

South Interceptor Equalization Facility Improvements

City of North Olmsted

WPCLF Funded Project

October 2024



Thomas Voldrich

210888

CITY OF NORTH OLMSTED OFFICIALS

ADMINISTRATION

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Kevin Kearney, Service Director
Jeffrey Filarski, P.E., City Engineer
Carrie Copfer, Finance Director
Michael R. Gareau, Jr., Director of Law
Max Upton, Director of Economic & Community Development
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Patrick Kelly, At-Large
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ADVERTISEMENT FOR BIDS/PUBLIC NOTICE TO BIDDERS

Sealed bids will be received at City Hall, City of North Olmsted, 5200 Dover Center Road, North Olmsted, Ohio 44070 until 2:00 p.m. on October 31, 2024 and will be opened and read immediately thereafter for the

SOUTH INTERCEPTOR EQUALIZATION FACILITY IMPROVEMENTS

WPCLF FUNDED PROJECT

OPINION OF PROBABLE CONSTRUCTION COST: \$8,000,000.00

COMPLETION DATE: 24 MONTHS FROM NOTICE TO PROCEED

The bid specifications, drawings, plan holders list, addenda, and other bid information (**but not the bid forms**) may be viewed and/or downloaded for free via the internet at <https://bids.ctconsultants.com>. The bidder shall be responsible to check for Addenda and obtain same from the web site.

Bids must be in accordance with drawings and specifications and on forms available from CT Consultants, Inc. at a non-refundable cost of Two Hundred Dollars (\$200.00) for hard copies and \$45.00 for electronic files. Documents may be ordered by registering and paying online at <https://bids.ctconsultants.com>. Please contact planroom@ctconsultants.com or call (440) 530-2351 if you encounter any problems viewing, registering or paying for the documents.

There will be a Pre-bid Conference on October 17, 2024 at 10:00 a.m. at City Hall, City of North Olmsted, 5200 Dover Center Road, North Olmsted, Ohio 44070.

This project will be funded by the Water Pollution Control Loan Fund Program as administered by the Ohio Environmental Protection Agency and the Ohio Water Development Authority. The Contractor shall note that there are Disadvantaged Business Enterprise participation goals for this project.

This procurement is subject to the EPA policy on encouraging the participation of small business in rural areas (SBRAs).

Publish: *The Plain Dealer*
October 9, 2024
October 16, 2024

TABLE OF CONTENTS

	<u>Page No.</u>
Title Page	i
Officials Page	ii
Advertisement for Bids/Public Notice to Bidders	iii
Table of Contents	iv - vii
SECTION 1 <u>BID DOCUMENTS AND BID FORMS</u>	
Instructions to Bidders	BD.1 - BD.8
Prices To Include	BD.9 – BD.10
<u>**ALL BID FORMS SHALL BE COMPLETED AND SUBMITTED WITH BID**</u>	
Form of Non-Collusion Affidavit	BF.1
Corporate Resolution	BF.2
Proposed Subcontractors	BF.3
Experience Record	BF.4
Insurance Agent Affidavit	BF.5
Supplemental Bond Acknowledgement	BF.6
Bid Security	BF.7
Proposal Forms	BF.8 - BF.9
EEO Certification	BF.EPA.1
Debarment Form 5700-49	BF.EPA.2
MBE/WBE Data Sheet I	BF.EPA.3
SECTION 2 <u>CONTRACT FORMS</u>	
Notice of Award	CF.1
Contract and Certificates of Fiscal Officer & Legal Counsel	CF.2 - CF.3
Contract Bond, Certificates of Insurance & Worker's Comp.	CF.4
Delinquent Personal Property Statement	CF.5
Lobbying Affidavit	CF.6
Escrow Waiver	CF.7
Notice to Proceed	CF.8
MBE/WBE Form 1A – 6100-3 Proposed MBE/WBE Subcontractor*	CF.EPA.4–CF.EPA.5
* To be signed by Bidder & Proposed Subcontractor – attach MBE/WBE Certificate	
MBE/WBE Form 1B – 6100-4 MBE/WBE Subcontractor List**	CF.EPA.6–CF.EPA.7
** Summary of All Subcontractors to be signed by Bidder	
American Iron & Steel	CF.EPA.8
Unresolved Findings of Recovery and Notifications	N.1
SECTION 3 <u>GENERAL CONDITIONS, EJCDC No. C-700 (2007)</u>	1 – 68
SECTION 4 <u>SUPPLEMENTARY CONDITIONS</u>	SC.1 - SC.7

