case, phosphor bronze bourdon tube, 6-inch or 4-1/2-inch dial faces with black lettering, micrometer type pointers and an accuracy of plus 1% of scale range. Pressure gauge shall be H.O. Trerice No. 450 series, Ashcroft 2462 series, or equal.

B. Gauges shall read in feet with graduations as listed below.

1. Range: 0 – 100 feet
2. Major Graduation: 10-feet
3. Minor Graduation: 1-foot

C. All pressure gauges unless otherwise directed shall include a brass pressure snubber and a needle type shut-off valve.

D. For sanitary sewer applications, pressure gauges shall have diaphragm seals. The gauges, seals, and snubber shall be factory assembled and filled with fluid. The diaphragm seal shall be Type 316 stainless steel with a stainless-steel housing. Diaphragm seal shall be an Ashcroft 101 series, H.O. Trerice 877-2 series, or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Cutting of all pipe shall be done with sharp tools. The ends of each pipe shall be reamed until all burrs or fins are removed. Full tapered threads shall be used throughout and threaded joints shall turn up perfectly tight without the use of filling substances. A standard pipe joint paste shall be used on the male threads only, and none shall be allowed to accumulate on the inside of the pipes. All connections between pipe, pipe hangers, and equipment shall be made with an approved dielectric insulating material.

B. Pipe joints shall conform to respective industry standards.

C. Expansion and contraction of the piping system shall be provided for by the use of swing joints, right angle loops, or approved expansion joints.

D. Interior and exterior pipelines shall be installed and graded in accordance with State and/or Local Plumbing Codes. Interior pipes shall run at right angles or parallel to building walls, placed as close as practicable to the ceiling and/or walls, and supported by hangers or brackets. All hangers and inserts or other approved method of pipe supports shall be provided. The inserts or anchor bolts shall be located according to Drawings and Specifications and installed in the concrete at the time it is placed.

E. Drain valves shall be installed at all low points. Vent valves shall be installed at all high points.

F. Pipe groups for plumbing shall be run parallel with pipes of other trades, and wherever practicable, all piping shall be supported on common group hangers unless pitch of pipe as hereinbefore mentioned is required.

G. The piping shall be installed in a workmanlike manner and shall avoid interference with columns, beams, equipment, and other piping or fixed construction. A minimum of 7-feet of headroom shall be maintained at any point including stairs.

H. Type C wall sleeves shall be provided for all pipes passing through exterior walls unless other sleeve types are noted on the Drawings. Type C sleeves shall also be provided in interior walls where indicated on the Drawings, Type D floor sleeves shall be used where piping passes through floor. Other sleeve types shall be used where shown on the Drawings.

I. Provide a system of vents from each plumbing fixture and drain, extended to drain at the bottom, and through the roof, providing equalized pressure on every trap. As a minimum the system shall be as indicated on the Drawings, but in no case, shall the complete system be less than required by the State and local Plumbing Codes.

J. Sanitary waste and vent piping indicated may, in some instances, exceed the code requirements. If Drawings indicate individual wastes for each fixture, then the Drawings and Specifications shall hold precedence over the code even though it exceeds the prescribed waste and vent code minimum.

K. Each vent stack shall be carried through the roof whether in combination with its parallel soil stack or in multiple combination with other vent stacks. Each vent or stack shall be increased one pipe size before passing through roof, but in no case, shall a vent through the roof be less than 4-inch

L. All vents through the roof less than 18-inch from an outside wall shall be offset by means of 1/4 bends to permit proper flashing.

M. Stacks enclosed in wall chases in finished rooms shall have extension pieces placed in tees set to bring the cleanout plugs just back of the finished wall line, and finished at the wall line with chromium plated cleanouts, Zurn No. 1440-1, Josam, or equal.

N. Buried pipe shall be firmly bedded the full length with the exception where bell holes are required. Unless shown otherwise on the Drawings, all pipelines shall be installed with a minimum cover of 5-feet. Where unstable soil conditions occur under buildings, support shall be made from the underside of the structural slab by an approved type hanging device embedded in the concrete.

O. Unless shown otherwise on the Drawings, all buried pipe carrying liquids shall be installed with a minimum cover of 5-feet. Pressure piping which carries gases shall be installed with a minimum cover of 4-feet. When new piping crosses existing utilities and other obstructions which force a change in elevation, the Contractor shall install the new piping at a deeper elevation to avoid the obstructions unless otherwise instructed by the Engineer. Such changes in elevation shall be made either by installing fittings or by deflecting joints in accordance with the pipe manufacturer’s recommendations. Such Work shall be performed at no additional cost to the Owner. To the extent possible, pressure and process piping shall be installed at a constant grade. All changes in grade shall be approved by the Engineer.

P. Extend downspout laterals from each roof drain and riser to storm drainage system. Make direction changes with TY fittings or Y fittings and 1/8 bends as required. Install cleanouts at each direction change, and the base of each riser, and at 50-foot intervals in horizontal straight runs.

Q. Horizontal piping shall be suspended to a grade of not less than 1/8-inch per-feet wherever possible, and as close to construction as practicable to insure maintenance of schedule ceiling heights and avoid interferences. Direction changes, junctions, etc., shall be made with TY fittings or Y fittings and 1/8 bends as required. Provide cleanouts at all directions, changes, dead ends, and at 50-foot intervals on straight runs.

R. Install cleanout fittings at the base of each vertical pipe used for sanitary drains, roof conductors, or vent stacks, and at each change of direction of the building drain greater than 45 degrees F.

S. The ends of all horizontal drain lines shall be extended to cleanouts as specified above with top of plug set level with the finished floor.

T. Underground traps, except “P” traps, into which floor drains with removable strainers discharge, shall be provided with accessible and removable cleanouts.

U. Where PVC piping is laid in a trench, the bottom of the trench shall be well graded and compacted to insure even bearing for the full length of the pipe and the pipe shall be snaked at approximate 50-foot intervals to provide for expansion or contraction. Prior to testing the pipe, the pipe shall be center loaded with backfill between joints before testing to prevent the pipe from arching or whipping under pressure. During backfill the line shall be pressurized to 25 psi to minimize impact damage.

V. All valves shall be installed with their stems horizontal or above. As far as possible, all valves of the same type shall be of the same manufacturer.

W. The T-drill method of manufacturing tees in continuous copper tubing is not acceptable.

X. Polypropylene pipe installation for laboratory use shall be in accordance with Contract Drawings, the manufacture’s recommendations, and the local plumbing code. Entire system shall be installed free of stress and in proper alignment without strain. Horizontal supports shall be split ring or clevis type hanger spaced in accordance with manufacturer’s recommendations. Vertical supports shall be standard riser clamps at each floor. Piping components shall be fused electronically with a Chem-Fuse power unit. Output voltage and fusion time shall be automatically controlled by the power unit. Connections between Chem-Fuse and other types of piping materials shall be made with Chem-Fuse adapters. Contractor shall provide, at no additional cost, on-site training for installation/maintenance personnel. Installation shall be in accordance with the manufacturer’s printed instructions, system design drawings, and applicable local codes. System testing shall be in accordance with local plumbing codes. Air or compressed gas is not recommended and should not be used as a media for testing Chem-Fuse piping systems.

3.02 TESTING AND ACCEPTANCE

A. Each pressure pipe system shall be tested hydrostatically at 150% of its operating pressure, unless otherwise stated in the Code. Test pressures and durations will be set by the Engineer and each test will be approved only after he has witnessed satisfactory pressures at the end of each test run.

B. The drains and vent lines shall be tested by filling the entire system with water to the highest point of overflow. After the pipes have stood full for 15 minutes, all joints and connections to fixtures shall be observed.

C. After all leaks have been repaired and approved, the lines and plumbing fixtures shall be flushed clean with hot water and left in a sanitary condition. The outside surfaces of pipes and equipment shall be cleaned of grease and dirt by a cleaning compound, then washed with water and allowed to dry.

D. The working temperature and pressure conditions shall be imposed on piping systems for a sufficient length of time to insure that flanges and bolts or studs have reached a point of constant temperature and have attained such changes in dimensions as will take place, after which all flanged joints and fittings on all equipment shall be retightened by the Contractor.

3.03 RESERVED

PART 4 SPECIAL PROVISIONS

None

END OF SECTION

SECTION 16005
ELECTRICAL

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing, planning, and coordinating all labor, equipment, materials, tools, plant supplies, testing, adjusting, and all temporary Work necessary to install all required electrical components and function for a complete electrical system(s) installation.

B. The Contractor shall provide all exposed, concealed, and underground electrical raceways, including conduits, wiring troughs, and auxiliary gutters, expansion and deflection fitting boxes, and all other fittings, supports, and other electrical raceway components required to complete the installation as shown and specified.

C. The Contractor shall provide related excavation, backfilling, concrete work, cutting and patching, and the restoration of all surfaces to their original condition.

D. The Contractor shall furnish all labor, materials, equipment, and incidentals required and install a complete grounding system in strict accordance with Article 250 of the National Electrical Code and as herein specified and shown on the Drawings.

E. This Section includes power wiring, power electrical conduit, power distribution panels, and circuit breakers, for HVAC equipment 115 volts and greater.

F. Additional product requirements are specified in Section 01350.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Where conduits are to be installed in a concrete slab, a conduit layout shall be submitted at least 14 days prior to the pour. All conduit layouts shall show conduits with anticipated number, size, and types of power, control or instrumentation, conductors/cables, spares, and grounds for each and every Section of Division 16 requiring separate conduits.

b. The Contractor shall submit detailed dimensional drawings covering all wiring systems and items of equipment. Drawings of co-jointly installed or operated equipment shall be submitted simultaneously for approval with Shop Drawings showing the assembly thereof. Drawings of equipment shall have the locations and service clearly noted. Shop Drawings, wiring and interconnection diagrams, where applicable, and manufacturer’s test reports shall be submitted.

c. Shop Drawings submitted for approval shall include complete wiring diagrams, showing control center wiring, including wiring between compartments, wiring to remotely located control stations, solenoids, limit switches, etc. Diagrams shall be supplemented by ladder-type schematic diagrams in accordance with NFPA 79, Annex D standards. Where ladder-type schematic information is not available from the manufacturer, the Contractor shall submit written evidence of same from the manufacturer.

2. Information for the Record:

a. Upon completion of the installation and acceptance by the Engineer, Record Documents of all electrical (schematic) diagrams, interconnection diagrams, panel layouts, instrument loop diagrams, and related support materials shall be corrected and amended, as required to reflect the installed system. This information shall be submitted in both of the following formats:

1) Mylar plots of Drawings and photocopy of all other diagrams and literature.

2) A computer file on CD of documents including but not limited to drawings in the latest version of AutoCAD format. Literature and other information shall be provided in either Microsoft Word or PDF format.

b. Certificate of final inspection and approval from the inspection authorities and the Fire Marshall.

c. Records of tests as required or as directed.

3. Operation and maintenance manuals, with information for the specific model number(s) used underlined, or conspicuously marked, to segregate that information from other model(s) where the manual includes information for more than one model.

1.03 QUALITY ASSURANCE

A. All Work shall be performed in accordance with the best modern practice and shall conform, as a minimum to the standards of the local authorities, the National Electrical Code, National Electric Safety Code, OSHA, and any other codes and standards specified or applicable. Where provisions of the cited codes or standards are modified or supplemented, the more stringent shall apply. The provisions or interpretation providing the highest standard work or quality of material shall prevail.

B. The Contract Drawings are diagrammatic, but shall be followed as closely as conditions at the Site of the Work will permit. They shall be supplemented by the Contractor with complete working drawings, including wiring diagrams, connection diagrams, conduit and equipment layouts to scale, and details of the installation, including conduit and

ductbank penetrations through structural slabs and walls and other required information.

C. Wiring diagrams shown on the Contract Documents are suggestive only. Final control connections will depend upon the equipment selected. The Contractor may submit alternative diagrams for approval by the Engineer.

D. Electrical materials and equipment shall be designed and manufactured in compliance with the latest applicable Standards of the UL; IEEE; NEMA; ANSI; ASTM; the Insulated Cable Engineers Association; and other applicable standards. Materials commonly bearing UL labels shall be so labeled.

1.04 ELECTRICAL AND CONTROL COORDINATION

A. The locations of equipment, appliances, outlets, fixtures, and similar devices shown or specified shall be considered approximate. The exact locations shall be approved by the Engineer during construction, and as required to suit the ambient conditions at the time of installation. The Contractor shall obtain, in the field, all information of the actual Work and final locations under other sections required for the placing of his work, and shall consult the Engineer and ascertain the actual location required. The Contractor shall also consult with other trades and sections and examine their drawings so as to avoid conflicts with other Work and apparatus.

1.05 GUARANTEE

A. Provide completed warranty information for each item. Include the following information:

1. Date of beginning warranty period.
2. Duration of warranty.
3. Warranty options.
4. Name, address, phone numbers, and procedures for filing warranty claims.

PART 2 PRODUCTS

2.01 GENERAL

A. All equipment and materials shall be new and, if of the same kind or performing parts of the same system, shall be the products of the same manufacturer.

B. All equipment and material shall be furnished by a manufacturer whose products have been in satisfactory use in similar service for not less than 5 years.

C. Wherever materials, equipment, apparatus, or other products are specified by manufacturer, brand name, type, or catalog number, such designation is to establish standards of desired quality, style, and dimensions and shall be the basis of the Bid.

D. All control, instrument, monitoring, signal, or other such conductor installations, whether spare requirements are specifically mentioned or not, shall, as a minimum,

include an additional unused 20% spare conductors over and above the number of conductors actually used or specified for this Contract, whichever is greater.

E. Control wires and shielded cable wires regardless of the location on this project shall have identification wire markers on each end of each wire and the wire numbers shall be identified on the submittal drawings. Complete electrical wiring diagrams identifying all HVAC, machinery, and equipment wiring as well as all component wiring shall be submitted before the project is accepted.

F. Electrical enclosure requirements shall conform with area classifications whether designated on the Drawings or not.

1. Unless shown otherwise on the Drawings, or specified, enclosures shall conform to the following: Enclosures, pushbutton stations, and components for enclosures located outdoors shall be NEMA 4X, and light switches and duplex outlets shall be weatherproof.

2. Areas with process equipment shall have minimum NEMA 4X enclosures and the installation shall conform to NEC Electrical Standards.

3. Indoor areas shall be NEMA 12 areas, but all HVAC wiring shall as a minimum conform to process area requirements described above.

4. “Hazardous” areas with process equipment shall be a Class I, Division 1, Group D type classification for enclosures and the installation per (NEC) Electrical Standards unless marked differently on the drawings.

2.02 LOW VOLTAGE TRANSFORMER 600 VOLTS AND BELOW

A. Mini-Power Zone:

1. Unit shall be used where specified on the Drawings. Unit shall be UL listed rated 3R/12 for outdoor/indoor applications. Rating shall be kVA as indicated on the Drawings. Transformer shall be dry-type, non-ventilated, 3-phase, 60 Hz with delta-connected primaries and 120/208 volts secondaries, or single-phase primary and 120/240 volts secondary, with primary and secondary circuit breakers. Unit shall include copper bus bars, copper ground and neutral bar.

2. The enclosure shall be made of heavy-gauge steel, and the maximum temperature of the enclosure shall not exceed 90 degrees C. The enclosure shall be totally enclosed non-ventilated with lifting eye. Unit shall be suitable for service entrance and shall be Square D “Mini-Power Zone”, Cutler-Hammer “Mini-Power Center”, or equal.

2.03 CONDUIT

A. Conduit shall be galvanized rigid steel, manufactured in accordance with UL 1242, and meeting the requirements of FS WWC-581, unless specified otherwise in the Project Specifications, or indicated on the Contract Drawings.

B. Conduit shall be hot-dip galvanized, including threads and couplings. Each length of conduit shall bear the UL label and the manufacturer's name and trademark.

C. No conduit smaller than 3/4-inch shall be incorporated in the Work, unless otherwise designated in the Project Specifications. Conduit installed underground or in poured concrete shall be 1-inch minimum size.

D. Plastic conduit (PVC) shall be heavy wall, Schedule 40 or Schedule 80, depending on installation, manufactured in compliance with NEMA TC-2 specifications and UL-651 Standards.

E. Underground plastic duct (PVC) shall be for concrete encasement or direct burial as specified and indicated. It shall conform to NEMA TC-6 and ASTM F512 Standards for underground installation. Concrete encasement shall be as recommended by the manufacturer. Plastic spacers, end bells, and fittings shall be furnished and installed, as required.

F. All flexible metallic conduit shall be liquidtight unless otherwise indicated on the Contract Drawings or in the Project Specifications. Fittings shall be liquidtight and as recommended by the conduit manufacturer. Conduit shall be "Sealtite", or equal.

G. PVC Coated Conduit (where specified): A plastic coating shall completely encapsulate metallic conduit to provide total protection against corrosion. The zinc surfaces of the conduit shall remain intact on both the inside and outside of the conduit throughout the preparation and application processing.

1. The conduit shall be "Hot Dipped" galvanized inside and outside including the threads. "Hot galvanizing" is not acceptable.

2. The threads shall be coated with urethane over the "Hot Dipped" galvanized threads.

3. A minimum thickness of 40 mils PVC exterior coating shall be permanently fused to a hot dipped galvanized rigid steel conduit.

4. A urethane or polyurethane interior coating shall be applied at a nominal 2 mil thickness to the interior of the conduit and over the hot dipped galvanized threads.

5. The PVC coating on all Form 8 fittings shall form a gasket-like flange of at least 5/16-inch wide and 0.040-inch thick covering the top of the fitting around the opening. All fittings should have a minimum of 40 mils PVC coating even around the edge of covers. Also, all fittings to have urethane coating inside and outside prior to PVC coating.

6. GUA type boxes shall be supplied with WOD type covers (Feraloy iron instead of aluminum) to prevent corrosive reaction between dissimilar metals. Conduit fittings (couplings, elbows, etc.) shall be of the same material.

7. PVC coated conduit shall be UL listed and conform to the same standards as a metallic conduit. PVC coated conduit shall be "OCAL BLUE" as manufactured by

OCAL, Inc., “Permacote”, “Korcap” or “Plasti-Bond” as manufactured by Robroy Industries, or equal.

8. Conduit shall be supported by corrosion resistant straps and clamps.

9. Contractor shall follow manufacturer’s recommendations regarding the handling, bending, coupling, tools, and installation of the conduit specified herein.

2.04 CONDUIT FITTINGS

A. Conduit fittings shall be standard threaded type of cast ferrous alloy, to suit the location and purpose. Fittings shall be Crouse-Hinds, Appleton Electric, or equal.

B. Fittings for use with plastic conduit/duct, or PVC coated conduit, shall be compatible with the type of plastic conduit/duct, or PVC coated conduit used, and shall be of the same manufacturer.