SECTION 5 SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

011100	SUMMARY OF WORK
011419	USE OF SITE
011423	ADDITIONAL WORK, OVERTIME
012513	PRODUCT SUBSTITUTION PROCEDURES
013119	PROJECT MEETINGS
013216	CONSTRUCTION PROGRESS SCHEDULE
013223	SURVEY AND LAYOUT DATA
013236	VIDEO MONITORING AND DOCUMENTATION
013319	FIELD TEST REPORTING
013320	SUBMITTALS
013323	SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
013325	WARRANTY
013326	PRODUCT TESTING AND CERTIFYING
013543	ENVIRONMENTAL PROTECTION
014126	GENERAL REGULATIONS AND PERMITS
014223	INDUSTRY STANDARDS
014323	QUALIFICATIONS OF TRADESMEN
015113	TEMPORARY HEATING, LIGHTING AND POWER
015136	TEMPORARY WATER AND DISTRIBUTION
015213	FIELD OFFICES AND FIRST AID
015526	TEMPORARY TRAFFIC CONTROL DEVICES
016600	PRODUCT HANDLING AND PROTECTION
017800	FINAL COMPLIANCE AND SUBMITTALS
017821	CLEANING AND PROTECTION
017823	MAINTENANCE MANUALS
017839	PROJECT RECORDS, DRAWINGS
017850	STARTING OF SYSTEMS / COMMISSIONING
017860	TESTING, ADJUSTING, AND BALANCING
017870	OPERATIONAL DEMONSTRATION
017900	MAINTENANCE
018000	SYSTEM PERFORMANCES

DIVISION 3 - CONCRETE

033000	CAST-IN-PLACE CONCRETE
034000	PRECAST CONCRETE TANKS
034000.02	PRECAST CONCRETE MANHOLES

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

079200 JOINT SEALANTS

DIVISION 9 – FINISHES

099700 SPECIAL COATINGS

DIVISION 11 – EQUIPMENT

110923 HDPE UNDERGROUND STORAGE TANK

DIVISION 20 – MECHANICAL SUPPORT

200010 GENERAL PROVISIONS

200050 BASIC MATERIALS & METHODS

200570 FIRE STOPPING

DIVISION 26 - ELECTRICAL

260000 ELECTRICAL GENERAL PROVISIONS

260500 BASIC MATERIALS & METHODS

262400 SERVICE & DISTRIBUTION

262419 MOTOR CONTROL CENTERS

262923 VARIABLE FREQUENCY DRIVES

263200 STANDBY ELECTRICAL GENERATOR SYSTEM

265000 LIGHTING

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

282000 TELEMETRY SYSTEM

DIVISION 31 – EARTHWORK

310000 EARTHWORK

312319 DEWATERING

315000 EXCAVATION SUPPORT AND PROTECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

321216 ASPHALT CONCRETE PAVING AND MATERIALS

323113 CHAIN LINK FENCES AND GATES

329200.19 SEEDING AND MULCHING

329300.23 TREE, SHRUBS, AND GROUND COVER

DIVISION 33 - UTILITIES

330130 MISCELLANEOUS TEMPORARY FACILITIES

333100 SANITARY SEWER SYSTEM

DIVISION 35 – WATERWAYS AND MAIN CONSTRUCTION

352226 SLUICE GATES AND SLIDE GATES

DIVISION 40 – PROCESS INTEGRATION

400507 PROCESS PIPE HANGERS AND SUPPORTS

400523 PROCESS VALVES

402336 PROCESS PIPE AND FITTINGS

409000 FIELD-MOUNTED INSTRUMENTATION EQUIPMENT

409500 PROCESS INSTRUMENTATION AND CONTROL SYSTEMS

DIVISION 43 – PROCESS LIQUID HANDLING

430000 SUBMERSIBLE WASTEWATER PUMPS FOR DUPLEX WETWELL
INSTALLATION

**DIVISION 44 – POLLUTION AND WASTE CONTROL
EQUIPMENT**

443116 CARBON ABSORPTION UNIT

Page No.

SECTION 6 SPECIFIC PROJECT REQUIREMENTS

SR.1 – SR.2

SECTION 7 SPECIAL REQUIREMENTS – EPA

WPCLF & WSRLA Projects
MBE/WBE Utilization

SR.EPA.1 – 5

SR. EPA.6 –
SR.EPA.17

Violating Facilities

SR.EPA.18

SBRA

SR.EPA.19

WPCLF Local Protest Procedure

SR.EPA.20

Continuous Treatment Provisions

SR.EPA.21

WPCLF/WSRLA Payments

SR.EPA.22

WPCLF/WSRLA Contract Change Order

SR.EPA.23 –
SR.EPA.24

Buy American Requirements for Iron and Steel Products

SR.EPA.25 –
SR.EPA.57

Prohibition on Telecommunications and Video Surveillance

SR.EPA.58

SECTION 8 WAGE RATES

Davis-Bacon Wage Rate Requirements

DB.1 – DB.10

Payroll Form, Fringe Benefit Statement & Employee Notification

DB.11 – DB.19

Davis-Bacon Prevailing Wage Schedule

SECTION 1
BID DOCUMENTS

INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

- 1.1 Sealed bids shall be received by the Owner at the location specified and until the time and date specified in the Advertisement for Bids/Public Notice to Bidders.
- 1.2 Each bid shall contain the full name and address of each person or company interested in said bid. If no other person be so interested, the Bidder shall distinctly so state the fact.
- 1.3 Bid forms must be completed in ink or by typewriter. Any corrections to the bid forms prior to submission must be initialed by the person signing the bid. Failure to submit any bid form(s) or other required document(s) may be cause for rejection of the bidder's bid at the sole discretion of the Owner.
- 1.4 Bids by Corporations must be executed in the corporate name by the President, Vice President, or other officer accompanied by evidence of authority to sign and the corporate seal must be affixed and attested by the Secretary on the Corporate Resolution form.
- 1.5 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature.
- 1.6 All names must be typed or printed below the signature.
- 1.7 The bid shall contain an acknowledgment of receipt of all Addenda.
- 1.8 If a Bidder wishes to withdraw their bid prior to the opening of bids, they shall state their purpose in writing to the Owner before the time fixed for the opening, and when reached it shall be handed to them unread.
- 1.9 After the opening of bids, no Bidder may withdraw their bid for a period of 120 days.

PART 2 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

- 2.1 Before submitting a bid, each Bidder must
 - A. Examine the Contract Documents thoroughly.
 - B. Visit the site to familiarize themselves with local conditions that may in any manner affect cost, progress, or performance of the work.
 - C. Familiarize themselves with Federal, State, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress, or performance of the work.
 - D. Study and carefully correlate Bidder's observations with the Contract Documents.

- 2.2 Reference is made to the Specific Project Requirements for the identification of any reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress or performance of the work which have been relied upon by the Engineer in preparing the drawings and specifications. Owner will make copies of such reports available to any Bidder requesting them if not made available with the bid documents. These reports are not guaranteed as to accuracy or completeness; nor are they part of the Contract Documents. Before submitting their bid each Bidder will, at their own expense, make such additional investigations and tests as the Bidder may deem necessary to determine their bid for performance of the work in accordance with the time, price and other terms and conditions of the Contract Documents.
- 2.3 Upon request, the Owner will provide each Bidder access to the site to conduct such reasonable investigations and tests as each Bidder deems necessary for submission for their bid.
- 2.4 The lands upon which the work is to be performed, rights-of-way for access thereto, and other lands designated for use by Bidder in performing the work are identified on the Drawings.
- 2.5 The submission of a bid will constitute an incontrovertible representation by the Bidder that they have complied with every requirement of this section and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the work.

PART 3 ESTIMATED QUANTITIES

- 3.1 In Unit Price Contracts, the quantities of the work itemized in the bid are approximate only and the bidders are hereby notified that the estimated quantities made by the Engineer are merely for the guidance of the Owner in comparing on a uniform basis all bids received for the work.
- 3.2 The contract quantities, where itemized, are based on plan horizontal and vertical dimensions unless otherwise specified. It is the Contractor's responsibility to verify and determine actual quantities of materials such as pipe, pavement, subgrade, etc. in their ordering materials.
- 3.3 Payments, except for lump sum contracts and except for lump sum items in unit price contracts, will be made to the Contractor only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications.
- 3.4 The successful Bidder will be required to furnish the Owner with a complete breakdown of the lump sum bid items, to the satisfaction of the Engineer/Architect, before signing the Contract documents.

PART 4 CONTRACTOR'S QUALIFICATION

- 4.1 Bidder shall provide detailed information relating to similar projects completed within the past 5 years which demonstrates the bidder's capability, responsibility, experience, skill, and financial standing to undertake this type of project and shall include a list of all projects currently under construction including status and contact person.
- 4.2 Bidder shall own, have rental or lease agreements for, or otherwise have readily available any and all equipment and tools necessary for proper execution of the work. The Owner reserves the right to request lists of equipment or tools available for the project including sources.
- 4.3 Bidder shall provide pertinent information to the Owner relative to any pending suits or outstanding liens. If no information is provided by the Bidder, the Owner shall assume that any such suits or liens do not exist.
- 4.4 The Owner may require similar information on any or all subcontractors proposed by the Bidder.
- 4.5 Bids of corporations not chartered in the state in which the work will take place must be accompanied by proper certification that the corporation is authorized to do business in that state.

PART 5 SUBCONTRACTORS

- 5.1 The Bidder shall state on the appropriate bid form the names of all Subcontractors, Sub Consultants and other professional service providers proposed and the items of work they are to be assigned. All work not assigned to a Subcontractor shall be assumed by the Owner to be performed by the Bidder.
- 5.2 The Owner reserves the right to approve all subcontractors proposed by the Bidder. If the Owner, after due investigation, rejects the use of a proposed subcontractor, the apparent successful Bidder may either submit an acceptable substitution without increase in bid price or decline substitution and withdraw their bid without sacrificing their bid security. Any listed subcontractor to whom the Owner does not make written objection prior to award of contract, shall be deemed acceptable to the Owner.
- 5.3 Requests for changes of Subcontractor by the Bidder after the award shall be subject to the Owner's approval and shall not change the contract bid prices.
- 5.4 No contractor shall be required to employ any Subcontractor, person or organization against whom they have reasonable objection.