C. Fittings shall be vapor proof, weatherproof, or explosion proof where required.

D. Unless specified otherwise, all exposed fittings, junction boxes, outlet boxes, terminal boxes, etc., shall be cast threaded hub type as specified. Also, all shall be hot-dip galvanized or cadmium plated.

E. Conduit expansion/deflection fittings shall be complete with bonding jumpers and shall be watertight.

F. Conduit insulating bushings with ground lug shall be the armored type.

G. Fire stops shall have a 3-hour fire resistance rating and shall be made by the 3M Company or equal.

2.05 BOXES

A. The volume of each outlet box shall be in compliance with the requirements of Article 314 of the NEC, minimum.

B. Outlet boxes located inside/outside of buildings or in wet or damp locations shall be galvanized malleable or cast iron, or corrosion resistant stainless steel.

C. Where two or more switches or devices are indicated at a single location at the same elevation, a multiple gang box shall be furnished and installed.

D. Pullbox size and gauge, unless otherwise indicated or specified, shall comply with Article 314 of the NEC, and be complete with covers. Pullboxes having any dimension greater than 8-inches shall be fabricated of not less than No. 12 gauge sheet steel, complete with cover and silicon-bronze screws, or equal. Boxes shall be constructed with all seams continuously welded, not spot welded. After fabrication, boxes shall be hot-dipped galvanized. Where additional pullboxes are required by code or to facilitate installation, they shall be furnished and installed at locations approved by the Engineer, at no additional cost to the Owner.

E. Floor boxes shall be cast, heavy duty, external flanged with gasketed, recessed, checkered cover for flush mounting complying with FS W-C-5836. Boxes shall be of the sizes specified and required, and shall be drilled and tapped as required for conduit connections.

2.06 WIRE AND CABLE

A. All wires and cables shall be delivered in full coils or reels and shall be properly tagged and well protected against damage by layers of paper and burlap wound around coils. UL "Approved Tags" giving grade of insulation, sizes and length of wire in each coil or reel, and the manufacturer's name must be securely attached.

B. Unless specified otherwise, all conductors shall be soft drawn annealed copper wire of 98% conductivity, with THHN/THWN insulation for 600-volt service. All service, feeder, and motor circuit conductors larger than No. 4 AWG shall have 90 degrees C Type XHHW-2, crosslinked polyethylene insulation.

C. All fixture wire, including circuit extensions in fluorescent fixture channels, shall comply with NEC requirements.

D. All power wires shall be No. 12 AWG or larger. Control wires shall be No. 14 AWG or larger, unless specified otherwise. Signal wires shall be No. 16 AWG or larger, unless specified otherwise. All conductors shall be stranded copper.

E. Cable terminators shall be as required for the type of cable involved, O-Z/Gedney Electrical Manufacturing Co., Thomas and Betts Co., or equal, unless specified otherwise.

F. 1000V Variable Frequency Drive Cable

1. Shall be manufactured by Lutze DriveFlex or equal.
2. General: Variable frequency drive cable shall be multiple conductor type and conforming to UL Standards 1277 and 2277
3. Flexible stranded tinned copper conductors per ASTM standard
4. Insulation for current-carrying conductors: Thermoset Type XHHW-2 or RHW-2 Cross-Linked Polyethylene (XLPE)
5. Only non-wicking fibrous or insulation material extruded fillers shall be used in cable construction.
6. Depending on motor ampacity, conductors shall be configured as either a four-conductor design (three current carrying conductors, plus one equivalent-sized ground) or a symmetrical insulated ground design (three current carrying conductors, plus three symmetrical ground conductors of reduced size)
7. Conductor Identification: Individually numbered current carrying conductors. Each current carrying conductor shall be labeled clearly and concisely no more than every six inches along the length of each conductor. Ground conductor

shall be green/yellow and conform to IEC 60446 Section 5.3.2 and NFPA 79 2018 edition, article 13.2.2.

8. Braid over foil construction: Dual layer shielding for EMC compliance is required. Shielding shall consist of overlapping aluminum mylar foil and tinned copper braid shield. A tinned copper drain wire shall be included on the exterior of the braid shield.

9. Outer jacket: Black TPE or PVC jacket with flexible, and oil resistant construction. Specifically formulated for easy stripping during field installation.

10. Cable shall have low capacitance.

11. Cable shall have high insulation resistance.

12. Cable shall be sunlight resistant and suitable for direct burial.

13. Cable Voltage Rating: Minimum 1000 Volts phase to phase

14. Cable Temperature Rating: 90 degree Celsius for normal operation

2.07 GROUNDING MATERIALS

A. Grounding materials shall be corrosion-resistant and chemically compatible with the materials with which they come in contact.

B. Ground rods shall be copper clad and not less than 3/4-inch in diameter and 10 feet long.

C. Connections in readily accessible locations shall be compression or bolted connectors of Burndy Engineering Company or equal.

D. Connections in locations not readily accessible after installation including splices and connections of grounding cable shall be made by exothermic welding by Cadweld or equal.

2.08 SPLICING MATERIALS

A. Dry Locations

1. No. 6 AWG and smaller wires

   a. Insulated spring connectors (wire nuts)

   b. Indentor butt connectors.

2. No. 4 AWG and larger wires

   a. Splices to uncut main runs shall be made with “Crimpits”, or equal for No. 4 AWG thru No. 4/0 AWG.

   b. Splices to uncut main runs shall be made with “Hytaps”, or equal for wires larger than No. 4/0 AWG.

B. Wet and Damp Locations

1. Indentor or compression connectors equal to “Sta-kon”, “Thomas and Betts”, or equal.
    a. Splices to uncut main runs shall be made with “Crimpits”, or equal for No. 14 AWG thru No. 4/0 AWG.
    b. Splices to uncut main runs shall be made with “Hytaps”, or equal for wires larger than No. 4/0 AWG.

2.09 CONCRETE

A. Concrete slabs for electrical equipment mounted on outdoor slabs shall be provided as shown. Unless otherwise indicated, slabs shall be 6 inches thick, project 2 inches above the highest-grade point, have No. 5 reinforcing bars 12 inches on center each way top and bottom, and set on 6 inches of No. 67 selected stone fill on top of compacted soil.

2.10 WIRING DEVICES

A. Switches shall be specification grade totally enclosed, quiet tumbler, AC type, meeting NEMA Performance Standards and FS and capable of control of 100% tungsten filament (incandescent) lamp loads.

B. Switches shall be rated at 20 amps, 120/277 volts. Operating handles shall be phenolic colored brown. Switches shall have screw terminals.

C. Receptacles shall be specification grade, meeting NEMA Performance Standards, and FS, and having a contact arrangement such that contact is made on two sides of each inserted blade without detent.

D. Receptacles shall be two-pole, three-wire grounding type with rating of 20 amps, 125 volts, NEMA configuration 5-20R, and have screw-type wire terminals suitable for No. 10 AWG designated CO/ALR. Bases shall be phenolic composition colored brown.

E. Receptacles for outdoor installation shall be provided with ground-fault protection with push-to-test capabilities.

2.11 IDENTIFICATION

A. Nameplates and Legends:

1. All new equipment shall be identified by means of a laminated phenolic nameplate.
2. Nameplate shall have white background with black engraved lettering or black background with engraved white lettering identifying function or equipment designation.
3. Main nameplate on MCC switchgear, control panel, etc. shall be 2 inches high by 6 inches wide with 1-inch high letters. Individual nameplates shall be 1-inch high by 3 inches wide with 1/4-inch high letters.

4. Legends shall be completely worded without abbreviations except as approved by the Engineer.

5. Nameplates shall be fastened by means of 3/16-inch diameter roundhead, stainless steel, self-tapping screws. All UL 508 4X enclosure nameplates shall be secured with silicon adhesive.

6. Blank nameplates shall be included on all unused components. Modified equipment shall be identified in the same manner as was the original equipment. Equipment whose designation has been changed shall be relabeled accordingly.

7. All nameplates on electrical panels which are fed from a remote source shall include, in addition to their function, where the power originates from (e.g. Scum Pump Panel - fed from MCC-1, MCC-1 fed from Main SWG).

B. Conductor Identification

1. Wires and cables, except at lighting and 120 volts convenience outlets, shall be identified by means of tags describing circuit.

2. Tags shall be on all connections, splices, and terminations, and shall also be applied where entering and leaving common wireways.

3. Wire tags shall be equal to Thomas & Betts white, self-adhesive wrap or Panduit heat shrink type labels. Tags shall be vinyl, polyester or Polyolefin, resistant to excessive heat, water, cold, dirt, and grease.

4. The tag type-on-area shall be sufficiently sized to contain five numerals on each line. Wire numbers shall be typed on with Thomas & Betts E-Z Coder Printer, Panduit Dura-Mark Printer or equal.

5. Insulated conductors No. 8 AWG and larger shall be color coded at each end with a 2-inch wrap of suitable color tape as follows, if integral color is not utilized.

System	Phase Conductors A, B, and C	Neutral Conductors
120 volts, single-phase, 2-wire	Black	White
208Y/120 volts, 3-phase, 4-wire	Black, Red, Blue	White
480 volts, 3-phase, 3-wire	Brown, Orange, Yellow	--
Grounding	Green	

** Apply tape near termination on cable.

6. Direct current conductors shall be identified by the following methods:

a. Provide self-sticking markers on each direct current conductor.

b. Marker colors shall be black letters on “alert orange” background.

c. Each marker shall designate circuit conductor polarity and voltage (e.g. 28 VDC).

d. Direct current control conductors shall be color-coded dark blue.

7. On a 4-wire delta-connected system where the midpoint of one phase winding is grounded to supply lighting and similar loads, the conductor or busbar having the higher phase voltage to ground shall be durably and permanently marked by an outer finish that is orange in color or by other effective means. Such identification shall be placed at each point on the system where a connection is made if the grounded conductor is also present

C. Pull, terminal, and junction boxes shall be identified by stenciling the names of the feeders and system wires and cables passing through them.

D. MCCs and power panels of NEMA 3R double-door construction shall have stenciled panel designation at the top and branch designations appropriately spaced in the outer doors. NEMA 4X lighting and power panels shall have designations appropriately placed on them.

E. Direct current conductors shall be identified by the following methods:

1. Provide self-sticking markers on each direct current conductor.
2. Marker colors shall be black letters on “alert orange” background.
3. Each marker shall designate circuit conductor polarity and voltage (e.g. +28 VDC).

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate electrical systems, equipment, and materials installations with other building components and building trades.

B. If the current requirement of any motor or piece of equipment is increased to such an extent that the wiring, conduit, or starter for that motor or equipment must be increased from that shown on the Electrical Drawings, the Contractor shall furnish and install the larger items at no additional cost to the Owner.

C. Certain equipment furnished under the equipment Sections shall be connected to the plant control system as shown on the P&ID drawings. Mechanical and electrical components for these connections shall be furnished, under the equipment sections, as required to provide control functions compatible with the plant control system. These connections and any remote-control connections shall be furnished and wired to clearly labeled terminal strips within the equipment control panel.

D. If the electrical control requirements change from that specified or shown on the Electrical or P&ID drawings due to the requirements of the actual equipment furnished, the Contractor shall perform all necessary modifications under the equipment section and no additional compensation will be allowed. The final installation shall meet the operational intent of that specified and shown on the Drawings.

3.02 INSTALLATION

A. Contractor shall furnish and install all wires, cables, conduits, conduit fittings, and other accessories. Contractor shall drill all holes required for the installation. Parts shall be insulated effectively from the ductwork and building structure, and objectionable noise or vibration. The electrical materials, equipment, and apparatus shall be installed in such a manner that parts requiring inspection, adjustment, and maintenance shall be readily accessible.

B. Wiring shall be contained in metal, PVC, or fiberglass raceway, and at the completion of the job all boxes shall have closed covers and where brought into panels all shall be identified and bundled in a neat fashion.

3.03 OPENINGS AND SLEEVES

A. All electrical conduit penetrations through an exterior surface above grade level shall be sealed and made water tight. For metal panels, use a sealant around the conduit penetration on both sides of the wall.

B. All electrical conduit penetrations through the fire resistance rated walls or floors shall be fire stopped as required by the NEC using the approved method as recommended by the manufacturer.

3.04 CONCRETE

A. Contractor shall furnish and install all concrete and reinforcing steel necessary to complete the electrical work, including foundations and all materials for concrete and reinforcing steel work wherever required. All concrete shall conform to the requirements specified in Section 03300.

3.05 MOUNTING AND ATTACHMENT

A. Equipment Mounting Pads - All indoor freestanding electrical equipment including motor control centers, switchgear, switchboards, and panels, excepting units with leg supports or rollout equipment, shall have concrete equipment mounting pads provided. Equipment mounting pads shall be 4-inches high with 1-1/2-inch chamfer on all exposed edges.

B. Cut ends of galvanized manufactured channels shall be painted with brush-on, 85% zinc-enriched paint.

3.06 CONDUIT AND FITTINGS

A. Minimum size of conduit shall be 3/4-inch, except that concealed homeruns, underground, and embedded conduits shall be not less than 1-inch. Conduit shall be located for protection from mechanical damage. All conduit shall be sized in accordance with NEC.

B. Conduit in concrete slabs and underground shall be PVC conduit unless otherwise noted. Exposed conduit shall be galvanized rigid steel unless otherwise specifically called for. Conduit stub-ups between underground or slab construction and exposed or concealed wall construction shall be bends of rigid galvanized steel conduit, made in accordance with Section 344-10 of the NEC, and shall have an ample coating of asphaltic paint prior to the placement of concrete. Nonmetallic runs shall change to encased galvanized conduit approximately six diameters before becoming exposed.

C. Exposed rigid metallic conduit shall be installed parallel with or at right angles to the lines of the structure, except as otherwise shown, and supported in an approved manner. Conduit fastened directly to structures shall be held with one-hole, malleable iron clamps and clamp backs, or otherwise suitably spaced from concrete or masonry surfaces. Concealed rigid metallic conduit shall be installed in as direct a line as possible, and shall be rigidly supported by approved methods and materials.

D. PVC conduit shall be installed in true alignment and sloped 1/16-inches per foot minimum for drainage wherever possible. PVC conduits which terminate in the concrete walls of manholes, handholes, or other concrete walls shall be provided with manufactured end bells. The installation of non-metallic conduit shall conform to the requirements for metallic conduit.

E. Flexible connections to all equipment subject to movement or vibration shall be made by means of liquid tight flexible conduit equal in length to approximately ten times the diameter of the conduit but not exceeding 3 feet in length.

F. Bushing caps shall remain in place until immediately before the conductors are installed.

G. In areas designated as hazardous, all fittings, material, and equipment shall be of the type approved for such installation. Seal-off fittings shall be used as required by the NEC and local codes, and the complete installation shall be in accordance with the requirements of such codes. All components and Work shall conform to Class I, Division 1, Group D requirements.

H. All conduits to pumps or other equipment shall, unless otherwise shown on the Drawings, be routed through or below concrete floor slabs. Runs on floor slabs are not permitted unless specifically shown as such on the Contract Drawings. Conduit shall be concealed in all locations where walls are faced with glazed tile, or ceilings are suspended. In other areas, except in slabs, conduit shall be run exposed and as approved by the Engineer. Wherever conduit is concealed in masonry of any type, it shall be the responsibility of the Contractor to maintain a clear passageway throughout the entire conduit system, and to clean the conduit system before installing the conductors.

I. Where conduit bushings are constructed wholly of insulating material, a locknut shall be installed both inside and outside the enclosure to which the conduit is attached. Ungrounded conductors No. 4 AWG or larger shall be protected with insulated throat bushings where entering or leaving enclosure in conduit systems.

J. Pulling distances shall be limited to 125 feet, and suitable pull boxes, etc., shall be provided whether shown on the Drawings or not. All “tee” type and in-line conduit

pulling fittings shall be with the tee-hub plugged, or pull boxes per Specifications. Conduit bends between pull points shall be a maximum of 3. Bends in conduit bearing cables for voltages greater than 600 VAC shall have a minimum radius of 36-inch.

3.07 UNDERGROUND CONDUIT

A. Underground conduit shall be concrete-encased where shown. The top of underground conduit shall be not less than 30-inches below grade unless otherwise specified. Concrete encasement shall provide a minimum cover of 6-inches on top and bottom and 6-inches on the sides. Horizontal curves where necessary, shall be drawn on radii of not less than six diameters of the largest conduit in the duct bank.

B. PVC conduit and fitting for use in underground duct banks shall be Schedule 40. Where direct-buried, it shall be Schedule 80.

C. Under pavement crossings shall have a 6-inches minimum concrete cover all around, be reinforced as detailed, and extend 5-feet either side of the pavement.

3.08 BOXES

A. Outlet, fixture, and device boxes in unfinished areas shall be surface mounted unless otherwise specified. Outlet, fixture, and device boxes shall conform to the requirements specified in the paragraphs herein.

B. Outlets shall be “FS” or “FD”.

C. Concrete and Masonry - Outlet boxes installed in unfinished concrete walls or columns shall be provided with 1-inch deep plaster ring. Box and ring shall be set in position before concrete is poured. Cover plate may be installed flush with unfinished surface. In case of brick walls, the same procedure shall be followed, and mason shall fill in around the plaster ring with mortar. Boxes shall be flush where outlets, switches, are so indicated on the Drawings. Protection from entrance of foreign materials shall be provided during construction.

D. Wall mounted convenience receptacles shall be mounted 18-inches above the finished floor unless shown otherwise on the Drawings, required by the NEC, or where required to clear radiators, grilles, louvers, or other equipment and piping.

E. Wall mounted switches shall be mounted 50-inches above finished floor to the center of the box unless directed otherwise. Space between door openings and switches shall be as uniform as possible throughout the buildings.

F. Special purpose outlets shall be located as shown on the Drawings, or in accordance with project or manufacturer’s requirements.

G. Splices made with wire nuts, crimp connectors, terminal blocks, split-bolts, or similar connectors shall be in boxes which are readily accessible. Terminal boxes shall be located a maximum of 8-feet above the floor and shall have a vertical-facing orientation.

3.09 WIRE AND CABLE

A. 120 and higher voltage wiring shall be in conduit. When installing wire or cable, extreme care shall be used to prevent any injury or damage to the materials. The Contractor shall observe the installation instructions and precautions issued by the manufacturer of the wire and cable. The Contractor shall avoid dragging cables across abrasive surfaces or obstructions in a manner which could damage the cable covering. Before pulling wires and cables, the Contractor shall file the record of conduit tests with the Engineer. No wires and cables shall be pulled until all operations which are likely to damage the conductors have been completed. Pulling compounds shall be submitted for approval prior to use, and shall be of such composition as not to damage the conductor covering. The Contractor shall provide adequate equipment for installation of cables which are satisfactory to the Engineer. Cables shall be pulled through conduits in such a manner as not to over stress, stretch, score, cut, twist, or damage the protective covering or insulation of the material. If mechanical means are employed for pulling the cables, a dynamometer shall be used.