PART 6 BID REVIEW BY OWNER

- 6.1 The Owner reserves the right to reject any and all bids, to waive as an informality any and all irregularities, and to disregard all nonconforming, nonresponsive or conditional bids.

- 6.2 All extensions and totals of unit prices and quantities submitted as part of the bid shall be considered informal until verified by the Owner. All bids must be made on the forms contained herein and the bid prices must be written therein, in figures only. Unit prices shall be separately written for "Unit Price Labor," "Unit Price Material," and "Total Unit Price" for each item listed. Should an error in addition and/or multiplication be determined while checking the Contractor's math and verifying their total bid, the "Unit Price Labor" and the "Unit Price Material" figures shall govern in determining the correct "Total Unit Price" and the correct "Item Total."
- 6.3 Each bidder must bid on all Items, Alternates, Deductions, and Additions contained in the Bidding Forms. All bids not in conformity with this notice may be considered non-responsive and may be rejected.
- 6.4 More than one bid for the same work from an individual or entity under the same of different names will not be considered. Reasonable grounds for believing that that any bidder has an interest in more than one bid for the work may be cause for disqualification of that bidder and the rejection of all bids in which the bidder has an interest. A subcontractor or supplier is not a bidder, and may submit prices to multiple bidders.
- 6.5 In evaluating bids, the Owner may consider:
- A. The qualifications and experience of the Bidder, proposed subcontractors, and principal material suppliers as outlined in the plans and specifications.
 - B. Financial ability and soundness of the Bidder and proposed subcontractors.
 - C. Completeness of all bid forms and bid requirements.
 - D. Alternates and unit prices requested in the Bid Forms.
 - E. Unit prices or schedules of values that are or appear to be unbalanced.
 - F. Previous contractual experience with the Owner.
 - G. Whether or not the bid package complies with the prescribed requirements.
 - H. The proposed completion date, if applicable.
 - I. Any other matter allowed by law or local ordinance or resolution.
- 6.5 Owner may conduct further investigations as they deem necessary to assist in the evaluation of any bid and to establish the responsibility, qualifications, and financial ability of the Bidder, proposed Subcontractors, and other persons and organizations to do the work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.
- 6.6 Owner reserves the right to reject the bid of any Bidder who does not pass any such evaluation to Owner's satisfaction.

- 6.7 The Contract award shall be based on the lowest and best bid or lowest responsive and responsible bid (as applicable for the public contracting agency receiving bids) for the base bid and selected alternate items (if any) for this project.

PART 7 BID SECURITY

- 7.1 Each bid must be accompanied by a certified or cashier's check in the amount of 10% of the amount bid, an irrevocable letter of credit in the amount of 10% of the amount bid or an original bond in the amount of 100% of the amount bid per ORC 153.54 and 153.571. The certified or cashier's check, or irrevocable letter of credit shall be from a financial institution authorized to transact business in the State of Ohio and acceptable to the Owner. The bond shall be underwritten by a Surety Company authorized to transact business in the State of Ohio having an Ohio agent and listed on the most current Department of the Treasury Circular 570, "Surety Companies Acceptable on Federal Bonds." The bond shall be a "Bid Guarantee and Contract Bond" ("rollover bond") per O.R.C. sections 153.54 and 153.571 submitted for the full amount of the bid **including all alternates**, if any.

If bid security is made by bond, the Bidder and their Surety shall sign the Supplemental Bond Acknowledgement form and submit with their bid.

- 7.2 The certified or cashier's check, irrevocable letter of credit, or bond shall be made payable to the Owner and shall serve as a guarantee that in the event the bid is accepted and a contract is awarded to the successful Bidder, the contract will be executed by the bidder including any certifications, certificates or additional bonds required by the contract.
- 7.3 Failure on the part of the successful Bidder to execute the contract documents will cause the certified or cashier's check, irrevocable letter of credit, or bond to be forfeited to the Owner as damages.
- A. If the Owner awards the contract without rebidding, the Bidder (and the Surety on their bond if a bond was submitted) shall be liable to the Owner for a penal sum not to exceed the difference between the low bid and the next lowest bidder or 10% of the amount of the bid, whichever is less.
- B. If the Owner does not award the Contract to the next lowest Bidder, but resubmits the project for bidding; the Bidder (and the Surety on their bond if a bond was submitted) shall be liable to the Owner for a penal sum not to exceed the costs in connection with the resubmission of bids or 10% of the amount of the bid, whichever is less.
- 7.4 Checks or letters of credit for bid security of all bidders will be returned in the manner and timeframe stipulated in the Ohio Revised Code.

PART 8 CONTRACT BOND

- 8.1 As security for faithful performance and payment of all obligations under the Contract, the Owner shall require and the successful Bidder shall furnish either:
- A. *If submitted as Bid Security at time of bid:* "Bid Guarantee and Contract Bond" (AKA "rollover bond") per O.R.C. sections 153.54 and 153.571.
 - B. *If a cashier's check or irrevocable letter of credit is submitted as Bid Security at time of bid:* Contract Bond per Ohio Revised Code Sections 153.54 and 153.57, in the amount of 100% of the Contract Price. The Contractor and their Surety shall sign the Supplemental Bond Acknowledgement form and submit with the Contract forms
- 8.2 The bond shall be underwritten by a Surety Company authorized to transact business in the State of Ohio having an Ohio agent and listed on the most current Department of the Treasury Circular 570, "Surety Companies Acceptable on Federal Bonds."
- 8.3 The contract bond shall cover correction of the work for the period stated in the specifications and the correction period shall start upon Final Acceptance of the entire project and final payment by the Owner.
- 8.4 Nothing in the performance of the Engineer's service to the Owner in connection with this project shall in any way imply any undertaking for the benefit of the successful Bidder, its subcontractor(s), or the surety of any of them.

PART 9 AWARD AND EXECUTION OF CONTRACT

- 9.1 After the Owner's legislative body awards the project, the successful bidder will receive the unsigned contract documents. Within 10 days after their receipt, the successful Bidder shall sign and deliver to the Owner said contract documents including any certifications, certificates, or additional bonds required by the contract.
- 9.2 The Owner shall execute the Contract within 120 days after the day of the bid opening. When necessary and by mutual consent between the Owner and the Successful Bidder, this 120 day period may be extended.
- 9.3 The date of the Owner's signature on the Contract Agreement shall be the effective contract date.
- 9.4 The Owner shall execute and deliver to the successful Bidder one set of fully executed contract documents.

PART 10 INSURANCE

- 10.1 Verification of limits for public liability, property damage, automobile, Worker's Compensation, or any other insurance required by the provisions of this Contract must be submitted to the Owner prior to execution of the Contract.

- 10.2 All insurance shall be endorsed so that it cannot be cancelled for non-payment of premium for 10 days or cancelled or non-renewed for any other reason in less than 30 days after a written notice of such proposed action by the insurer is given to the Owner. The cancellation clause on the Certificate(s) of Insurance shall read as specified in the Supplementary Conditions and failure to submit an insurance certificate and/or policy endorsement verifying same shall be reason for the Owner to consider the Contractor non-responsive in complying with the requirements for contract execution and may be cause for forfeiture of the Bid Security to Owner.
- 10.3 The Contractor's Liability Insurance policy(s) shall be endorsed such that limits are on a Per Project basis.
- 10.4 The Contractor shall also provide an Owner's and Contractor's Protective Policy.

PART 11 NON-COLLUSION AFFIDAVIT

- 11.1 Collusion between bidders will be cause for rejection of affected bids and may be cause for rejection of all bids. Multiple bids submitted by one bidder under the same name or different names, whether as an individual, firm, partnership, corporation, profit or non-profit, affiliate, or association will be cause for rejection of bids. A subcontractor is not a bidder, and may submit prices to multiple bidders.
- 11.2 All bidders shall submit an affidavit that their bid is genuine and not collusive or sham; that such bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid, or that such other bidder or person shall refrain from bidding; that such bidder has not in any manner, directly or indirectly sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or any other bidder, or to fix any overhead, profit or cost element of said bid price, or of that of any other bidder, or to secure any advantage against the Owner or any person or persons interested in the proposed contract; that such bidder is the only party (or parties) who has an interest with the bidder in the profits of any contract which may result from the herein contained proposal; that no individual affiliated with the Owner, including but not limited to the head of any department, any employee, or any other official or officer of the Owner, is or will be directly or indirectly interested in this bid, and/or the profits from this bid if successful; that no individual affiliated with the Owner, including but not limited to the head of any department, any employee, or any other official or officer of the Owner, has or will receive anything of value as a result of the submission of this bid or its award; that no individual affiliated with the Owner, including but not limited to the head of any department, any employee, or any other official or officer of the Owner, has been solicited to provide assistance and/or provided assistance to the bidder which might give the bidder a competitive advantage or circumvent the competitive bidding process; and that all statements contained in said proposal are true; and further, that such bidder has not, directly or indirectly submitted this bid, or the contents thereof, or divulged information or data relative thereto to any association or to any member or agent thereof.

11.3 Each bid must be accompanied by a completed Noncollusion Affidavit provided within the contract documents.

11.4 Where there is reason to believe collusion or combination among bidders exists, the Owner reserves the right to reject the bid of those concerned.

PART 12 DELINQUENT PERSONAL PROPERTY STATEMENT

12.1 Included with the contract documents is a Delinquent Personal Property Statement to be filled out by the successful Bidder.

12.2 The statement shall be sent to both the County Auditor and the County Treasurer. A signed copy shall remain in the contract documents as well.

PART 13 ORIGINAL DOCUMENTS

13.1 All bid forms, contract forms, bonds and any other bid documents or contract documents requiring signatures shall be submitted with original signatures. No photo copies or faxed copies of signed documents shall be accepted.