B. Damp or Wet Locations - The ends of low-voltage cables installed in damp or wet locations shall be carefully sealed, as specified for deadends, until permanently connected or spliced. The Contractor shall be responsible for maintaining a dry condition while the cables are being pulled.

C. Support in Boxes and Enclosures - Wiring shall be done in a workmanlike manner and shall be furnished to give a neat and orderly appearance. Cables in boxes and equipment enclosures shall be neatly arranged, supported, and laced with approved materials. Cables shall be supported on cable racks in concrete pullboxes and manholes.

D. Pull Wires - Conduits left empty under this Contract shall be equipped with a polypropylene pull rope. Where conduits have less than 25% fill of required conductors/spares, they shall also have a suitable polypropylene line pulled-inch. The pulling line shall be cut and tied off to an anchored steel eyebolt at each box, cabinet, or other destination. Pulling lines may be omitted on lighting conduits less than 60 feet in length.

E. 120 volt “home runs” in excess of 100 feet shall be No. 10 AWG minimum. Branch circuits supplying 1500 watts or more at 115 volts shall be No. 10 AWG minimum.

F. Conductors in vertical runs shall be adequately supported with approved conductor supports, as outlined in the NEC.

G. Conductor Combination and Separation - The combining of conductors of various systems within one conduit system shall not be permitted. Conduit layouts shall provide for the cable separation requirements between various systems and between various signals within given systems throughout this Division as required by this Section. Each of the following shall be maintained in a separate conduit system apart from the others:

1. Lighting and 120-volt utility.

2. Power Distribution - Conductors for voltages over 600 VAC shall be in conduit separate from conduit containing power conductors for 600 VAC or less.

3. Motor Branch Circuit. Exception: Where conductors are less than No. 4 AWG, they may be combined with 7 below.

4. Communication Systems.

5. Shielded Pair Instrumentation and Control.

6. 120-volt motor and equipment controls.

7. UL approved intrinsically safe instrumentation.

H. Separation distance requirements between each of the Items 1 through 8 above shall be as shown on the Drawings, or as otherwise required by the specifications. Shielded cables shall be placed in rigid galvanized conduit, and shall be spaced 12 inches minimum away from power and control conduits. Shielded cable conduits require no spacing between each other when being installed.

3.10 SPLICES AND TERMINATIONS: 600 VOLT AND BELOW

A. Splices and terminations in wires and cables rated 600 volts or less shall be made as described below. Indentor and compression type connectors shall be applied to conductors by means of a tool providing controlled indentation or compression. Splices and connections shall have a conductivity and insulation resistance at least equal to that of the cable and shall be in strict accordance with the conductor manufacturer's recommendations.

1. Wherever conductors are terminated they shall be bundled and identified in a manner matching approved Contractor submitted drawings. Conductors shall be terminated wherever shown or implied on the Contract Drawings.

B. Splices - Wire and cable lengths shall be continuous and without splices between the points of connection, except as otherwise specified, indicated on the Drawings, or approved by the Engineer.

C. The Owner reserves the right to inspect any and all joints made in 600 volt wiring before they are taped, or if they are taped without being inspected, to order the tape removed from any joint(s), and the Contractor shall correct any defect found. After inspection and correction of any fault found, the Contractor shall properly re-tape the joints.

1. Dry Locations - No. 6 AWG and Smaller - Single-conductor, rubber or plastic-insulated conductors with nonmetallic coverings shall be spliced using the materials listed in Part 2 of this specification, followed by wrapping with two half-lapped layers of approved plastic tape extending a distance of not less than 1-inch from the connector.

a. Insulated spring connectors.

b. Indentor butt connectors.

2. Dry Locations - Conductors No. 4 AWG and Larger - Conductors shall be spliced using the materials listed in Part 2 of this specification, except as otherwise specified, by wrapping with two half-lapped layers of approved plastic tape

extending a distance from the connector of twice the outside diameter of the larger conductor or 1 inch, whichever is greater.

3. The insulation of Conductors No. 2 AWG and larger shall be penciled to the diameter of the connector.

4. Where necessary to provide a smooth taping surface, approved electrical insulating putty shall be used as a filler before applying the tape.

5. Wet Locations or Locations Subject to Flooding or Hosing - Single-conductor, rubber or plastic-insulated conductors of all sizes with nonmetallic covering shall be spliced by the use of the connectors listed below, except as otherwise specified, by wrapping with four half-lapped layers of approved plastic tape, extending a distance from the connector of twice the outside diameter of the larger conductor, or 1 inch, whichever is greater. Splices in manholes shall only be permitted where specifically shown on Drawings. In manholes, splices No. 4 AWG and smaller shall be in submersible NEMA terminal boxes within easy reach of ground level.

3.11 GROUNDING

A. General:

1. System neutrals; secondaries of control power, instrument, metering and relaying transformers; noncurrent-carrying metallic equipment enclosures; exposed metal structures; and supports shall be effectively grounded to ground grids and busses provided under this Contract.

2. Noncurrent-carrying metallic parts, electrical equipment and systems including, but not limited to, transformers, motors, lighting, equipment, raceways, control panels and consoles, panelboards, and cable shields, as well as metallic structures, shall be grounded.

   a. Care shall be taken to ensure ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires, sized per NEC Table 250-95, shall be installed.

   b. Conduits stubbed-up below a motor control center shall be fitted with insulated grounding bushings, and connected to the motor control center ground bus or structure. Boxes mounted below motor control centers shall be bonded to the motor control center ground bus. The grounding wire shall be sized in accordance with Table 250-95 of the National Electrical Code, except that a minimum No. 12 AWG copper shall be used.

   c. Liquid tight flexible metal conduit, UL approved for grounding, shall be permitted as equipment grounding means in the 1-1/4-inch and smaller trade sizes, if the total length in any ground return path is 6 feet or less, and the conduit is terminated in fittings approved for grounding.

1) Flexible metal conduit, where permitted by NEC Article 348, is permitted as equipment grounding means if the above restrictions for the liquid tight flexible type are met, and if the circuits are limited to 20 amperes.

2) Flexible metal and liquid tight metal conduit shall be bonded around externally on sizes 1-1/2-inch trade size and larger. Grounding liquid tight connectors or bronze grounding bushings shall be used for the installation of equipment grounding conductor around the flexible metal conduit.

d. Insulated grounding bushings shall be used on the grounding of conduits 480 volts and higher, with the appropriate size copper equipment grounding conductor.

B. Conductors - Ground conductors shall be run with feeders in polyvinyl chloride conduits, whether shown or not, sized no less than required by NEC or larger if required by the Drawings.

C. Connections:

1. Exposed connections shall be made by means of approved grounding clamps. In readily accessible locations, compression or bolted connectors shall be used. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A, or equal. Buried connections shall be made by welding process.

2. Where grounding conductors are carried external to flexible conduit, they shall originate in bronze grounding clamps and terminate in a terminal bolted to the main frame of the motor (not to sheet metal terminal boxes).

3.12 IDENTIFICATION

A. The Contractor shall furnish and install equipment nameplates, typed panel rosters, wire and cable tags, stenciling, and other identification with text, lettering type, etc., as specified or as directed.

3.13 FIELD TESTING

A. General - Wherever testing is required, test shall be completed and accepted before the Contractor proceeds with subsequent Work. When adjustments are required following test procedure, test shall be repeated as many times as required to obtain test results acceptable to the Engineer or Permitting Authority. Written reports shall be required on tests.

B. The Contractor shall be responsible for the procurement and installation of compatible components and equipment, and shall perform Work necessary for the proper operation and guarantee of the equipment. The Contractor shall provide all labor, instruments, and apparatus required, and shall make such tests as may be necessary to demonstrate that the Work and equipment, as installed, complies with the Contract Documents.

C. Field testing shall be performed by the Contractor, as outlined herein, and as required to demonstrate that the installation meets the requirements of the Contract Documents. When required, such tests shall be performed in the Engineer's presence. Before conducting field tests, the Contractor shall submit to the Engineer, a written outline of the methods and equipment used. The Engineer reserves the right to require the Contractor's instruments be checked by an independent instrument tester. Test equipment shall be provided by the Contractor. Records shall be kept of each test, and copies shall be submitted to the Engineer.

D. Conduit - Cleaning and Clearance - After conduit and accessories have been installed, and all concreting operations completed, conduit runs shall be satisfactorily cleared of obstructions and foreign matter. Any defects which might damage cable upon installation shall be corrected.

1. Conduits shall be tested, in the presence of the Engineer, by pulling through each conduit a flexible cylindrical mandrel having an outside diameter 1/4-inch less than the inside diameter of the conduit, followed by a stiff wire brush of the same diameter as the conduit. Where conduits installed under this Contract are connected to conduits installed by others, the entire runs between boxes, manholes, or other termination points shall be tested.

2. Record of Conduit Tests - The Contractor shall keep a record, by number, of conduits tested clear, and shall submit such record to the Engineer.

3. Any defects or stoppages in conduit runs installed by the Contractor shall be corrected at the Contractor's expense. Any defects or stoppages in conduit runs installed by others shall be reported to the Engineer, who shall determine the corrective measure to be taken.

E. Made Grounds - The Contractor shall test the ground resistance of the systems. Test equipment shall be provided under this Section and be approved by the Engineer. Dry season resistance of each system shall not exceed 5 ohms. If such resistance cannot be obtained with the system as shown, provide additional grounding as directed by the Engineer. Made grounds shall be tested by the Contractor, in the presence of the Engineer, for continuity and resistance; readings shall be recorded and submitted to the Engineer. Ground resistance of more than 5 ohms shall be reduced to 5 ohms or less by the use of additional ground rods or ground connections.

F. Low Voltage Systems:

1. Tests Before Equipment Connection - Upon the completion of each electrical system rated 600 volts or less, but before wiring connections are made to equipment, the Contractor shall test each circuit and each piece of equipment for:

a. Continuity.

b. Grounds.

c. Insulation resistance, phase-to-phase and phase-to-ground, of 480 volt conductors and equipment with a 500-volt megohmmeter. (See 3.13.F.2, below.)

2. Correction - If discontinuities or grounds are discovered in low voltage systems, they shall be corrected before the insulation resistance is measured. If any insulation resistance readings are lower than required, the Contractor shall repair or replace the equipment or wiring involved.

3. The Contractor shall perform insulation resistance testing of 480-volt power feeder circuits with a 500-volt megger, and prepare a written test report of the results. Equipment which may be damaged during this test, such as solid-state motor starters, variable-speed drives, etc., shall be disconnected. Tests shall be performed with all other equipment connected to the circuit. Resistance values from line to ground of less than 3 megohms are not acceptable.

4. After control cable installation and conductor termination for instrumentation and control, the Contractor shall perform tests witnessed by the Engineer to ensure that control cable shields are isolated from ground except at the grounding point. The Contractor shall remove all improper grounds at no additional cost to the Owner.

5. Following the satisfactory completion of the circuit and equipment insulation resistance tests and the connection of wiring to equipment, but before it is energized, the tests specified above shall again be carried out. The same care shall be taken to protect equipment as in 3.13. F. 3. above.

6. Motors shall be checked for proper rotation along with controls for proper function and corrected by contractor.

G. Acceptance Tests - Upon completion, and before the final estimate is submitted for payment, the entire installation shall be tested in the presence of the Engineer to see that the conditions of the specifications have been met. The entire system shall test free from shorts and unintentional grounds, and each part shall function properly, as intended. The entire system shall show an insulation resistance between conductors, and between conductors and ground not less than 3 megohm.

H. The Contractor shall measure and tabulate the line voltage of each phase at the load terminals of the main switch or circuit breaker in the building.

PART 4 SPECIAL PROVISIONS

4.01 SUPPORT MATERIAL SCHEDULE

A. Exterior – All exterior supports shall be 304 stainless steel.

B. In Chamber or Exposed to Wastewater – All supports shall be 304 stainless steel.

C. Pump Station Exterior – All supports shall be 304 stainless steel.

D. Electrical Room in Pump Station (not included in one of the description above) – Carbon Steel.

4.02 SPARE PARTS

A. Spare fuses shall be provided and delivered to the Owner as follows:

1. Secondary (600 VAC or less) fuses shall be provided in the amount of 10% of each size and type installed, but in no case shall less than three spares of a specified size and type be supplied. Special control fuses, capacitor fuses, and electronic fuses shall be furnished exactly as provided by the equipment manufacturer with no substitutions permitted.

B. Primary (over 600 VAC) fuses shall be provided with one set of spare fuses for each set of primary fuse holders.

END OF SECTION

SECTION 16122
WIRING DEVICES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes providing wiring devices in accordance with the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. A list of materials needed for construction giving manufacturer's names and catalog numbers.

   b. Manufacturer's technical product sheets on each component to be furnished.

2. Information for the Record:

   a. Manufacturer's qualifications.

   b. Certified copies of factory test procedures and results.

   c. Manufacturer's recommended method of installation for the products to be furnished.

   d. Manufacturer's recommended spare parts list for components and accessories.

   e. Operation and maintenance manuals for equipment provided, including accessories, and maintenance instructions.

   f. Provide warranty for review; executed copies shall be submitted when completed with copies included in the operation and maintenance manuals.

1.03 PRODUCT HANDLING

A. Handle wiring devices and components carefully to avoid breakage, impacts, denting, and scouring finishes. Do not install damaged equipment.

PART 2 PRODUCTS

2.01 MATERIALS

A. Switches shall be specification grade, totally enclosed, quiet tumbler, ac type, meeting NEMA Performance Standards and FS and capable of control of 100% tungsten filament lamp loads.

B. Switches shall be rated at 20 amps, 120/277 volts. Operating handles shall be phenolic colored brown. Switches shall have screw terminals.

C. Receptacles shall be specification grade, meeting NEMA Performance Standards, and FS, and having a contact arrangement such that contact is made on two sides of each inserted blade without detent.

D. Receptacles shall be two-pole, three-wire grounding type with rating of 20 amps, 125 volts, NEMA configuration 5-20R, and have screw-type wire terminals suitable for No. 12 thru No. 10 AWG designated CO/ALR. Bases shall be phenolic composition colored brown.

E. Receptacles for outdoor installation and where shown on the drawings shall be provided with ground-fault protection with push-to-test capabilities.

F. For surface-mount or weatherproof devices, the Contractor shall provide cast metal device plates of malleable ferrous metal, with gaskets and oval-head, stainless-steel screws.

G. Wall plates for receptacles located outside of building, and inside of buildings in wet or damp locations, shall be the weatherproof type. Weatherproof receptacles, where exposed to weather or in other wet locations, shall be in a weatherproof enclosure, the integrity of which is not affected when the receptacle is in use (attachment plug cap inserted), per NEC 406.8. Enclosures shall be as manufactured by TAYMAC Corporation, Tempe, Arizona, RACO, or equal.

H. Where weatherproof switches are designated or required, provide the switch specified mounted in the specified box with a gasketed, weatherproof, cast-metal cover plate incorporating an external operator for the internal switch and with stainless steel mounting screws. Cover plate shall be Crouse-Hinds Cat. No. DS181, or equal.

2.02 PERFORMANCE REQUIREMENTS

A. GFCI receptacles which cannot pass their internal test function shall render themselves incapable of delivering power or indicate by visual or audible means that the receptacle must be replaced. GFCI receptacles shall not provide power if the source wires are connected to the load terminals per UL943.

PART 3 EXECUTION

3.01 COORDINATION

A. Switch and outlet boxes shall be cleaned from foreign materials before devices are installed. Wall plates and covers shall be installed after all wall treatments have been completed.

3.02 INSTALLATION

A. Outlet, fixture, and device boxes in unfinished areas shall be surface mounted. Outlet, fixture, and device boxes shall conform to the requirements specified in the paragraphs herein.

B. Wall mounted convenience receptacles shall be mounted 18 inches from the finished floor to the bottom of the box unless shown otherwise on the Drawings, required by the NEC, or where required to clear radiators, grilles, louvers, or other mechanical equipment.

C. Wall mounted switches shall be mounted 44-48-inches above finished floor to the center of the box unless directed otherwise. Space between door openings and switches shall be as uniform as possible throughout the buildings.

D. Special purpose outlets shall be located as shown on the Drawings, or in accordance with project or manufacturer's requirements.

E. Splices made with wire nuts, crimp connectors, terminal blocks, split-bolts, or similar connectors shall be in boxes that are readily accessible. Terminal boxes shall be located a maximum of 8 feet above finished floor, and shall have a vertical-facing orientation.

F. Unless otherwise required, all receptacles shall be installed vertically with their ground pins up. Where horizontal receptacles are used, they shall be installed with the neutral conductor uppermost.

G. Conventional 120 VAC receptacles shall not be wired to the load side of GFCI receptacles unless both devices are contained in the same box.

H. Cables connected to Category 5 and 6 computer jacks shall not have more than 1 inch of the conductors exposed outside of the cable's outer jacket. No more than 0.5 inch of the individual conductors shall be untwisted.

3.03 TESTING

A. Prior to energizing circuits, test wiring for electrical continuity and for short circuits in accordance with Section 16005. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.

B. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer's recommendations.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 16132
ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes all labor, tools, equipment, and materials necessary to provide electrical boxes and fittings in accordance with the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and Section 16010 and shall include:

1. Shop Drawings for Review:

   a. A list of materials needed for construction, giving quantities, manufacturer's name and catalog numbers.

   b. Manufacturer's technical product sheets on each component to be furnished.

2. Information for the Record:

   a. Manufacturer's qualifications.

   b. Certified copies of factory test procedures and results.

   c. Manufacturer's recommended method of installation for the products to be furnished.

   d. Operation and maintenance manuals for equipment provided, including accessories, and maintenance instructions.

   e. Manufacturer's recommended spare parts list for the system components and accessories.

   f. Provide warranty for review; executed copies shall be submitted when completed with copies included in the operation and maintenance manuals.

1.03 QUALITY ASSURANCE

A. Applicable Standards:

1. UL.

2. NEMA.

3. FS.

4. NEC.

PART 2 PRODUCTS

2.01 MATERIALS

A. Except as otherwise specified in non-corrosive areas, metallic outlet, device, terminal, junction, pullboxes and conduit fittings shall be appropriate to the related conduit specification.

1. Cast ferrous metal boxes shall be used with rigid galvanized conduit. Threaded openings shall have a minimum of 5 threads and neoprene-gasketed, cast covers held in place with stainless steel screws.

2. Boxes whose weight in cast ferrous metal would exceed 75 pounds shall be made of sheet steel with 5-thread bosses and neoprene-gasketed covers held in place with stainless steel screws. Similarly, sheet aluminum boxes shall be provided in the larger sizes.

3. Boxes larger than 6-inch shall be equipped with cap screws and hinged covers.

B. In areas designated as NEMA 4X, outlet, device, terminal, junction and pullboxes shall be NEMA 4X of stainless steel. Sheet metal boxes where permitted above, shall be NEMA 4X watertight boxes made of 12-gauge stainless steel.