PART 14 ADDENDA

14.1 The bidder shall be responsible to obtain Addenda from the web at <https://bids.ctconsultants.com>.

END OF SECTION 10/31/23

PRICES TO INCLUDE

PART 1 - GENERAL

All work shown on the plans or required in the specifications shall be included in the cost of the General Construction. The amount bid shall include, but is not limited to, the following:

- 1.1 All labor, materials, tools, equipment, and transportation necessary for the proper execution of the work in accordance with the Contract Documents.
- 1.2 All assistance required by the Engineer to verify compliance with the Contract Documents, including measuring for final pay quantities.
- 1.3 Project coordination and scheduling.
- 1.4 Detailed breakdown of lump sum bid items as requested by the Engineer.
- 1.5 All provisions necessary to protect workmen, the general public, and property along the work in accordance with the Contract Documents.
- 1.6 Protection and/or replacement of existing property corner monuments.
- 1.7 Recording the final location and elevation of all underground electrical conduit, sewers, tees, wyes, etc. that are installed or encountered as part of these projects.
- 1.8 Reimbursement to Owner for costs of re-inspection or re-testing of any work not installed in compliance with the Contract Documents.
- 1.9 Construction staking of the improvements.
- 1.10 Erosion Control.
- 1.11 Clearing and grubbing.
- 1.12 Removal and replacement of: pavement; sidewalks; landscape items; footer drains; fences; fence posts; signs, sign posts and/or foundations; storm sewers; culverts and all other items needed to be removed for the purpose of the installation of the proposed improvements.
- 1.13 Bonds and Insurances (including "Owner/Contractor Protective Policy," "All Risk Builder's Risk Insurance," and/or "Installation Floater Insurance", **and/or endorsements to fully comply with all contract requirements**).

PART 2 – PAY ITEMS

REF 1. GENERAL CONSTRUCTION

Method of Measurement

The lump sum price bid for this item shall include all work shown on the contract drawings, associated specifications and details for the complete installation other than any specified Allowances.

The price bid shall include all costs associated with coordination, temporary facilities, service, testing and startup services to date of final estimate, final restoration and other items that may be identified in Section 011100 of the specifications relative to General Construction prime contractor responsibilities.

Payment for the work indicated shall be at the lump sum price bid for the work completely performed and accepted in accordance with the contract proposal, detailed plans and specifications.

The successful Bidder will be required to furnish a Schedule of Values breakdown of his bid, by labor and material for each item in the Contract. This will be due two (2) weeks after the award of the Contract.

Basis of Payment

Payment for the work indicated in the proposal shall be the lump sum bid for each item of the work completely performed and accepted in accordance with the contract proposal, detailed plans and specifications. Payment shall be considered as full compensation for the furnishing of all labor, materials, and equipment necessary to complete in every detail the construction and installation of all improvements.

For the Infrapipe Weholite HDPE storage tank system, assembled in place, including pipes, manifolds, manhole risers and castings in accordance with plans and Section 110923 **a not to exceed total payment of \$2,573,000.00 shall be included in the lump sum price** bid for the fabrication, delivery, welding assembly of the storage tanks, riser pipes and internal walls and pressure testing as specified. All site demolition, earthwork (excavation, foundation preparation, backfilling, and site restoration), dewatering related activities and temporary pipe storage area provisions as may be needed are to be provided by the contractor but not included in this payment. Final payment will be paid upon completion of the installation and upon acceptance of the joint testing, backfilling and final deflection testing.

BID FORMS

The bid forms are not available online. The bid forms are available only by purchasing a set of plans and specifications at the location indicated in the Advertisement for Bids/Public Notice to Bidders.

SECTION 2
CONTRACT FORMS

NOTICE OF AWARD

TO: «ContractName»
«ContractAddr»
«ContractCity», «ContractState» «ContractZip»

PROJECT: «TitleCaps»

You are notified that your Bid which was opened on «Bidopening» has been accepted for items in the amount of «ContractDollars» at the unit bid prices as reflected in the bid tabulation contained herein for the *(fill in awarded parts, i.e. for Base Bid and Alternate C, or delete)*.

You are required by the Instructions to Bidders to execute the Agreement and furnish the required Bonds, Certificates of Insurance, and other documents within 10 calendar days from the date of receipt of this Notice.

Failure to comply with these conditions within the time specified will entitle Owner to consider your Bid in default, to annul this Notice and to declare your Bid Security forfeited.

The Owner will return to you one (1) fully signed set of the contract documents.

«OwnerCaps»

«OwnerCEOFirst» «OwnerCEOLast», «OwnerCEOTitle»

Date

ACKNOWLEDGMENT

«ContractCAPName»

DO NOT SIGN THIS PAGE. FOR REFERENCE ONLY. OWNER WILL SEND SIGNED COPY.

«ContractFirst» «ContractLast», «ContractTitle»

Date

CONTRACT

FOR «TitleCaps»

THIS CONTRACT, made and entered into at «OwnerCity», «OwnerState», this _____ day of _____, 20____, by and between the «OwnerMuni» (“OWNER”), «OwnerState» and «ContractName» (“CONTRACTOR”).