C. Terminal and junction boxes used for control, signal, or communication wiring shall be NEMA 4X stainless, except where located in a dry area or electric room, where they shall be NEMA 12. Terminal boxes shall have white-painted backplates, barriered terminal blocks of sufficient quantity for all field taps and for all spare deadends.

D. Cast boxes used indoors in non-corrosive locations not subject to flooding or hosing shall:

1. Be dust-tight equal to O-Z/Gedney Electrical Manufacturing Company Type YU flush boxes and Type YS surface boxes.

2. Include mounting lugs, with threaded openings having a minimum of 3 threads and neoprene-gasketed covers held in place with stainless steel screws.

E. Sheet-metal boxes where permitted, including junction boxes and pullboxes at motor control centers, shall be hot-dip galvanized NEMA 12 with neoprene-gasketed covers held in place with stainless steel screws.

F. In hazardous areas, NEMA 7 pull boxes and junction boxes shall meet all requirements of Class I, Division 1, Group D unless noted otherwise.

1. Enclosures shall have hinged covers and captive cover screws, multiple threaded for fast removal, and an O-ring added to make the enclosure watertight.

2. Enclosures shall be as manufactured by Killark Electric Manufacturing Company, or equal.

G. Checkered covers shall be provided for boxes in floors or sidewalks.

H. Outlets in exterior locations or in exposed conduit shall be “FS” or “FD”, and PVC where used with PVC conduit.

I. Interior junction boxes and gutters shall conform to NEC thickness and dimensional requirements, minimum.

J. Cut edges or knockouts on all FRP boxes shall be sealed with a catalyzed resin compatible with the original resin and as recommended by the manufacturer. The sealing of the edges shall prevent premature fraying at the field cut edges.

2.02 RESERVED

PART 3 EXECUTION

3.01 COORDINATION

A. Layout and installation of electrical cabinets, boxes, and fittings shall be coordinated with other installations.

3.02 INSTALLATION

A. Install electrical boxes and fittings as indicated, in accordance with manufacturer’s written instructions, applicable requirements of NEC and NECA “Standard of Installation”, and in accordance with recognized industry practices to fulfill project requirements.

B. Install items where indicated and where required to suit code requirements and installation conditions.

1. Cap unused knockout hole where blanks have been removed and plug unused conduit hubs so as to maintain the NEMA rating of the box.

2. Install boxes in locations which ensure ready accessibility to enclosed electrical wiring and avoid installing boxes back to back in walls where there would be less than 6 inches (150 mm) separation. Fasten boxes firmly and rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

3. Do not install aluminum products in concrete.

C. Outlet and device boxes for flush mounted installation shall be a minimum of 4 inch square or octagonal and positioned accurately to allow for surface finish thickness.

D. Junction boxes, pullboxes, and enclosures with hinged doors which are surface mounted shall utilize spacers to maintain 1/4-inch clearance from the wall.

E. Floor boxes shall be installed level and flush with finished flooring material.

F. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and secure connections when fastened with locknut or bushing on rounded surfaces.

G. Provide electrical connections for installed boxes.

3.03 GROUNDING

A. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with requirements.

3.04 CLEANING AND FINISH REPAIR

A. Upon completion of installation, inspect components, remove burrs, dirt, and construction debris, and repair damaged finish including chips, scratches, abrasions, and weld marks.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 16220
DIESEL GENERATOR SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing a stationary, engine powered, standby power rated, diesel fueled, generating system(s), complete and in place, ready for service.

B. System shall include, but not be limited to, the engine-generator set, battery system, exhaust system, fuel system, enclosure, ducting, and all other appurtenances needed to make a complete operating system.

C. Engine-generator system shall be delivered to the Site completely equipped, tested, and ready for installation.

D. Engine-generator system(s) shall be comprised of all new materials. The design kW rating is based on the loads and load steps and the model listed in Part 4 of this Section.

E. Power and control wiring to the generator(s), transfer switch(s), and accessories, except wiring described herein, shall be furnished and installed under other sections of Division 16.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

a. Submit a list of materials giving manufacturer's name, and catalog numbers.

b. Submit manufacturer's technical product sheets on each component to be furnished.

c. Submit drawings which show dimensional layouts of the engine-generator system(s) and its spatial relationship to associated equipment.

d. Submit wiring diagrams for the engine-generator system(s) showing connections to feeders, load, and accessory equipment. Clearly differentiate between portions of the wiring that are manufacturer installed and the portions to be field wired.

e. Provide warranty for review; executed copies shall be submitted when completed with copies included in the operation and maintenance manuals.

2. Information for the Record:

   a. Manufacturer's recommended method of installation for the products to be furnished.

   b. Certified copies of the factory and field test procedures and results.

   c. Operation and maintenance manuals.

   d. Manufacturer's qualifications, including a list of similar installations.

1.03 QUALITY ASSURANCE

A. Engine-generator system(s) and accessories described herein shall be furnished by a single supplier who shall be responsible for the performance of the equipment in its entirety. The responsibility shall not be split among suppliers of individual components.

B. The supplier of the engine-generator shall maintain a rental fleet of portable engine generators within 100 highway miles of the project location, maintain 24-hour parts and service capability, and provide qualified, factory trained, service personnel that can respond to an emergency call within 4 hours of notification.

1.04 ELECTRICAL AND CONTROL COORDINATION

A. All electrical, instrumentation, control equipment, and panels furnished under this Contract shall conform to appropriate Sections of Division 16 of these Specifications. Equipment and panels shall be NEMA rated as shown on the Drawings or specified in Part 4.

B. Certain equipment items shall be connected to the facility control system as shown on the Drawings. Those connections and any remote-control connections shall be wired to clearly labeled terminal strips within the equipment control panel.

1.05 GUARANTEE

A. The manufacturer's standard warranty shall be for a period of five years from the date of substantial completion and shall not be limited by hours of operation. Warranty shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables including, but not limited to lubricating oil, filters, antifreeze, and other service items used during the course of repair.

B. Optional warranties, supplier/manufacturer maintenance packages, and associated cost shall be available for the Owner's consideration.

C. Engine starting batteries shall have a twelve-month full replacement warranty. The warranty shall be prorated from twelve to sixty months.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Engine:

1. Provide a liquid cooled, four cycle, full compression, No. 2 diesel fueled engine for each engine-generator system.
2. Each engine shall have the number of cylinders and displacement needed to develop the brake horsepower and torque necessary to drive the alternator at 1800 revolutions per minute to meet the specified performance requirements listed in Part 4.
3. Provide a fully enclosed electronic speed sensing isochronous governor, capable of providing accurate speed control. Frequency regulation shall be plus 0.5% of rated frequency during steady state conditions.
4. Engine shall be provided with an electric starting motor with starter pinion and solenoid to turn the engine at firing speed under the temperature range of 110 degrees F maximum and 0 degrees F minimum. Each starting motor shall be rated to operate on the voltage as determined by the engine manufacturer.
5. An engine mounted, replaceable element, dry type air cleaner of sufficient capacity and filtration rating to protect working parts of the engine from dust and grit.

B. Cooling System:

1. Each engine shall be furnished with a radiator, mounted on vibration isolators, and fan with fan guard.
2. Radiator shall keep the engine within normal operating temperature when running at full load.
3. Radiator for an engine-generator system installed indoors shall be provided with a duct adapter flange to allow the attachment of an air discharge duct to direct air discharge through the radiator and the wall.
4. Each engine coolant system shall be filled with the engine manufacturer’s recommended antifreeze/antiboil solution. The Contractor shall provide the engine manufacturer’s recommended antifreeze/antiboil solution.
5. Engine shall be furnished with a coolant heating system. The heating element(s) shall be single-phase and rated for operation at 60 Hz and the AC voltage listed in Part 4 of this Section.
6. Engine coolant heater system shall maintain the manufacturer’s specified coolant temperature. A thermostat shall control the temperature of the coolant to the manufacturer’s recommended temperature for start-up.

7. WARNING: Do not energize block heater until engine block is filled with coolant and the generator set is run to remove trapped air. Otherwise, block heater failure will result.

C. Alternator:

1. Alternator shall be 12 lead reconnectable, engine driven, drip proof, self-aligning, continuous duty, synchronous unit with full amortisseur windings. The insulation shall be NEMA Class H.

2. Alternator shall be rated for the voltage listed in Part 4 of this Section and for 60 Hz operation at rated 1800 rpm.

3. The alternator neutral wire shall not be connected to ground at the alternator. Each alternator shall be directly connected to the engine through a flexible coupling.

4. Operating temperature of the rotor and stator shall not exceed 105 degrees C at rated load.

5. Alternator shall have a brushless, rotating, solid-state, full wave, rectifier or a permanent magnet exciter. Surge suppressors shall be included on the brushless, solid-state exciter to protect the diodes from voltage spikes.

6. Alternator shall have a voltage regulator to provide no load to full load regulation of plus or minus 0.5% at rated voltage during steady state conditions. Regulator shall be a totally solid state design, and shall include electronic voltage buildup, volts per Hz regulation, three phase sensing, over-excitation protection, loss of sensing protection, temperature compensation, and shall limit voltage overshoot on startup, and be environmentally sealed.

D. Engine Fuel System:

1. The engine shall have fuel filters with replaceable elements and an engine driven or electric fuel pump.

2. Fuel shall be injected into each cylinder by individual, adjustment- free injectors.

3. Fuel filter and serviceable fuel system components shall be located to prevent fuel from spilling onto engine-generator set batteries.

E. Lubrication System:

1. Lubricating oil shall be supplied by a lube oil system.

2. Full flow, replaceable element, oil filters, dip stick oil level indicator, and oil pan drain valve shall also be provided.

3. The filter system shall be equipped with a bypass valve to prevent stoppage of lubricating oil in the event the filters become clogged

4. The contractor shall provide the engine manufacturer’s recommended lubricant and fill the crankcase to the proper level.

F. Batteries/Charger/Tray:

1. Provide sealed storage batteries.
2. Batteries shall be sized to crank and start the engine in the ambient temperatures of 0 degrees F for outdoor installations and 40 degrees F for indoor installations.
3. Battery system shall have the capacity to start the engine a minimum of three times between charges.
4. Provide battery cables sized to prevent voltage drop problems during cranking cycle.
5. Provide a UL listed, fully automatic, solid-state, battery charger with both float and equalize charge rates, automatic AC line voltage compensation, DC voltage regulation, and automatic equalizing timer.
6. The input voltage to the charger shall be 120 VAC, single phase, 60 Hz.
7. Charger shall be capable of fully recharging batteries within 24 hours.
8. Charger shall have the following protective features: fused AC input, fused DC output, automatic surge suppression, and current limit overload protection.
9. Charger shall have a DC ammeter, DC voltmeter, AC pilot light, and an equalize charge light.
10. Provide the following alarm contacts for connection to the alternator local annunciator: low DC voltage, high DC voltage, current/charger failure, and AC power failure. Provide high DC voltage shutdown. Charger shall be mounted for easy visual and maintenance access.
11. Provide a battery tray or rack for each battery set.
12. Battery tray or rack shall conform to NEC. It shall be treated to be resistant to deterioration by battery electrolyte.
13. Battery tray or rack shall contain any spillage or boil-over of electrolyte.

G. Exhaust System:

1. Engine-generator exhaust silencer system located internal to the generator enclosure.
2. Piping shall be by the manufacturer - insulated and shielded, supported and braced to prevent weight or thermal growth being transferred to the engine.
3. Exhaust shall have flexible expansion fittings to accommodate thermal growth. Support dampers and springs shall be included where necessary to isolate vibration.
4. Long runs of exhaust pipe shall be pitched away from the engine and water traps installed at the lowest point. Exhaust stacks shall be cut at 45 degrees to minimize noise.

5. Exhaust pipes shall have stainless steel screening at the outlet to prevent entry of small animals.

2.02 ENGINE-GENERATOR CONTROL PANEL

A. Engine-generator control panel shall be mounted on the alternator end of the assembly.

B. Control panel shall be housed in a rigid metal, NEMA 3R rated enclosure, and shall include a section for cable terminations. Enclosure doors shall be lockable.

C. Control panel shall be furnished with the necessary fuses, transformers, and other accessories required to perform the following functions:

1. Alternator output power thermal magnetic circuit breaker, as listed in Part 4 of this Section. Breaker shall be sized and rated to carry 100% of the output current of the alternator, be UL listed, and have an adjustable shunt trip unit.
2. Automatic start/stop operation.
3. Adjustable cycle cranking.
4. Output voltage adjustment potentiometer.
5. Digital AC metering with manual phase selection and 0.5% true RMS accuracy.
6. Digital engine monitoring.
7. Shutdown sensors and alarms with horn and reset.
8. Adjustable cool-down timer, and a maintained-action, red mushroom head, emergency stop push-button.
9. Self-diagnostics and fault logging.

D. Control panel components shall be environmentally sealed to protect against moisture and dirt. Engraved nameplates (black letters on white background) shall be provided to identify each device or function located on each control panel.

E. Provide visual display of the following variables, either with gauges or digital displays:

1. Engine oil pressure.
2. Engine oil temperature.
3. Coolant temperature.
4. Engine RPM.
5. System DC Volts.
6. Engine accumulated running hours.
7. Alternator AC volts, selectable line-to-line and line-to-neutral.
8. Alternator AC amps, selectable each phase.
9. Alternator frequency.

10. Alternator output kW.
11. Alternator output kWHR.
12. Alternator output kVA.
13. Alternator output kVAR.
14. Percentage of rated power.
15. Alternator power factor.

F. Control panel shall include a local annunciator with the following alarms:

1. Low engine oil pressure alarm light.
2. Low engine oil pressure shutdown light.
3. High coolant temperature alarm light.
4. High coolant temperature shutdown light.
5. Low coolant temperature alarm light.
6. Overcrank lockout light.
7. Audible alarm and reset button.
8. System not in Auto indicator light.
9. Overspeed shutdown alarm light.
10. Diagnostic shutdown light.
11. Low coolant level.
12. Low battery/DC voltage.
13. Battery charger ac failure.
14. High battery voltage.
15. Emergency stop depressed.
16. Spare.

Note: All alarm lights to be flashing LED type.

G. Remote Alarms and Monitoring:

1. Furnish contacts for remote indication of the following:
   a. Generator common fault.
   b. Generator running.

2.03 PERFORMANCE REQUIREMENTS

A. The engine-generator system shall be capable of producing the amount of electrical power listed in Part 4 of this Section at 0.8 power factor for continuous operation.

B. The engine-generator system shall be ready to have loads applied within 10 seconds after start-up.

C. The engine-generator system shall have a minimum motor starting capability of the kilovolt amperes (kVA) listed in Part 4 of this Section. The engine-generator system shall meet NFPA 110 single step load pickup. These ratings shall be met after all applicable demand factors for operation at 1,000 feet above sea level and in an ambient temperature of 95 degrees F maximum and 0 degrees F minimum.

2.04 ACCESSORIES

A. Silencer:

1. Engine-generator system shall provide a factory mounted critical grade silencer to reduce noise attenuation.

B. Enclosure:

1. Provide a steel, weather-protected, sound attenuated, enclosure for each engine-generator system located outdoors. Maximum sound level shall be 70 decibels at 23 feet, while the engine-generator system is operating at full load.

2. Enclosure shall be constructed from galvanized steel and shall be designed and constructed so that the engine-generator system and accessories are totally enclosed.

3. Enclosure shall be zinc phosphate treated prior to painting, then painted with the manufacturer's standard color polyester powder baked paint.

4. Enclosure door(s) shall be hinged and key lockable with stainless locks and hinges. Other enclosure hardware shall be stainless steel. A control panel viewing window with safety glass and lockable access door to the control panel and circuit breaker shall be provided. Each enclosure shall be provided with an externally mounted, shielded emergency stop button; drain lines to the outside for lube oil, coolant, and crankcase fumes disposal.

C. Engine Generator Fuel Storage System - Subbase Fuel Tanks:

1. Furnish and install engine generator fuel storage system, sized as shown on the schedule, in accordance with Federal, State and Local authorities.

2. The exterior fuel storage tank shall be a UL 142 approved, double wall design for above ground use, consisting of a Fuel Holding Cell (Inner Tank) and The Secondary Containment Tank (outer tank).

3. Tanks shall provide at least one 24-hour day fuel supply for engine-generators operating at full capacity.

4. The subbase fuel storage tank shall include but not be limited to: lockable fill cap, overfill protection, spill containment, normal vent with riser and cap, emergency pressure relief vent, outer tank emergency pressure relief vent,

mechanical fuel gauge, low fuel level alarm, 2-inch opening for fuel gauge/switch assembly, and leak alarm.

5. The Fuel Holding Cell (inner tank) and Secondary Containment Tank (outer tank) shall be mated together into one assembly.

6. Subbase fuel tanks shall be suitable for applications requiring sound enclosures.

7. The sub-base fuel tank and related equipment including vents and fill pipes shall not block access to serviceable items on the engine or generator.

8. Access ports, such as vents, fill opening and instrumentation, on the sub-base fuel tank shall not be located inside the area defined by the plan view of the radiator shroud.

9. Means shall be provided to prevent adding additional fuel to the tank if oil is detected in the interstitial space between the inner and outer tanks.

10. Include subbase fuel tank with all required State of Ohio Fire Marshal subbase tank fuel option – 5 gallon spill containment, combustible liquids decal, 12 ft. above grade emergency vent, high fuel switch (alarms at 90% full) with visual and audible alarms to alert the tank truck operator.

D. Emergency Stop Pushbutton:

1. All generators shall have a remote manual stop station similar to a “Break-Glass” station located outside the room housing the prime mover. If the generator is located outdoors the stop station shall be located elsewhere on the premises.

2. The pushbutton station shall have a red pushbutton labeled “Stop” covered by a thin glass disc. A small hammer shall be attached to the enclosure with a chain. The switch shall have one Normally Closed set of contacts for each generator. The enclosure shall be rated for the area in which it is installed.

3. A permanent nameplate shall be provided to indicate that the purpose of the switch is to stop the generator in an emergency. The nameplate shall be mounted on or in close proximity to the pushbutton station.

4. The contractor shall provide at least five spare glass discs to the owner.

5. The pushbutton station shall be Allen-Bradley Catalog Number 800T-NX114 with Glass Disc Kit 800T-N28, or equal.

2.05 FABRICATION

A. Base:

1. Engine-generator system shall be mounted on a structural steel base capable of maintaining proper alignment between components during shipment, installation, and operation.

2. The engine-generator system shall be free from torsional stress when running at 10% of rated speed.

3. Provide spring type vibration isolators with rubber backing between the structural steel base and its foundation.

2.06 FACTORY TESTS AND FIELD TESTS

A. Prior to shipment, the unit shall be factory performance tested under load with all accessories. The tests shall be performed in accordance with the manufacturer's standards.

B. Full block load test shall demonstrate no more than a 15% RMS voltage dip and 15% frequency deviation measured during the fourth complete cycle following application of the load.

C. Both voltage and frequency shall return to within 3% of rated voltage and frequency in less than 5 seconds following the application of the block load. The following block load tests shall be performed:

1. Stepped load test at 1/2, 3/4, and full load for 5 minutes each step.

2. Three-quarter block load.

3. Full single step block load.

D. The Contractor shall furnish a qualified representative of the manufacturer to perform inspection, start-up, testing, and training services. The manufacturer's representative shall be experienced in the installation, start-up, operation, and maintenance of the equipment.

E. The representative shall check the installation and supervise final adjustments and initial start-up of the equipment. The representative shall certify that each installation is correct and that the equipment is operating satisfactorily. This service shall be for a minimum period of one trip and three days.

F. The complete installation including each automatic transfer switch, if applicable, shall be field-tested for compliance with the plans and specifications following completion of all site work. Testing shall be conducted by representatives of the transfer switch supplier, if applicable, and the engine- generator supplier, and the switchgear supplier, if applicable. The Contractor shall supply the load bank and other equipment required for each test. The Owner and inspector shall be notified in advance and shall have the option to witness the tests. The tests shall be repeated until each system performs as specified. The tests to be conducted on site shall be as follows:

1. Perform a cold start test on each engine-generator using the generator's actual load as a test load. A power failure shall be simulated by opening the normal power source disconnect and the following information shall be recorded for each engine-generator set.

a. Time delay on start.

b. Cranking on time.

c. Time required coming up to speed.

d. Voltage and frequency overshoot.

e. Time to achieve steady state.

f. Voltage, frequency, and amps at standby state.

g. Oil pressure, water temperature, and battery charge rate at 5 minute intervals for the first 15 minutes and at 15 minute intervals thereafter for 2 hours.

h. Time delay on retransfer after return of normal power.

i. Cool down time delay.

2. Immediately after cooling time from cold start test, perform a one-step, four-hour, full load test using a load bank. Record the same data as in the cold start test except for time delays on transfer and retransfer.

3. Disable each engine-generator from starting by a method approved by the manufacturer and test the crank cycle by switching the engine-generator controls to “Run”.

4. Test each engine-generator safety shutdown mechanism.

G. After the field-testing, has been successfully completed, the manufacturer’s representative shall train the Owner’s personnel for 2-4 hours in the proper operation and maintenance of the equipment. The Owner may make a video record of the training.

PART 3 EXECUTION

3.01 COORDINATION

A. Examine area for compliance to written installation requirements.

3.02 INSTALLATION

A. Engine-Generator:

1. Provide a concrete housekeeping pad in accordance with Section 03300.

2. Each engine-generator set shall be installed with galvanized steel anchor bolts as recommended by the manufacturer. Bolts shall be embedded in the concrete pad. Expansion-type anchors are not acceptable.

3. Each engine-generator shall be installed with vibration isolators provided with the set.

4. Provide equipment grounding connection(s) for each engine-generator unit as indicated by the manufacturer. Tighten each connection to comply with the

tightening torques specified in UL standards to assure permanent and effective grounding.

5. All connections to the engine, generator and mounting base such as conduits, fuel lines, exhaust piping, etc., must have flexible sections to prevent breakage and isolate vibration to the generator set.

PART 4 SPECIAL PROVISIONS

4.01 ENGINE GENERATOR LOADING SCHEDULE

Step Number	Load Type (1)	Load Rating (2)	Full Load Amps	Motor Controller (3)	Equipment ID Tag
1	Trf	15 kVA	18		MP2-P5
2	Motor	35 hp	42	VFD	PUMP-1
3	Motor	35 hp	42	VFD	PUMP-2

(1) Load Type:
Mtr = Motor
Trf = Transformer
Res = Resistance Heating
HVAC = Heating, Ventilating, Air Conditioning
Misc = Miscellaneous

(2) Load Rating:
hp = Horsepower
kW = kilowatts
kVA = kilovolt-amperes

(3) Motor Controller:
FV = Full-Voltage, across-the-line
RVSS = Reduced-Voltage Solid-state
VFD = Variable Frequency Drive
2S = Two-Step, single or double winding
RVA = Reduced Voltage Auto-transformer
2Spd = Two Speed

4.02 POWER GENERATING SYSTEM SCHEDULE

A. The following schedule is intended to aid the Contractor in identifying generator location and size. It is intended to supplement the Drawings and Specifications and is not guaranteed to be complete. All generators shown on the drawings shall be furnished and installed by the Contractor whether or not listed in the schedule. Contractor shall submit plans to the State Fire Marshal indicating generator location.

Location	Size kW/kVA	Model Number*	Alternator Voltage(s)	Engine Coolant Heater Voltage	Control Panel Strip Heater Voltage	Minimum Starting Capability (kVA)	Circuit Breaker Rating (amps)	Tank Capacity
Willowbend PS	100/125	100RE0ZIF	480-277	120V	120v	448	150 100% Rated	215

*Generator shall be Kohler or equal by Cummins.

4.03 FUEL

A. The Contractor shall provide a full tank of fuel for testing the system. Fuel shall be No. 2 off-road diesel (not subject to highway fuel taxes). The fuel tank shall be topped off at the Contractor's expense after testing is complete and before the system is turned over to the Owner. The State of Ohio does not accept Factory Testing of the tank and will require a site inspection and test. Prior to filling the tank, the Contractor shall furnish a tank permit for on site testing of the fuel tank. The test shall be witnessed by a Fire Safety Inspector.

4.04 RESERVED

END OF SECTION

SECTION 16251
SURGE PROTECTIVE DEVICES (SPD)

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing surge protective devices (SPD) and related equipment in accordance with the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Submit manufacturer's technical product sheets on each component to be furnished, giving conductor size, type and length, dimensions, manufacturer's name and catalog numbers.

   b. Submit prototype test results of proposed equipment indicating short circuit current rating (SCCR) and compliance with UL requirements indicating a nominal discharge rating of 20 kA.

2. Information for the Record:

   a. Manufacturer's recommended method of installation for the products to be furnished.

   b. Operation and maintenance manuals.

1.03 QUALITY ASSURANCE

A. Materials described herein shall be furnished by a single supplier who shall be responsible for the performance of the equipment in its entirety. The responsibility shall not be split among suppliers of individual components.

B. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum of five years.

C. Manufacturer shall provide documentation showing the SPD meets the requirements of UL1449, 3rd Edition.

1.04 GUARANTEE

A. Manufacturer shall provide a minimum of a ten-year replacement warranty for any SPD part failure.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Unit shall have an engineered solid-state high performance suppression system, utilizing arrays of fused nonlinear voltage dependent metal oxide varistors with similar operating characteristics.

B. Suppression system platform shall be balanced to provide equal impedance paths for surge currents to ground, in a seamless low stress manner ensuring maximum performance.

C. The unit shall have a maximum continuous operating voltage (MCOV) rating of 115% of the system's nominal operating voltage. The MCOV shall be a tested value as defined in Section 377.3 of UL1449, 3rd Edition.

D. Units for wye configured electrical systems shall have directly connected suppression elements between line-line, line-neutral, line-ground, and neutral-ground.

E. Units for delta configured electrical systems shall have suppression elements between line-line and line-ground.

F. Units for Split Phase, 3 wire plus ground configured electrical systems shall have suppression elements between line-line, line-neutral, line-ground and neutral-ground.

G. Units for 3 Phase, High Leg Delta, 4 Wire plus ground configured electrical systems shall have suppression elements between line-line, line-neutral, line-ground, neutral-ground, high line-neutral and high line-ground.

H. SPD shall have a high-performance noise rejection filter. Attenuation for electric line noise shall be minimal per UL standards.

I. Units shall not consist of plug-in type modules or printed circuit boards as surge current conductors. All internal components shall be hardwired with connections using low impedance conductors or copper bus and compression fittings.

J. Unit shall include solid-state, long-life, externally mounted LED visual status indicators that indicate the on-line status of each phase of the unit. Service Entrance units shall include a surge counter alarm and dry contact output for remote alarm indication.

K. Service Entrance Unit shall incorporate an integral test point allowing easy off-line diagnostic testing to verify the operational integrity of the unit's suppression/filter system.

L. Provide enclosure of NEMA 12 rating unless shown otherwise on the Drawings or in Part 4 of this Specification.

M. SPD shall be as manufactured by Eaton Innovative Technologies, Surge Suppression, Inc., APT, or equal.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate with other Work, including painting, and electrical boxes and wiring work as necessary to interface orderly installation of all Work.

3.02 INSTALLATION

A. Verify that neutral to ground bond is present and voltage form neutral to ground is less than 5 VAC on three phase wye, split phase and high-leg delta systems.

B. Install SPDs as indicated in the manufacturer's written instructions and other recognized industry practices.

C. Install SPD as close as practical to the device to be protected in accordance with applicable manufacturer's instructions and local or national code requirements.

D. Connections shall be with low impedance bus or minimum No. 8 AWG, copper conductor. Leads shall not be any longer than necessary, avoid unnecessary bending of conductors.

E. Ground SPD per manufacturer's recommendations and in accordance with Section 16020.

F. If permanently attached leads provided with the SPD need to be extended, in-line butt splices shall be used. Connectors, such as wire nuts, that introduce a pointed connection are not acceptable.

3.03 INSPECTION, STARTUP, AND TRAINING

A. Demonstrate that the SPD is installed correctly and functioning properly prior to energizing equipment to be protected.

B. Contractor shall provide four hours of field training to Owner by a factory trained representative on proper procedures to operate diagnostic test equipment. Coordination of this training shall be made with Owner's schedule.

PART 4 SPECIAL PROVISIONS

4.01 SURGE PROTECTIVE DEVICE SCHEDULE

A. The following schedules are intended to aid the Contractor in identifying SPD location and rating. It is intended to supplement the Drawings and Specifications and is not guaranteed to be complete. All SPD shown on the Drawings shall be furnished and installed by the Contractor whether listed in the schedules or not.

B. The rating of the SPD for the service entrance disconnect shall be rated at least 150,000 amps per Phase. SPD for service entrance overcurrent protective devices rated above 2000 amps shall be based on the table below this Section.

C. The rating of the SPD for Motor Control Centers, Power Panels or Switchgear downstream of the main service entrance disconnect shall be based on the following tables below this Section.

Main Overcurrent Protective Device	Amps Per Phase
0 – 800 Amps	50 kA
801 – 2000 Amps or Service Entrance	150 kA
2001 – 4000 Amps	200 kA
Greater Than 4000 Amps	300 kA

Location	ID Tag	Voltage	Phase	No. Of Wires	Main Overcurrent Protective Device	NEMA Enclosure*
Willowbend PS	DP-PS	480V	3	3	150A	12

D. The SPD for Lighting Panels shall have 48,000 Amps per Phase protection and be the Sine Wave Tracking type.

Location	ID Tag	Voltage	Phase	No. Of Wires	Main Circuit Breaker	NEMA Enclosure*
Willowbend PS	MPZ-PS	120/208V	3	4	60A	12

* SPD's if mounted in separate enclosure inside Motor Control Centers, Power Panels, Lighting Panels or Switchgear by the manufacturer shall have the same enclosure rating as the equipment they are installed in.

END OF SECTION

SECTION 16430
DISCONNECT SWITCHES

PART 1 GENERAL

1.01 SCOPE

A. This Section defines the requirements necessary to furnish and install circuit and motor disconnect switches in accordance with the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturer's technical product sheets on each component to be furnished.

   b. Furnish manufacturer's name(s) and catalog numbers.

2. Information for the Record:

   a. Manufacturer’s recommended method of installation for the products to be furnished.

   b. Operation and maintenance manuals.

   c. Manufacturer's recommended spare parts list for the components and accessories.

   d. Provide warranty for review; executed copies shall be submitted when completed with copies included in the operation and maintenance manuals.

1.03 ELECTRICAL AND CONTROL COORDINATION

A. Layout and installation of disconnect switches and accessories shall be coordinated with other trades and with motor horsepower ratings.

1.04 PRODUCT HANDLING

A. Deliver disconnect switches properly packaged in factory fabricated type containers or wrappings, which properly protect devices from damage.

B. Store disconnect switches in original packaging and protect from weather and construction traffic. Wherever possible, store indoors. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.

C. Handle disconnect switches carefully to prevent physical damage. Do not install damaged disconnect switches, remove from Site and replace damaged devices with new.

PART 2 PRODUCTS

2.01 FUSED SAFETY SWITCHES

A. Provide individual fused switches as specified, shown on the Drawings, or as directed.

B. Fused switches shall have a minimal short-circuit rating of 100,000 amps, RMS symmetrical.

C. Where shown on the drawings, provide fused switches that lock in the ON position. Field modifying to provide this feature shall not be permitted. Where the service disconnect is locked in the ON position, branch circuit overcurrent devices shall be located in a readily accessible location and shall be of a lower amp rating than the LOCKED-ON service overcurrent device per the NEC.

D. Disconnect switches located outdoors, in process areas, damp locations, wet locations, and indoors below grade shall be NEMA 4X stainless steel unless noted otherwise on the Drawings. Disconnect switches located indoors in dry, non-process areas above grade shall be NEMA 12 unless noted otherwise on the Drawings. Provide switches that can be locked in the OFF position. Enclosures shall be mechanically interlocked to prevent the opening of the cover with the switch in the ON position.

E. Fused switches shall be quick-make, quick-break, motor-rated, load-break, heavy duty (HD) type having external marking clearly indicating ON and OFF positions.

F. Provide fuses of the current ratings indicated and types specified in Section 16432 on fuses. Utilize rejection fuse clips that accept only Class RK1/RK5 fuses.

G. Disconnect switches for motors driving process equipment shall have two normally open auxiliary contacts. One shall be wired to disable the motor controller when the switch is open. The other shall be wired to signal the Plant Control System (PCS) that the equipment is "In Service." Disconnect switches for motors driving utility equipment shall have one normally open auxiliary contact. It shall be wired to disable the motor controller when the switch is open.

H. Switches shall be UL listed and horsepower rated for 250 VAC or DC or 600 VAC as required. Lugs shall be UL listed for copper cable. All fused switches shall include equipment grounding bar.

I. Where required by the NEC, fused safety switches shall be rated for use as service entrance equipment.

J. Disconnect switches shall be Square D, Crouse-Hinds, Cutler-Hammer, or equal.

2.02 NONFUSED SAFETY SWITCHES

A. Provide non- fused switches with the same provisions as for fused switches but without fuse clips.

B. Disconnect switches for motors driving process equipment shall have two normally open auxiliary contacts. One shall be wired to disable the motor controller when the switch is open. The other shall be wired to signal the Plant Control System (PCS) that the equipment is "In Service." Disconnect switches for motors driving utility equipment shall have one normally open auxiliary contact. It shall be wired to disable the motor controller when the switch is open.

C. For applications in which all of the conditions listed in the following (1 thru 4) are met, the safety disconnect switch shall be a Crouse-Hinds NSSC manual motor starting switch, or equal, with a high-impact, fiberglass-reinforced polyester, corrosion-resistant, dust-tight, watertight, weatherproof enclosure rated NEMA 3, 4X, and 12 containing a two or three pole switch, as required by the application. Each switch shall have provisions to be pad locked in the off position. Each switch shall be UL listed and horsepower rated for 250 VDC or VAC, or 600 VAC as required. Lugs shall be UL listed for copper cable. Each switch shall include an equipment grounding plate for 3/4-inch and 1-inch conduit.

1. Auxiliary contacts are not required for interlocking or remote monitoring.
2. The driven equipment is not process related; e.g., overhead door operator, electric hoist, HVAC equipment, etc.
3. The motor is three-phase rated 10 hp or less at 460 VAC, 7-1/2 hp or less at 230 VAC, or single-phase rated at 2 hp or less at 230 VAC, or 1 hp or less at 115 VAC.
4. Motor overload protection is not required, or is provided separately by a separate device in the motor circuit.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install disconnect switches for use with motor driven equipment, motors, and controllers, within sight of the motor position where indicated.

B. Provide suitable means for mounting disconnect switches.

3.02 TESTING

A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at Site, then retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

PART 4 SPECIAL PROVISIONS

4.01 FUSES

A. Provide and install fuses for all fused disconnect switches along with a minimum of 3 spare fuses of each size supplied.

END OF SECTION

SECTION 16431
CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SCOPE

A. This Section defines the requirements necessary to furnish and install circuit breakers in accordance with the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturer's technical product sheets on each component to be furnished showing dimensions and ratings for voltage, amperage and maximum interruption.

   b. Furnish manufacturer's name and catalog numbers.

2. Information for the Record:

   a. Manufacturer's recommended method of installation for the products to be furnished.

   b. Operation and maintenance manuals.

   c. Manufacturer's recommended spare parts list for the components and accessories.

   d. Manufacturer shall provide time/current characteristic trip curves (Ip and I2t let-through curves for true current limiting circuit breakers only) for each type of circuit breaker.

1.03 QUALITY ASSURANCE

A. Equipment and materials shall be new and, if of the same type as other performing parts of the same system, shall be the products of the same manufacturer.

B. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum of five years.

C. Equipment shall meet applicable standards of NEC, NRTL, OSHA, UL, and NEMA.

PART 2 PRODUCTS

2.01 MAIN CIRCUIT BREAKER IN LIGHTING AND POWER PANELBOARDS

A. Molded case circuit breakers shall have overcenter, trip-free, toggle mechanisms which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole.

B. Two and three pole circuit breakers shall have an internal common trip crossbar to provide simultaneous tripping of all poles.

C. Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL listed for reverse connection without restrictive line or load markings.

D. Lugs shall be UL listed to accept solid or stranded copper conductors. Lugs shall be suitable for 75 degrees C rated wires. Lug body shall be bolted in place. Snap-in designs are not acceptable.

2.02 BRANCH CIRCUIT BREAKERS IN LIGHTING AND POWER PANELBOARDS

A. Breakers shall be UL listed with amperage ratings and number of poles as indicated on the Drawings.

B. Plug-in type circuit breakers that are backfed and used as main circuit breakers in “Main Lugs Only” panelboards shall be secured in place by an additional fastener that requires other than a pull to release the device from the bus bar assembly.

C. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two and three pole circuit breakers shall have an internal common trip crossbar to provide simultaneous tripping.

D. There shall be visible trip indication. The breaker handle shall be trip free and reside in a TRIPPED position between ON and OFF.

E. In addition to standard ON/OFF markings, circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position by rivet or bolt. Handle accessories shall be by the same manufacturer as the circuit breaker. Clip on locking means will not be permitted.

F. The exposed faceplates of all branch circuit breakers shall be flush with one another.

G. All circuit breakers for 120 volts, 277 volts, and fluorescent and HID lighting circuits shall be approved for switching duty, and shall be marked SWD.