WITNESSETH: That the said CONTRACTOR has agreed and by this presents does agree with the OWNER for the consideration hereinafter mentioned and contained, and under penalty expressed in a bond given with these presents, and herein contained or hereunto annexed, to furnish at its own cost and expense, all the necessary tools, equipment, materials, labor, and tests in an expeditious, substantial and workmanlike manner, the equipment and appurtenances herein contemplated, commencing work within 20 days from the date of the Notice to Proceed and executing the work within the time and in the manner specified and in conformity with the requirements set forth in this Contract.

The following form essential parts of the Contract (may vary with project).

1. Advertisement for Bids/Public Notice to Bidders
2. Instruction to Bidders
3. Bid Forms and Proposal
4. Contract Forms and Exhibits
5. Contract Bond – ORC 153.571 or ORC 153.57
6. Contract Provisions
7. General Conditions
8. Supplementary Conditions
9. Specifications
10. Specific Project Requirements
11. Prevailing Wage Rate Schedule
12. Contract Drawings; if any.
13. Addenda; if any.

The CONTRACTOR agrees and understands that the work on this contract shall be subject to the acceptance of the OWNER based upon and in accordance with the contract specifications and contract plans and drawings on file in the office of the OWNER.

The CONTRACTOR agrees that each individual employed by the CONTRACTOR or any Subcontractor and engaged in work on the project under this contract shall be paid by prevailing wage established by the Department of Industrial Relations of the State of Ohio or the U.S. Department of Labor (Davis-Bacon Act) as detailed in the section titled "Wage Rates." This shall occur regardless of any contractual relationship which may be said to exist between the Contractor or any Subcontractor and such individual. *(if a School District, delete this paragraph)*

The CONTRACTOR shall proceed with the said work in a prompt and diligent manner and shall do the several parts thereof. Further the CONTRACTOR shall complete the whole of said work in accordance with the specifications and contract drawings to the satisfaction of the OWNER on or before the time stated, and in default of completion within the time as fixed, the CONTRACTOR shall pay to the OWNER as liquidated damages, an amount equal to «Liquidated», for each and every day (Sundays and legal holidays excepted) the completion of the work may be delayed beyond the date fixed in the manner and as stipulated.

It is hereby mutually agreed that the OWNER is to pay and the CONTRACTOR is to receive, as full compensation for furnishing all materials and labor in building, constructing and testing and in all respect completing the herein described work and appurtenances in the manner and under the conditions herein specified, the prices stipulated in the proposal herein contained or hereto annexed and the total contract sum is «ContractDollars».

This Contract shall be in full force and effect from the date of execution by the OWNER and CONTRACTOR.

IN WITNESS WHEREOF: The OWNER and CONTRACTOR hereunto affixed their signature the day and year first mentioned above.

«ContractCAPName»

«ContractFirst» «ContractLast», «ContractTitle»

«OwnerCaps»

«OwnerCEOFirst» «OwnerCEOLast», «OwnerCEOTitle»

I hereby certify that funds in the amount of «ContractAmtwords» Dollars («ContractDollars») necessary for the foregoing Contract have been appropriated and are in the Treasury, or are in the process of collection, or are available through grants and/or loans from other funding sources.

«OwnerFiscalFirst» «OwnerFiscalLast», «OwnerFiscalTitle»

APPROVED AS TO FORM:

«OwnerLegalName», «OwnerLegalTitle»

**THE CONTRACTOR SHALL FURNISH THE FOLLOWING ITEMS
WITHIN 10 DAYS OF NOTIFICATION OF AWARD:**

- A) **CERTIFICATE OF INSURANCE FOR
CONTRACTOR'S PUBLIC LIABILITY INSURANCE POLICY
AND AUTOMOTIVE INSURANCE POLICY**

- B) **CERTIFICATE OF INSURANCE FOR
OWNER'S AND CONTRACTOR'S PROTECTIVE POLICY**
Owner Named as Insured

- C) **CERTIFICATE OF WORKER'S COMPENSATION**

- D) **CONTRACT BOND THAT COMPLIES WITH ORC 153.54 AND 153.57**

* D above is not required if a bond complying with ORC 153.54 and 153.571 (rollover bond) was submitted at time of bid.

DELINQUENT PERSONAL PROPERTY STATEMENT

STATE OF _____)
) SS
COUNTY OF _____)

«ContractName», having been awarded a contract by the «OwnerMuni», «OwnerState», hereby affirms under oath, pursuant to Ohio Revised Code Section 5719.042, that at the time the bid was submitted, my company **was / was not (CIRCLE ONE)** charged with delinquent personal property taxes on the General Tax List of Personal Property for «OwnerCounty» County, Ohio.

If such charge for delinquent personal property tax exists on the General Tax List of Personal Property for «OwnerCounty» County, Ohio, the amount of such due and unpaid delinquent taxes, including due and unpaid penalties and interest shall be set forth below.