H. Branch circuit breakers for 120/208/240/277-volt circuits shall have a minimum of 10,000-amp interrupting capacity. Breakers shall be operable in any position, and shall be removable from the front of the panelboard without disturbing adjacent units.

I. Ground Fault Circuit Interrupters (GFCI) shall be provided where listed in the panel schedules. GFCI shall be Class A, 4-6 mA.

J. Ground Fault Equipment Protection Devices (GFEPD) shall be provided where listed in the panel schedules. GFEPDs shall have a trip setting of 30 mA.

K. Arc Fault Circuit Interrupters (AFCI) shall be provided where listed in the panel schedules. AFCIs shall meet or exceed the requirements of UL Standard 1699. AFCIs shall trip if they detect a line to neutral arcing fault of 75 amps or greater. They shall also trip for line to ground faults of 5 Amps or greater.

L. GFCI, AFCI, and GFEPD branch circuit breakers shall have a “push-to-trip” device for maintenance and testing purposes.

M. Lugs shall be UL listed to accept solid or stranded copper conductors. Lugs shall be suitable for 75 degrees C rated wire, unless noted otherwise.

2.03 CIRCUIT BREAKERS FOR 480V OR 480Y/277V PANELBOARDS

A. In addition to the above specifications, 480-volt circuit breakers shall meet the following criteria.

1. Circuit breakers shall be factory sealed and shall have a date code on the face of the circuit breaker. Poles shall be labeled with respective phase designations.
2. Standard construction circuit breakers shall be UL listed for reverse connection without restrictive line or load markings. Circuit breakers shall be suitable for mounting and operating in any position.
3. Circuit breakers shall not require any additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners.
4. Each individual circuit breaker shall be capable of being mounted independently. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
5. Circuit breakers shall have 25,000-amp minimum interrupting capacity. Amp ratings shall be as shown on the Drawings.
6. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole.
7. Two and three pole circuit breakers shall have an internal common trip crossbar to provide simultaneous tripping.
8. Circuit breaker frame sizes above 100 amp shall have a single magnetic trip adjustment located on the front of the breaker which allows the user to simultaneously select the desired trip level of all poles.
9. Circuit breakers in distribution equipment shall be factory installed.
10. Single and two-pole circuit breakers installed in 480 volt panelboards shall be constructed in such a manner that they plug into the proper phase busbar(s) as shown on the drawings.

2.04 RESERVED

2.05 MOTOR CIRCUIT PROTECTORS

A. Motor Circuit Protectors (MCP) are intended for use in combination with motor starters with overload relays for the protection of motor circuits from short circuits. They also serve as the disconnecting means for the motor circuit.

B. MCPs shall contain a magnetic trip element in each pole with the trip point adjustable from the front. There shall be a common adjustment screw or knob to set the trip point of all three poles with one operation.

C. The magnetic trip point on the MCP shall be adjustable from three to ten or eleven times the continuous current in at least eight steps to permit the motor to start without nuisance tripping due to inrush current.

D. MCPs shall be recognized components under UL489 (Molded Case Circuit Breakers) and tested for short-circuit protection in equipment listed under UL508 (Industrial Control Equipment) and UL845 (Motor Control Centers).

E. MCPs shall have a minimum of 65,000 amp interrupting rating at 480 VAC.

F. MCPs shall be 3-pole devices with an internal common trip crossbar to provide simultaneous tripping of all three poles.

G. Select the amp rating of the MCP based on the full load current of the motor to be protected and the MCP manufacturer's recommendations or sizing table.

H. MCPs shall be as manufactured by Cutler-Hammer, Square D, or equal.

2.06 RESERVED

2.07 LABELS

A. Provide products that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the NEC, Article 100.

2.08 IDENTIFICATION

A. Identify components in accordance with Section 16005.

2.09 MANUFACTURER

A. Circuit breakers shall be as manufactured by Square D, Cutler-Hammer, or equal.

PART 3 EXECUTION

3.01 COORDINATION

A. Locate independently mounted circuit breakers and install in accordance with manufacturer's written installation instructions.

B. Install wiring between circuit breakers and control/identification devices as specified in Section 16120.

3.02 INSTALLATION

A. Check connectors, terminals, bus joints, and mountings for tightness. Tighten field-connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL standards.

B. Provide equipment grounding connections for individually mounted units as indicated and as required by the NEC.

C. Tighten connectors to comply with tightening torques specified in UL standards to assure permanent and effective grounding.

D. Upon completion of installation, inspect devices. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

E. Install labels inside enclosure identifying the type of circuit breaker installed, its overcurrent rating, its interrupt rating and the UL class. Where applicable, trip setting and time delay information shall be provided on permanent labels.

F. The MCP trip setting for all motors, except Design E motors, shall be at least 115% but not more than 1300% of the full load current shown on the motor's nameplate. However, settings up to 1700% of the motor's full load current are permitted for Design E motors.

3.03 INSPECTION, START-UP, AND TRAINING

A. On circuit breakers with adjustable trip settings, the contractor shall coordinate with the circuit breaker manufacturer, or their authorized agent, verification that the ratings and settings are appropriate for proper coordination with other system protection devices. All settings shall be identified and adjusted before circuit breaker is energized.

B. Where discrepancies are found, Contractor or the manufacturer's representative shall recommend final protective device ratings for approval by the Owner and Engineer.

C. Inspect for defects and physical damage, NRTL labeling, and nameplate compliance with current single line diagram.

D. Exercise and perform operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.

E. Check tightness of electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.

3.04 PROTECTION

A. Panelboards and installed circuit breaker equipment shall be covered and protected from physical damage and construction dirt and debris until ready to be placed into service.

PART 4 SPECIAL PROVISIONS

Not used.

END OF SECTION

SECTION 16432
LOW VOLTAGE FUSES AND FUSE HOLDERS

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing all labor, tools, equipment, and materials necessary to install fuses rated 600 volts or less in accordance with the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturer's technical product sheets on each component to be furnished.

   b. Manufacturer's name(s) and catalog numbers for all fuses.

2. Information for the Record:

   a. Time/current characteristic trip curves for each fuse rated above 60 amps.

   b. Manufacturer's test reports and certification for materials provided.

1.03 QUALITY ASSURANCE

A. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum of five years.

B. Applicable Standards:

1. Listing and Labeling Agency Qualifications:

   a. Comply with a NRTL as defined in OSHA Regulations.

1.04 PRODUCT HANDLING

A. Deliver fuses properly packaged in factory fabricated type containers or wrappings, which properly protect devices from damage.

B. Store fuses in original packaging and protect from weather and construction traffic. Wherever possible, store indoors. Where necessary to store outdoors, store above grade and enclose with watertight wrapping.

C. Handle fuses carefully to prevent physical damage. Do not install damaged fuses, remove from Site, and replace damaged devices with new.

PART 2 PRODUCTS

2.01 MATERIALS

A. The Contractor shall provide a complete set of current limiting fuses wherever fuses are indicated, or required.

B. Fuses shall be sized per fuse manufacturer's tables for short circuit protection.

C. Unless noted otherwise, fuses 0.1-600 amp sizes shall be Class RK1/RK5 rejection type fuses, dual-element, time delay with a minimum of 200,000 amps interrupting capacity and a blown fuse indicator, if available.

D. Provide the following Littelfuse types, or equal:

Type	Voltage	Amperage	Class
FLNR	250 volts	0.1-30 amp circuits	RK5
FLNR_ID	250 volts	35-600 amp circuits	RK5
IDSR	600 volts	0.1-600 amp circuits	RK5
LLNRK	250 volts	0.1-600 amp circuits	RK1
LLSRK	600 volts	0.1-600 amp circuits	RK1
KLPC	600 volts	601-6,000 amp circuits	L
SOO	125 volts	0.25-30 amp circuits	S
JTD	600 volts	1-600 amp circuits	J
218	250 volts	0.032-6.3 amp circuits	-

E. Transformer secondary fuses shall be equal to Littelfuse, as recommended by the manufacturer to secure proper coordination and protection.

F. Where fuse reducers are used, they shall provide a strong mechanical and electrical contact, and shall be UL listed. Fuses and fuse reducers shall be manufactured by the same company.

G. Special control fuses, capacitor fuses, and electronic fuses shall be furnished exactly as provided by the equipment manufacturer with no substitutions permitted.

H. Type S plug fuses shall be used only with HVAC devices.

2.02 MANUFACTURERS

A. Fuses shall be as manufactured by Bussman, Littelfuse, Ferraz Shawmut, or equal.

2.03 FUSE HOLDERS

A. Fuse holders shall be UL Listed.

B. Fuse holders shall be provided with box type wire lugs. Screw type connectors are not acceptable.

C. Fuse holders shall be suitable for the Class, voltage and amperage of the fuses they hold, i.e. Class H fuse holders shall not be used with Class R fuses.

D. Fuse holders for Type S plug fuses shall be of the box cover type and shall include a switch. They shall also include a properly sized adaptor to prevent the installation of fuses with larger amperage than the circuit or protected device was designed for.

E. Fuse holders shall be as manufactured by Marathon Special Products, Bussman, Littelfuse, Square D, Allen-Bradley, or equal.

2.04 LABELS

A. Install labels inside enclosure identifying the type of fuse installed, its ratings and the UL class.

PART 3 EXECUTION

3.01 COORDINATION

A. Contractor shall be responsible for verifying fuse size (shown or not) to properly coordinate with the equipment provided including cable protection before ordering fuses.

B. Install wiring between fuses and load devices as specified in Section 16120.

3.02 INSTALLATION

A. Verify indicated ratings and settings to be appropriate for final system arrangement and parameters. Where discrepancies are found, test organization shall recommend final protective device ratings and settings. Use accepted revised ratings or settings to make the final system adjustments.

B. Locate independently mounted fuses and install in accordance with manufacturer's written installation instructions.

C. Fuses shall be installed such that the label and indicator are visible from front of the fuse holder.

3.03 IDENTIFICATION

A. Identify components in accordance with Section 16030.

3.04 TESTING AND INSPECTION

A. Inspect for defects and physical damage, NRTL labeling, and nameplate compliance with current single line diagram.

B. Fuses blown during construction and start-up shall be replaced by the Contractor at no additional cost to the Owner.

PART 4 SPECIAL PROVISIONS

4.01 SPARE PARTS

A. Spare fuses shall be provided and delivered to the Owner as follows:

1. Spare fuses shall be provided in the amount of 10% of each size and type installed, but in no case shall less than three spares of a specified size and type be supplied.

2. Primary fuses shall be provided with one set of spare fuses for each set of primary fuse holders.

END OF SECTION

SECTION 16440
AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes all labor, tools, equipment, and materials to install a complete and functional automatic electrical load transfer system.

B. System shall connect partial or the entire facility electrical load to either the normal electrical utility source or to a standby electrical power source, which may be an alternate feed from the electric utility company or an engine-generator set.

C. Transfer switch shall be delivered to the Site completely equipped, tested, and ready for installation.

D. Transfer switch and components shall be comprised of all new materials. The design rating shall be based on the loads listed in Part 4 of this Section.

E. Power and control wiring to the generator(s), transfer switch(es), and accessories, except wiring described herein, shall be furnished and installed under other sections of Division 16.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Submit a list of materials giving quantities, manufacturer's name, and catalog numbers.

   b. Submit manufacturer's technical product sheets on each component to be furnished.

   c. Submit drawings which show dimensional layouts of the transfer switch from various elevations and its spatial relationship to associated power and control conduits and other associated equipment.

   d. Submit wiring diagrams showing connections to feeders, load, and accessory equipment. Clearly differentiate between portions of the wiring that are manufacturer installed and the portions to be field wired.

2. Information for the Record:

   a. Manufacturer's recommended method of installation for the products to be furnished.

b. Certified copies of factory and field test procedures and results.

c. Operation and maintenance manuals.

d. Provide warranty for review; executed copies shall be submitted when completed with copies included in the operation and maintenance manuals.

e. Manufacturer's qualifications, including a list of similar installations.

1.03 QUALITY ASSURANCE

A. All Work and materials shall be in compliance with applicable requirements of governing agencies having jurisdiction and the NEC.

B. Automatic transfer switch(es) and all components shall be designed, manufactured, and tested in accordance with the latest applicable standards of UL, NEMA, and NFPA as follows:

1. UL 50 - Cabinets and Boxes.
2. UL 489 - Molded Case Circuit Breakers, Molded Case Switches.
3. UL 508 - Industrial Control Systems.
4. UL 1008 - Transfer Switches.
5. NEMA ICS - Industrial Control and Systems.
6. NFPA 101 - Life Safety Code.
7. NFPA 110 - Emergency and Standby Power Systems.

C. Transfer switch(es) and accessories described herein shall be furnished by a single supplier who shall be responsible for the performance of the equipment in its entirety. The responsibility shall not be split among suppliers of individual components.

1.04 ELECTRICAL AND CONTROL COORDINATION

A. Size of automatic transfer switch shall be coordinated with the normal feed source, standby feed source and the voltage and current of the load being transferred.

1.05 GUARANTEE

A. The manufacturer's standard warranty shall be for a minimum period of one year and shall include repair parts, labor, and reasonable travel expense necessary for repairs at the job site.

B. Optional warranties and associated cost shall be available for the Owner's consideration.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Automatic transfer switches shall be installed within a NEMA 4X rated enclosure, unless otherwise noted in Part 4. All transfer switches 1000 amps or larger shall be in a free-standing enclosure.

B. Switches rated 1000 amps and less shall include quick-break, quick-make contact mechanism for manual transfer under load.

C. Switch shall be sized and rated for continuous duty operation at the current and voltage listed in Part 4 of this Section.

D. Main contacts shall be rated for 600 VAC minimum.

E. Transfer switch shall be designed to carry 100% of rated current continuously in the enclosure and have 4 poles for 3 phases and a neutral, unless otherwise noted.

F. Transfer switch shall be double-throw, with a center neutral (OFF) position, electronically and mechanically interlocked, and mechanically held in both normal and standby positions.

G. Each transfer switch shall be equipped with quick-break, quick-make, over-center contact, operating mechanisms suitable for safe manual operation under load with door(s) closed.

H. One set of Form “C” contacts rated at 10 amps, 250 VAC shall be provided for remote monitoring of each of the following parameters:

1. Switch in Normal/Standby Neutral positions.
2. Common transfer switch fault condition.
3. Loss of utility power.

I. Switches located outdoors or in non-climate controlled environments shall contain thermostatically controlled space heaters.

J. Automatic transfer switch shall be similar to ASCO Series 7000, Russ Electric RMTD, Lake Shore Electric, or equal.

2.02 PERFORMANCE REQUIREMENTS

A. The automatic transfer switch shall comply with Standard UL-1008 with 3-cycle short-circuit closing and withstand as follows:

RMS symmetrical amps at 480 VAC:

Switch Rating Amps	Closing and Withstand
100 - 400	25,000
600 - 800	65,000
1,000 - 1,200	85,000
1,000 - 4,000	100,000

B. When coordinated with current limiting fuses, each automatic transfer switch shall have closing and withstand ratings of 200,000 amps, RMS symmetrical.

C. Operation - Engine-Generator System:

1. Sequence for operation of the transfer switch from the normal source to the standby source shall be as follows:

   a. The standby engine-generator shall start after a time delay of at least 1 minute but not to exceed 5 minutes to allow for the normal source momentary voltage or frequency transients.

   b. Conditions requiring operation of the engine-generator:

      1) Voltage of any phase drops below 80% or rises to 120% of nominal.

      2) Frequency drops below 80% or increases to 120% of 60 Hz.

      3) A voltage differential between any two phases of 20% or greater is detected.

   c. The time delay shall be keyboard programmable.

2. The transfer switch shall transfer load to the standby power source when that source has reached and maintained specified voltage and frequency on all phases for 1 minute.

3. Sequence for operation of the transfer switch from the standby source to the normal source shall be as follows:

   a. The automatic transfer switch shall retransfer the load to the normal source, after 5 minute delay, when all of the following conditions are met:

      1) The normal source phase voltages have been restored to a preset value of at least 90% to no more than 110% of nominal.

      2) Frequency of the normal source has been restored to no less than 95% and no more than 105% of 60 Hz nominal.

      3) The voltage differential between all phases of the normal source is below 20%.

   b. The time delay shall be keypad programmable.

4. After retransfer of the load to the normal power source, the engine-generator set shall operate at no load for 15 minutes to allow the set to cool down, and to prevent restarting the engine-generator if the restoration of normal power is temporary.

    a. The preset time period shall be keypad programmable.

2.03 FABRICATION

A. Main switch contacts shall be made of high-pressure silver alloy. Contact assembly shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.

B. Normal power source connection lugs shall be at top. Standby power source lugs shall be at bottom. Load connection lugs shall be at bottom.

2.04 COMPONENTS AND ACCESSORIES

A. Control system shall be microprocessor based, solid-state, and shall be field programmable for transfer, re-transfer, and “pause-in-neutral position” time delays.

1. Override momentary normal source power failure to delay engine starting.
2. Transfer of load to standby power source.
3. Retransfer of load to normal power source.
4. Contact transition time on transfer to either power source.
5. Allow engine-generator set to run unloaded after retransfer to the normal power source.

B. Control system shall be field programmable for automatic or manual exercising of the switch and the engine-generator set, with or without load.

1. Any operator initiated functions including, but not limited to selecting load or no-load exercising, shall be provided on the enclosure door and shall not require the enclosure to be opened to access this feature thus minimizing exposure to arc flash conditions.

C. A contact closure shall be provided to start and stop the engine-generator set.

D. Non-volatile memory capable of storing historical data including date and time of transfer and re-transfer for a minimum of 16 operating cycles shall be provided.

E. Control system shall have three-phase under and over voltage, under and over frequency, and phase voltage differential sensing of both the normal and standby power sources.

F. Control system shall provide each operational function of the automatic transfer switch. Controller shall have two asynchronous serial communications ports, a real-time clock, and a battery control power backup.

G. Microprocessor shall have on-board self-diagnostics to perform periodic tests of the memory, I/O, and communications circuits, and have watchdog/power fail circuit.

H. Controller shall have a back-lighted Liquid Crystal Display (LCD) with a keypad for access to view operational parameters and to make programming changes. The display shall show a minimum of four (4) lines of 20 characters, and the keypad shall have at least 6 tactile buttons.

I. Transfer switch shall be equipped with electronic controls designed for surge voltage isolation, voltage sensors on all phases of power sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking, and mechanically held contacts.

J. Transfer switches located outdoors shall have a control power transformer for a thermostatically controlled, 120-volt, 250-watt electric strip heater to prevent internal condensation.

K. Controller disconnect switch-integral controller disconnect for isolation/servicing of control logic boards.

2.05 SOURCE QUALITY CONTROL

A. Automatic transfer switch shall be subjected to the following factory tests:

1. Units shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency, and time delay settings are in compliance with the specification requirements.
2. Switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1.
3. Manufacturer shall provide Owner with factory test reports.
4. Manufacturer shall certify compliance with all specifications including compliance with codes, standards, and withstand current ratings.

PART 3 EXECUTION

3.01 COORDINATION

A. Coordinate with other electrical work, including normal feeds, standby feeds and locations, as necessary to interface installation of transfer switch with other Work.

3.02 INSTALLATION

A. Automatic transfer switch and associated control devices shall be installed in accordance with the manufacturer’s written instructions.

B. Provide and install housekeeping pads for all floor mounted transfer switches.

C. Power wiring shall be anchored to withstand short circuit current conditions.

D. Provide equipment grounding connection(s) as indicated by the manufacturer.

E. Tighten electrical connectors and terminals in accordance with manufacturer's published torque tightening values. Where such values are not published, comply with tightening values specified in UL Standards.

3.03 INSPECTION, STARTUP, AND TRAINING

A. The Contractor shall furnish a qualified representative of the manufacturer to perform inspection, testing, and training services. The manufacturer's representative shall be experienced in the installation, operation, and maintenance of the equipment.

B. The representative shall check the installation and supervise final adjustments of the equipment. The representative shall certify that each installation is correct and that the equipment has been tested and is operating satisfactorily.

C. If the automatic transfer switch is used with an engine-generator system, testing shall be conducted by representatives of the engine-generator supplier and the automatic transfer switch.

D. The Owner and Engineer shall be notified in advance and shall have the option to witness the tests.

E. After the field testing, has been completed, the manufacturer's representative shall train the Owner's personnel for one eight-hour day in the proper operation and maintenance of the equipment. The Owner may make a video record of the training.

PART 4 SPECIAL PROVISIONS

4.01 AUTOMATIC TRANSFER SWITCH SCHEDULE

A. The following schedule is intended to aid the Contractor in identifying automatic transfer switch location and size. It is intended to supplement the Drawings and Specifications and is not guaranteed to be complete. All automatic transfer switches shown on the Drawings shall be furnished and installed by the Contractor whether or not listed in the schedule.

Location	Switch ID Tag	Phase	Voltage L-L	Continuous Amps	Number of Poles	Switch Rating (1)	Enclosure Heater Control Voltage	Short-Circuit Closing and Withstand Amps RMS Symmetrical	NEMA Type Enclosure
Willowbend PS		3	480	150 80% rated	3	SE	120v	25kA	12

(1) Switch Rating: SE = Entrance

END OF SECTION

SECTION 16453
MINI POWER ZONES

PART 1 GENERAL

1.01 SCOPE

A. This Section includes furnishing and installing single phase and three phase, general purpose, individually mounted, mini-power centers of the two-part construction type, self-cooled, complete and in place, ready for service.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:
   a. General arrangement drawings.
   b. Wiring schematics and termination identifications.
   c. Manufacturer's catalog cut-sheets on each component to be furnished.
2. Information for the Record:
   a. Manufacturer's qualifications.
   b. Manufacturer's storage, handling, and maintenance requirements.
   c. Installation information.
   d. Certified factory production reports.
   e. Equipment warranty.
   f. Operation and maintenance manuals.
   g. Field test reports.

1.03 QUALITY ASSURANCE

A. Transformers shall be designed, constructed, rated, and tested in accordance with UL, NEMA, ANSI, IEEE, NFPA, and OSHA standards.

B. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five years.

C. Manufacturers shall be registered firms in accordance with ISO 9001:2000; which includes the design and manufacture of low voltage dry-type power, distribution, and specialty transformers.

D. Transformer and accessories described herein shall be furnished by a supplier who shall be responsible for the performance of the equipment in its entirety. The supplier shall maintain a parts and service capability, and provide qualified, factory trained, service personnel that can respond to an emergency call within 4 hours of notification.

1.04 PRODUCT HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. A copy of these instructions shall be included with the equipment at the time of shipping.

1.05 GUARANTEE

A. Transformers shall be warranted against defects in materials, workmanship, and performance for five years from date of substantial completion.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Mini power zones shall include a main primary breaker and a secondary panelboard with main breaker. Primary and secondary circuit breakers shall be in accordance with the requirements of Division 16.

B. Transformers shall be totally enclosed non-ventilated with continuously wound coils and shall be completely encapsulated in a polyester resin compound to provide a shock-resistant, moisture-proof, seal. Insulation temperature class shall be based on 180 degrees C system minimum.

C. Transformer cores shall be constructed with low hysteresis and eddy current losses. Magnetic flux densities shall be below the saturation point to prevent core overheating by harmonic voltage distortion and load current offset.

D. Cores for transformers shall be clamped utilizing insulated bolts through the core laminations to provide proper pressure throughout the length of the core.

E. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.

F. Transformer enclosure shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring.

G. Transformers located outdoors shall have lifting eyes and a NEMA rated enclosure as identified on the Drawings or listed in Part 4.

H. Transformers in corrosive areas indoors or outdoors shall have stainless steel enclosures.

I. Enclosure shall be equipped with padlockable hinged door.

J. Mini Power Zones shall be manufactured by Square D, Cutler-Hammer, Siemens, or equal.

K. All circuit breakers shall be bolt-on type. Plug-on breakers are not permitted.

2.02 PERFORMANCE REQUIREMENTS

A. Transformers shall be supplied with two full capacity, 5% below normal taps in the high voltage windings.

B. Transformer sound levels shall meet the requirements as established by ANSI and NEMA for self-cooled ratings:

1. Up to 9 kVA - 40 dB.
2. 10 to 30 kVA - 45 dB.

C. All interconnecting wiring between the primary breaker, transformer, and secondary breakers shall be factory installed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Contractor shall install all equipment per the manufacturer's recommendations and the Drawings.

B. Tighten all lugs to manufacturer's specifications, and adjust transformer taps to provide secondary voltage to within 2% of nominal system rating.

3.02 FIELD TESTING

A. Measure primary and secondary winding resistance for shorted or open windings.

B. Measure primary and secondary voltages for proper tap settings.

C. Measure impedance from neutral to ground.

D. Submit written report of test results to Engineer.

PART 4 SPECIAL PROVISIONS

4.01 MINI POWER ZONE SCHEDULE

A. Mini Power Zone Transformers shall be identified as to their location, size, voltages, enclosures, number of phases, and accessories as per the following schedule.

B. The following schedule is intended to aid the Contractor in identifying Mini-Power-Zone location and size. It is intended to supplement the Drawings and Specifications and is not guaranteed to be complete. All Mini-Power-Zones shown on the drawings shall be furnished and installed by the Contractor whether or not listed in the schedule.

Location	ID Tag	Size kVA	Primary Voltage	Secondary Voltage	Accessories and Options	Single or Three Phases	Enclosure Type
Willowbend PS	MPZ-PS	15	480	120/208		Three	3R

Accessories:

WS	=	Weather Shield
WMB	=	Wall Mounting Bracket
CMB	=	Ceiling Mounting Bracket
SH	=	Shunt Trip Primary Breaker
IS	=	Electronic Shielding

Enclosures:

3R	=	NEMA 3R
4X	=	Stainless Steel

END OF SECTION

SECTION 16510
LIGHTING

PART 1 GENERAL

1.01 SCOPE

A. Under this Section, the Contractor shall provide all labor, material, services, and appurtenances necessary to make a complete operating lighting system.

B. The Work specified in this Section includes but shall not be limited to, furnishing, installing, connecting, and testing lighting fixtures, lamps, hangers, structural supports, wiring, outlets, connections, and controls as shown on the Drawings or specifications.

C. All Work, services, wiring, devices, equipment, and systems described herein shall conform to appropriate Sections of Division 16.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. A list of materials giving manufacturer's name and catalog numbers.

   b. Manufacturer's Literature on lighting photometrics.

2. Information for the Record:

   a. Manufacturer's recommended method of installation for the products to be furnished.

   b. Operation and maintenance manual.

   c. Manufacturer's recommended spare parts list for components and accessories.

   d. Provide warranty for review; executed copies shall be submitted when completed with copies included in the operation and maintenance manuals.

PART 2 PRODUCTS

2.01 LIGHTING FIXTURES

A. All lighting fixtures, exit lighting fixtures and emergency lighting fixtures shall be of the size and type designated in the "Lighting Fixture Schedule" and as indicated on the Drawings.

B. All lighting fixtures shall be equipped with accessories, special finishes, or modifications as required, and with hangers and end caps. Continuous rows of ceiling mounted or

stem mounted fluorescent lighting fixtures shall have couplers. Flush mounted lighting fixtures shall be furnished with all mounting accessories required for complete installation in the particular ceiling system involved.

C. All vapor tight and hazardous area fixtures shall include an approved cast iron or malleable box.

D. All recessed lighting fixtures shall be equipped with a suitable gasket to prevent light leakage. Where the specific fixture catalog number or type does not include the gasket, it shall be provided by the Contractor at no additional expense to the Owner.

E. Ballasts - All fluorescent or HID type fixtures shall use two-lamp ballasts whenever possible and shall be supplied with -20 degrees F ballasts when located outdoors or in unheated buildings. All HID ballasts shall be constant wattage type. Fluorescent lighting fixture ballasts shall be protected GE UltraMax, Lithonia Highly efficient electronic ballast or equal.

1. Ceiling mounted fluorescent lighting fixtures shall be provided with high power factor, CBM approved, UL listed, ETL certified ballasts, with thermal overload and automatic reset, premium Class P, sound rating “A”.

2. Recessed fluorescent lighting fixtures shall be provided with high power factor, CBM approved, UL listed, ETL certified ballasts with the thermal overload and automatic reset, super premium Class P, sound rating “A+”.

3. Stem mounted fluorescent lighting fixtures shall be provided with high power factor, CBM approved, UL listed, ETL certified ballasts, with thermal overload and automatic reset, Class P, sound rating “A”.

4. High pressure sodium lighting fixtures shall have high power factor ballasts, regulated type with electronic starter.

5. Metal halide lighting fixtures shall be provided with proper and suitable ballasts of the lead peaked circuit type, compatible with the particular type of lamp selected, providing high power factor, low line starting current, allowable line voltage range plus or minus 10%.

6. LED drivers shall be electronic-type, labeled as compliant with radio frequency interference (RFI) requirements of FCC Title 47 Part 15, and comply with NEMA SSL 1 Electronic Drivers for LED Devices, Arrays, or Systems. LED drivers shall have a sound rating of A, have a minimum efficiency of 85%, and be rated for a THD of less than 20% at all input voltages.

7. Dimmable LED drivers shall be 0-10V type. Dimmable LED drivers shall be capable of dimming without LED strobing or flicker across their full dimming range.

F. LED fixture shall comply with UL Standard 8750 Light Emitting Diode Equipment for use in Lighting Products, IES Standard LM-79 Electrical and Photometric Measurements of Solid-State Lighting Products, IES Standard LM-80 Measuring Lumen Maintenance of LED Light Sources.

1. Provide LED fixtures with a DesignLights Consortium® (DLC) listing, a US Department of Energy (DOE) LED Lighting Facts label, or a US Environmental Protection Agency (EPA) ENERGY STAR label, which have demonstrated third-party testing verification.
2. Recessed lighting fixtures shall be thermally protected.
3. LED fixtures shall be modular and allow for separate replacement of LED lamps and drivers.
4. Dimmable LED fixtures shall have either a 0-10 volt, 3-wire dimming driver, or a two-step (50% - 100%) line voltage, two switch controlled dimming driver.

2.02 LAMPS

A. All lighting fixtures shall be provided with the proper number and types of new lamps of the correct size as shown on the Drawings, as specified, or as required for the particular fixture type. Only the number of lamps required to provide adequate lighting for Work yet to be done in each area and acceptable temporary lighting elsewhere shall be installed at the time lighting fixtures are installed and tested. Remaining lamps are to be installed not more than 10 days prior to acceptance of the project by the Owner.

B. All lamps shall be in working order at the time of final acceptance of the Work by the Owner. All defective lamps shall be replaced until the Work is finally accepted.

C. LED lamps shall have a minimum color temperature of 4000 degrees K, CRI of 80 minimum, and a lumen maintenance L70 rating of 50,000 hours minimum.

2.03 LIGHTING CONTROL, GENERAL

A. In addition to the conduit and wiring, the lighting control systems for the exterior lighting systems, certain indoor lighting systems, entrance ways, vestibules and canopies shall consist of the following components:

1. 120 volt separate mount photoelectric cell units shall be provided and wired as indicated or shown. Units shall be Contractor located for operation free of background light.
2. Photoelectric cell units shall:
   a. Be weatherproof.
   b. Have light level adjustment.
   c. Have 1/2-inch stem mounting with swivel.
   d. Have contacts rated to handle 15 amps of incandescent light at 120 VAC and 8.3 amps of ballast load at 120 VAC.
3. Photoelectric cell units shall be Intermatic K4221, or equal.
4. Exterior LED lighting shall have surge protection for each luminaire up to 6 kV minimum.

2.04 ROADWAY AND YARD LIGHTING

A. All luminaires for the roadway and yard lighting systems shall be of the sizes and types designated on the Drawings.

B. All luminaires shall be equipped with accessories as required for proper workmanlike installation.

C. All luminaires shall be equipped with the poles as indicated on the Drawings.

D. All HID luminaires shall be provided with lamps and integral proper ballasting, permitting lamp starts down to -20 degrees F, and be weatherproofed.

E. All pole mounting shall be complete with prefabricated anchor bolt assembly, leveling shims, pole base cover, grounding lug, and reinforced handhole.

2.05 RESERVED

PART 3 EXECUTION

3.01 LIGHTING FIXTURES

A. All lighting fixtures shall be securely supported with hangers approved for the purpose and the particular ceiling involved. Fixture support methods shall meet the fixture manufacturer's recommendations.

B. Box mounted fixtures shall be mounted directly to the mounting ears of the box.

C. Fixtures shall be supported from structural ceilings or structural supports, not suspended ceiling supports. Fixtures shall not be hung from metal deck.

D. Fixtures shall be installed with due regard for structural systems, doors, piping, ductwork, and other mechanical equipment and related Work. Any fixture obscured with other Work shall be relocated at the Contractor's expense.

E. Unless the mounting height of fixtures is shown on the Drawings or designated in the Project Specifications, fixtures shall not be mounted less than 9 feet above the floor unless the ceiling height will not permit such height.

F. Job site Conditions: Surfaces and structures to, and on which products will be placed and installed shall be inspected before the Work of this Section begins, and shall be capable of supporting the products. Surfaces which will be concealed by products shall be finished before products are installed. Sources of permanent power shall be connected to products only after the products have been installed, inspected, tested, and approved.

G. Emergency fixtures shall be wired to the same branch lighting circuit as normal fixtures in the same area, but to the line side of any switch or control device.

H. Multiwire, (shared neutral), branch circuits may be used for lighting fixtures containing ballasts when the fixture includes a switch capable of simultaneously opening all supply conductors to the ballast.

3.02 ROADWAY AND YARD LIGHTING

A. All poles and luminaires shall be assembled and erected in full compliance with manufacturer's recommendations.

B. Trenching and backfilling for electrical work shall be performed as specified in Section 02200.

C. All concrete bases for roadway and yard lighting as indicated on the Drawings shall be furnished and installed under this Contract in a manner as specified in Section 03300 of this Specification.

3.03 RESERVED

3.04 TESTS AND INSPECTIONS

A. General - This Section sets forth the electrical testing procedures required for the acceptance of electrical equipment as described in the sections that follow. The purpose of the specified tests and inspections is to determine that each piece of equipment is in satisfactory condition to successfully perform its intended function. It is the intent of these procedures to ensure that all workmanship, material, the manner and method of erection and installation conform to manufacturer's instructions, IEEE and ANSI standards and NEC, except as modified herein.

B. Responsibility - The Contractor shall perform and supervise all tests unless specifically noted otherwise herein or on the Drawings. The Contractor shall furnish all equipment required for the test performed by him and shall be responsible for providing such safety measures as are required for each test.

1. The Contractor shall schedule all testing with the Engineer and no testing of any kind shall be performed without the Engineer's approval.

2. The Contractor shall notify all involved parties other than the Engineer prior to test, advising them of the test to be performed and the schedule date and time.

3. The Contractor shall give manufacturers sufficient notice to allow the necessary arrangements to be made and to have their engineer or representative present at tests where their presence is required. Where the manufacturer's responsibility includes both electrical and mechanical performance, the Contractor shall coordinate the tests with the others involved.

C. Circuits and Devices - The Contractor shall show by demonstration in service that all circuits and devices are in operating condition.

1. Tests shall be provided to determine that each item of control equipment will function not less than 5 times.

2. The Contractor shall test all 600-volt wiring to verify that no short-circuits or accidental grounds exist. Tests shall be made using an instrument that applies 500 volts between conductor and ground.

3. The conduit system shall be tested for continuity to ground.

3.05 CLEANING

A. Prior to requesting final payment, Contractor shall thoroughly clean lighting fixtures and lamps.

PART 4 SPECIAL PROVISIONS

4.01 FIXTURE SCHEDULE

A. See Drawings for fixture schedule.

4.02 SPARE PARTS

A. Contractor shall furnish at least one spare lamp for each type of light fixture installed. If more than 10 units of a type of fixture are installed, an additional spare lamp shall be furnished for each additional 10 units, or portion thereof, installed.

END OF SECTION

SECTION 16902
METERING AND CONTROL EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

A. Work under this Section includes furnishing and installing all metering and control equipment which is part of the Plant Control System except the programmable controller system and the graphic user interface system.

B. All Work performed shall comply and be in accordance with all approved trade practices and manufacturer's recommendations.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Manufacturer's literature including model number, type, size, materials, quantity, connections, equipment number, mounting hardware, and installation information.

2. Information for the Record:

   a. Equipment suppliers report that equipment is properly installed and satisfactory operation is obtained.

   b. Software, cables, etc. for configuration, programming or operation of meters or equipment, minimum of two each is required.

   c. Operation and maintenance manuals.

   d. Schedule of Owner's training for all new equipment.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

A. All metering and control equipment shall be as indicated on the Drawings and as specified, and shall include, but not be limited to those devices hereinafter defined. Should additional devices be required, but not specifically indicated elsewhere, in order to affect the intent of the Contract Documents, such devices shall be furnished.

B. All metering and control equipment used for similar applications shall be the product of a single manufacturer.

C. All features and requirements listed in the individual instrument specifications are required.

D. All field instrument enclosures shall be NEMA 4X construction except in hazardous locations where the enclosures shall be NEMA 7 for Class I, Division 1, Group D service, unless otherwise noted. Equipment in hazardous locations shall indicate temperature rating as specified in the NEC.

E. All faces of panel mounted instruments shall be NEMA 4X construction except where the panel is located in a protected Control Room environment.

F. Whenever an "or equal" equipment item is proposed in lieu of that specified it will not be considered equal if it is of non-potted construction and the specified item is potted construction.

2.02 PERFORMANCE REQUIREMENTS

A. Intrinsically safe equipment shall be Factory Mutual approved for Class I, Division 1, Group D service.

B. Analog signals for input to a programmable controller system shall be isolated 4-20 mA DC and where required, current to current transducers or other device shall be furnished to produce an isolated signal to the programmable controller analog input modules.

C. Digital input signal sources shall provide an isolated contact rated at 5-amp minimum, 115 VAC, to the programmable controller system.

D. Power supplies shall be furnished for two-wire transmitters and other devices requiring DC power. No more than four loops shall be powered from one power supply. Separate power supplies shall be provided for duplicate instruments to ensure failure of one power supply will not inhibit operation of secondary equipment.

E. The Site is in an area subject to radio frequency activity. Any equipment sensitive to radio frequency interference (RFI) shall be provided with the proper RFI filters, be properly shielded and grounded, or otherwise protected to allow proper operation of the equipment.

2.03 FLOW

A. Flow Element and Transmitter ((FE)/(FIT))

Function	Measure flow in process line and transmit signal proportional to flow
Type	Pulsed DC magnetic induction
Size	12-inches
Meter Location / Rating	Underground Vault Rated for NEMA6/IP67 Continuous Submerged Service in a maximum of 15-feet of water. NEMA-7 Junction Box
Input Signal	Analog Process Flow
Output Signal	Isolated 4-20mA DC output into 800 ohms.

	Flow direction, empty pipe detection. Two contact outputs and one contact for positive zero return.
Fluid Type	Municipal Wastewater
Metering Tube	304 SST, Epoxy Coated
Accuracy	0.5% of the flow rate 1-33 fps
Liner	Hard Rubber
Electrodes	Hastaloy C Bullet Nose
HMI / Display	Remote Mounted, capable of simultaneously displaying flow rate and totalization
Transmitter Enclosure:	NEMA 4X remote electronic display, with flow rate and totalization indicator. Backlit LCD Display
Process Pipe Connections	Class D 150 lb. AWWA Flanges
Grounding	All meters must be supplied with orifice type 316 stainless steel grounding rings. Grounding electrodes are not acceptable.
Converter:	Microprocessor based remote converter. Refer to drawings for cable length.
Power Requirements	110/120 VAC 50/60 Hz.for Remote display
Electrical Rating	Meter shall be FM approved for Class 1 Division 1 and 2 Groups B, C and D.
Manufacturer	Sparling
Model	TigermagEP FM656

2.04 ACCESSORIES

A. All piping and tubing for connections to instruments shall be stainless steel. Threaded pipe shall be ASTM A312, Grade TP304, Schedule 40S, and fittings shall be AISI Type 304. Tubing shall be ASTM Grade TP304, 0.028-inch minimum wall thickness for flareless “bite” type with threaded nut and ferrule fittings.

B. All mechanical fasteners such as bolts, nuts, screws, cinch anchors, clamps, etc., shall be stainless steel.

C. All special mounting brackets shall be stainless steel, galvanized, or nonferrous non-corrosive metal.

D. All equipment mounted outdoors that includes any type of visual indicator, LCD, etc., shall be furnished with a sun visor.

PART 3 EXECUTION

3.01 GENERAL

A. The features and installation of the instrumentation shall be coordinated for optimal performance with the characteristics of the process material to be metered.

B. Care must be exercised to identify locations that meet the requirements of the manufacturer including upstream and downstream distances, pressures, temperatures, and accessibility for maintenance.

C. Verify equipment requirements and dimensions with provisions specified under this Section. Check actual field conditions, report necessary changes, and submit equipment reflecting changes.

D. Coordinate Work with other trades to avoid conflict and to provide correct rough-in and electrical connection requirements. Inform Contractors of other trades of the required access to and clearances around equipment to maintain serviceability and code compliance.

E. Where the installation of any device is dependent on, or affected by, Work performed under other sections of these specifications, the Contractor shall coordinate the Work. Installation coordination includes the correct location and placement of devices, piping to the equipment, pipe taps, control power circuits, connections to the control system, etc.

F. Installation of instrumentation in an existing system being modified, replaced, or abandoned, shall be coordinated with the Owner and shall be performed to minimize operational disruptions and minimize time that equipment may be out of service.

3.02 INSTALLATION

A. Installation shall include the provision of materials, and the coordination of all details, necessary to properly install the instruments including location, arrangement in piping, power source, signal wiring and conduit, special brackets, and all mounting hardware.

B. All instrumentation devices shall be installed in accordance with the manufacturer's installation requirements.

C. Wiring practices for intrinsically safe systems shall be in accordance with ISA RP12.06.01.

D. Instruments shall be installed so that the various components are accessible for maintenance. Care shall be taken in the installation to ensure sufficient space is provided between instruments and other equipment, including piping, for ease of removal and servicing. All instruments shall be readily accessible from grade, permanent platforms, or fixed ladders.

3.03 STARTUP AND TRAINING

A. The Contractor shall provide the services of component manufacturer's factory trained personnel for the supervision of installation, initialization, and calibration of equipment.

PART 4 SPECIAL PROVISIONS

None Used

SECTION 16903
CONTROL PANELS

PART 1 GENERAL

1.01 SCOPE

A. Work under this Section includes the fabrication and installation of all control panels and other enclosures required to provide a complete instrumentation and control package. Panel wiring is also included herein.

B. All control panels furnished or installed under this contract shall meet the requirements of this Section. Panels include, but are not limited to, those designated control panels, interim panels, enclosures, remote I/O panels, or other required enclosures necessary to complete the Work.

1.02 SUBMITTALS

A. Submittals shall be in accordance with the requirements of Section 01300 and shall include:

1. Shop Drawings for Review:

   a. Submittals shall show door arrangement and device layout, wireways, subpanel layout, padlock and vault type locking handle, dimensions, legends, terminal blocks and terminations, etc.

   b. Panel schematic wiring diagrams shall be provided to show all panel wiring systematically numbered. All devices shall be identified by device symbol designation; all lines and points shall be numbered. Each line shall be identified by function.

   c. Furnish manufacturer’s name, catalog numbers, and product specifications for each component and panel to be furnished.

2. Information for the Record:

   a. Operation and maintenance manuals.

   b. Upon completion of the installation and acceptance by the Owner and Engineer, all electrical (schematic) diagrams, interconnection diagrams, panel layouts, and related support materials shall be corrected and amended to reflect the installed system.

1.03 QUALITY ASSURANCE

A. All control panel enclosures shall be UL listed and designed in accordance with applicable NEMA, ANSI, and UL 508 Standards.

B. All wiring and terminations shall be designed, manufactured, and tested in accordance with the latest applicable standards of the NEC as well as state and local codes.

C. Control panels shall conform to third party safety certification. The assembled control panel shall bear a serialized UL label listed for “Industrial Control Panels” UL 508A. The enclosure, and all components mounted thereto shall conform to UL descriptions and procedures.

PART 2 PRODUCTS

2.01 ENCLOSURES

A. All enclosures shall be Hoffman Enclosures, Inc., Bulletin A4, A12, A19, or A30 as specified or equal.

B. All equipment and controls shall be mounted in metal enclosures designed and manufactured in accordance with the applicable standards of NEMA, ANSI, and UL 508A Standards. Panels shall be floor-mounted, free standing or wall mounted (as determined by manufacturer’s mounting provisions for the size and type of panel).

C. Enclosures in a Control Room shall be NEMA 12 rated. Enclosures not located in a Control Room shall be NEMA 4X rated, nonventilated stainless steel unless noted otherwise.

D. Enclosures shall have a rolled lip around all sides of the opening so that a drip hood is not required.

E. Single door enclosures shall be hinged left with removable hinge pins. All NEMA 12 rated panel doors shall incorporate a vault type handle with 3-point latching mechanism for securing the door in closed position and door locks shall be keyed alike. NEMA 4X rated panel doors shall be furnished with padlock hasp and padlocks, all keyed alike. NEMA 4X rated panel doors shall be held closed with hardware certified compatible with the epoxy resin coating or stainless steel. Only smooth rubber gasket material shall be used for providing the door seal.

F. Double door enclosures shall have a removable center mullion and overlapping doors with three-point latching mechanisms with oil tight keyed locking handles, all keyed alike.

G. Removable “eye” bolts shall be provided to facilitate slinging and handling of enclosures. “Eye” bolts shall be mounted directly to and be part of the enclosure structural members so as to distribute the stresses and weight while slinging.

H. Panels shall have print pockets attached inside the door, as space permits.

I. Cover boxes, enclosures; etc. regardless of size with front mounted devices shall have a hinged door unless noted otherwise.

J. Panel layout and equipment spacing shall be sufficient to allow for device removal and maintenance without disassembly of adjacent devices. Additionally, ample panel gutter space (sides, top, and bottom) shall be provided for training wires and cables.

K. The Contractor shall properly size each enclosure, allowing 20% back panel spare space. Each enclosure shall be sized as specified herein or shown on the Drawings, or to suit the physical dimensions required for components and heat requirements of the components mounted within, whichever is the largest.

L. Control panel doors shall not exceed 36 inches in width.

M. Control panel depth shall not be less than 8 inches.

N. Floor mounted type enclosures shall be provided with floor stands. The legs of floor-mounted enclosures shall be at least 12 inches high.

2.02 PLC AND REMOTE I/O AND CONTROL ENCLOSURES

A. Furnished by others, installed by Contractor.

2.03 POWER, INSTRUMENTATION AND CONTROL WIRING

A. Panel interior control wiring shall be a minimum of No. 16 AWG-MTW, 2/64 PVC insulation, and 90 degrees C rated for AC connections. Nylon jacketed and/or TFFN wire will not be accepted. Thermoplastic wire cover shall be colored:

RED	for AC wires
DARK BLUE	for DC wires
CANARY YELLOW	all foreign wiring inside the panel not being de-energized by the panel feed circuit breaker
GREEN	all ground wire connections
BLACK	for power source
WHITE	for power neutral
LIGHT BLUE	intrinsically safe system

B. Signal conductors shall be as specified in Section 16121.

C. Power wiring shall be 600 volts and as specified in Section 16120. Conductors shall be stranded copper. No wire smaller than No. 12 AWG shall be used for power wiring.

D. All wire in control enclosures shall be identified at each terminal with wire identification tags as specified in Section 16030.

2.04 ENCLOSURE ACCESSORIES

A. Terminal blocks shall be Allen Bradley 1492 - W4 or equal. The Contractor shall allow 20% extra terminal connections in addition to those terminals required for the termination of spare control conductors and instrument cables.

B. Outdoor NEMA 4X rated enclosures shall have condensation protection and temperature control to maintain equipment manufacturer’s specified operating temperatures. Condensation protection and temperature control shall be typical for all such enclosures and shall be sized accordingly and thermostatically controlled.

Condensation protection and temperature control shall be Hoffman Enclosures Inc. - Bulletin D85, or equal.

C. Plastic wireway shall be used to train wires in all control panels and enclosures. Wireway fill shall not exceed 20% and shall be run in continuous lengths with snap-on type covers.

D. Each panel shall have a panel grounding bus bonded to the panel enclosure and a braided grounding strap connecting the panel door(s) to the panel enclosure frame.

E. Nameplates and legends shall be per Section 16030.

2.05 FABRICATION

A. Equipment, controls, and devices specified elsewhere and shown on the Drawings shall be mounted in enclosures manufactured in accordance with applicable NEMA, ANSI, and UL 508A Standards. All devices shall be mounted in accordance with the component manufacturer's recommendation. Devices shall be adequately supported and organized so that operation and maintenance access is unrestricted.

B. All necessary inner panels and supporting members shall be provided by the Contractor.

C. To minimize future maintenance problems, all panel enclosures shall be provided by one manufacturer to the extent that it is possible.

D. All panel wiring shall terminate at terminal blocks unless noted otherwise. Wire numbers shall be marked on an integral marker strip in numerical sequence for each individual block.

E. Instrumentation designs shall be such that analog signals that do not leave the enclosure shall be wired direct, without splices or terminals, from instrument to instrument unless accomplished in accordance with other provisions of these specifications.

F. Signal wiring shall be segregated and shielded from control and power wiring, grouped functionally, and arranged neatly to facilitate tracing of circuits.

G. No combination of analog, digital input, or control output wiring should be intermixed within the same bundle or duct. All analog wires shall be justified right while discrete 120 VAC wires shall be justified left.

H. Plastic wiring wraps shall be used to bundle wires, except within wiring ducts. The bundles shall be securely fastened to the steel structure at suitable intervals, not exceeding 12 inches.

I. Required device holes shall be provided by the panel manufacturer and punched prior to coating. No extra holes or field cut holes shall be permitted unless approved by Owner or Engineer.

J. Door or cover mounted panel devices shall not be located less than 30 inches above the finished floor. Door and cover mounted devices (i.e., pushbuttons, pilot lights, selector switches, meters, etc.) mounted in NEMA 12 and 4X enclosures shall, in addition to

standard gaskets, be sealed with silicone grease compound as manufactured by Dow-Corning (No. 732) or equal.

K. Panels containing 480 volt power wiring contained within shall have a defeatable (disconnect switch) mounted on the panel front exterior to prevent opening the panel while the switch is in the ON position.

L. Panels containing 120 volt power (except canary yellow foreign wiring powered elsewhere) shall have provided inside the enclosure a properly sized fused isolation switch or circuit breaker.

M. Floor mounted and free standing enclosures shall be equipped with an interior, 15 amp, specification grade duplex receptacle and interior fluorescent lighting. A switch shall be provided to control the lighting unless noted otherwise in these specifications. The receptacle and light shall be powered from a circuit separate from the control voltage circuit.

N. Panel shall have sufficient structural reinforcement to ensure a flat plane surface, to limit vibration, and to provide rigidity during shipment, installation, and operation, without distortion or damage to the panel or damage to any instrument mounted thereon. Minimum thickness of panels shall be:

1. Single door wall mounted up to 48-inch high by 36-inch wide by 16-inch deep shall be a minimum of 14-gauge steel.

2. Floor-mounted, wall-mounted and free standing panels larger than the above shall be a minimum of 12-gauge steel with angle reinforcement.

O. Joined edges, corners, and seams shall be of a continuous bead weld (filler or dubbing shall not be permitted), and ground to a finish so as not to be detectable after painting. Spot welds shall be used only to connect flat metal surfaces to structural support bracing to provide rigidity. Panels with any warping due to welding procedures or any other cause shall be rejected.

P. Panels shall be bonderized or cold phosphated before painting. NEMA 12 rated panel shall be primed and factory finished with two coats of ANSI color baked enamel. The color is to be selected by the Owner. NEMA 4X rated panels shall be primed and coated with a powdered resin, heat-cured, 100% solid thermosetting epoxy, unless the enclosure is stainless steel. Interior surfaces shall be high-gloss white, and the exterior surfaces shall be a high-gloss color to be selected by the Owner.

Q. The inner-mounting panel shall be a minimum of 12 gauge for single door enclosures and 10 gauge for double door enclosures. The panel shall be mounted with stainless steel fasteners and coated the same as panel interior.

R. Equipment mounted within free standing and floor-mounted control enclosures shall not be located such that it will be less than 18 inches above the mounting surface (floor, housekeeping pad, platform, etc.) after installation in the field.

S. Outdoor enclosures shall have their operator controls, (such as, but not limited to: pushbuttons and selector switches), mounted on a steel inner swing-out panel unless

noted otherwise on the drawings. The swing-out panel mounted controls shall be accessible only after opening the lockable outer door.

T. Indicators and control operators mounted through the exterior of control enclosures shall be at least 30 inches above the walking surface (floor, housekeeping pad, platform, etc.) after installation in the field. The only exception to this rule will be alarm horns, speakers and similar audible devices.

PART 3 EXECUTION

3.01 COORDINATION

A. Panel location and clearances shall be in compliance with the NEC.

3.02 INSTALLATION

A. Each conduit penetration of the panel shall be made in accordance with the manufacturer's recommendations. Each panel penetration shall comply with requirements to maintain NEMA ratings specified. No remaining holes or knockouts will be permitted except for power wiring entrances, signal wiring entrances, and mounting hole for any future panel mounted device(s). Holes shall be covered with a plastic plate. Conduit entrances shall be from the bottom of the enclosure first; then if bottom is not practical, the sides of the enclosure will be used. All panel mounted equipment will be protected from metal shavings, moisture, and debris while working in enclosures.

B. Install wiring between panel mounted devices and field devices as specified in Section 16120.

C. Check connectors, terminals, bus joints, and mountings for tightness. Tighten field-connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and UL 486B.

D. Provide equipment grounding connections for individually mounted units as indicated and as required by the NEC. Tighten connectors to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounding.

E. Upon completion of installation, inspect devices, and remove paint splatters, other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

F. The bottom of wall-mounted control enclosures shall be at least 18 inches above the floor or platform. Use galvanized or aluminum unistrut when attaching control enclosures to vertical surfaces. Consideration shall be given to compatibility of unistrut and control panel metal surfaces in contact with one another.

G. The mounting of each panel shall allow for a minimum of 30-inch wide by 42-inch deep work area and door opening clearance of 90 degrees in front of panel to accommodate suitable room to open panel door and to provide the necessary work area.

H. Each floor mounted or freestanding panel shall be installed on a 4-inch thick housekeeping pad, continuous under the panel and extending 1-inch out from all sides. Pads shall have a 1/2-inch chamfer on all sides, except against walls.

3.03 IDENTIFICATION

A. Identify panel and components in accordance with Section 16030.

B. Individual nameplates shall be labeled to match the single line and schematic drawings.

PART 4 SPECIAL PROVISIONS

4.01 GENERAL ENCLOSURE SCHEDULE

A. The following schedule is intended to aid the Contractor in identifying panels, location, and approximate size. It is intended to supplement the Drawings and Specifications and is not guaranteed to be complete. All enclosures shown on the drawings, specified or as necessary to complete the Work shall be furnished and installed by the Contractor whether or not listed in the schedule.

Panel Name	Location	NEMA Rating	Approx. Size (H x W x D)
Pump Control Panel	Willowbend Pump Station Bldg	12	72” x 72” x 18”

4.02 PLC AND REMOTE I/O ENCLOSURE SCHEDULE

A. The following schedule is intended to aid the Contractor in identifying panels, location, and approximate size. It is intended to supplement the Drawings and Specifications and is not guaranteed to be complete. All enclosures shown on the drawings, specified or as necessary to complete the Work shall be furnished and installed by the Contractor whether or not listed in the schedule.

Panel Name	Location	NEMA Rating	Approx. Size (H x W x D)
Remote Telemetry Unit Panel	Willowbend Pump Station Bldg (Supplied by WD Automation through Allowance Item).	12	36” x 36” x 16”

4.03 RESERVED

END OF SECTION