A copy of this statement shall be transmitted by the Taxing District's Fiscal Officer to the County Treasurer within thirty days of the date it is submitted. A copy of this statement shall also be incorporated into the Contract made between «OwnerMuni», «OwnerState», and «ContractName», and no payment shall be made with respect to any Contract unless such statement has been so incorporated as a part thereof.

Delinquent Personal Property Tax	\$ _____
Penalties	\$ _____
Interest	\$ _____

«ContractCAPName»

«ContractFirst» «ContractLast», «ContractTitle»

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

Notary Public

My Commission Expires: _____

ESCROW WAIVER

In accordance with a certain Contract between the «OwnerMuni», «OwnerState», (hereinafter referred to as "the Owner") and «ContractName», (hereinafter referred to as "the Contractor") it is mutually agreed by and between the parties hereto that because of the short-term duration of the within contract, no escrow account will be established pursuant to Sections 153.13, 153.14 and 153.63 of the Ohio Revised Code nor shall any interest be paid on any retainage.

«ContractCAPName»

«ContractFirst» «ContractLast», «ContractTitle»

«OwnerCaps»

«OwnerFiscalFirst» «OwnerFiscalLast», «OwnerFiscalTitle»

NOTICE TO PROCEED

Project: «Title»

Owner: «OwnerMuni»
«OwnerAddr»
«OwnerCity», «OwnerState» «OwnerZip»

To: «ContractName»
«ContractAddr»
«ContractCity», «ContractState» «ContractZip»

Date: _____

You are hereby notified to commence work in accordance with the Contract. All work shall be completed by «Completion_Date».

«OwnerCaps»

«OwnerCEOFirst» «OwnerCEOLast», «OwnerCEOTitle»

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form**

This form is intended to capture the DBE¹ subcontractor's² 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: <input type="radio"/> ODOT <input type="radio"/> DAS/EDGE <input type="radio"/> Other: _____		Meets/ exceeds EPA certification standards? <input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> Unknown

Check Which One Applies: _____ MBE _____ WBE (Include MBE/WBE Certificates, No DBE Certs)

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.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form**

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 I.

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 DBE¹ subcontractors² 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.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form**

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 I.

Prime Contractor Signature	Print Name
Title	Date

AMERICAN IRON AND STEEL ACKNOWLEDGEMENT

The Contractor acknowledges to and for the benefit of the City of _____ (“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 Contractor 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.

THE OWNER OR THEIR AUTHORIZED REPRESENTATIVE SHALL INSERT THE FOLLOWING CONTRACT DOCUMENTATION IN THE EXECUTED CONTRACT:

A) FINDINGS FOR RECOVERY – ORC 9.24
(<http://ffr.ohioauditor.gov/>)

B1) CHECK FOR DEBARRED CONTRACTORS IN THE STATE OF OHIO
(<https://www.sos.state.oh.us/records/debarred-contractors/>)

**B2) CHECK FEDERAL SAM (System for Award Management) for
FEDERAL FUNDING (including sub-contractors), (if applicable)**
(<https://www.sam.gov/SAM/>)

**C) NOTIFICATION OF SURETY AND AGENT OF CONSTRUCTION
CONTRACT AWARD – ORC 9.32 (if applicable)**

**D) NOTIFICATION TO UTILITY COMPANIES OF COMMENCEMENT
OF CONTRACT EXECUTION – ORC 153.64 (if applicable)**

SECTION 3
GENERAL CONDITIONS

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by



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

Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

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

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

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

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

9.03	Project Representative	38
9.04	Authorized Variations in Work	38
9.05	Rejecting Defective Work	38
9.06	Shop Drawings, Change Orders and Payments.....	38
9.07	Determinations for Unit Price Work	39
9.08	Decisions on Requirements of Contract Documents and Acceptability of Work.....	39
9.09	Limitations on Engineer’s Authority and Responsibilities.....	39
9.10	Compliance with Safety Program.....	40
Article 10 – Changes in the Work; Claims		40
10.01	Authorized Changes in the Work	40
10.02	Unauthorized Changes in the Work	40
10.03	Execution of Change Orders.....	41
10.04	Notification to Surety.....	41
10.05	Claims.....	41
Article 11 – Cost of the Work; Allowances; Unit Price Work.....		42
11.01	Cost of the Work	42
11.02	Allowances	45
11.03	Unit Price Work	45
Article 12 – Change of Contract Price; Change of Contract Times		46
12.01	Change of Contract Price.....	46
12.02	Change of Contract Times	47
12.03	Delays.....	47
Article 13 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work		48
13.01	Notice of Defects	48
13.02	Access to Work	48
13.03	Tests and Inspections	48
13.04	Uncovering Work.....	49
13.05	Owner May Stop the Work.....	50
13.06	Correction or Removal of Defective Work	50
13.07	Correction Period.....	50
13.08	Acceptance of Defective Work.....	51
13.09	Owner May Correct Defective Work	51
Article 14 – Payments to Contractor and Completion.....		52
14.01	Schedule of Values.....	52
14.02	Progress Payments	52
14.03	Contractor’s Warranty of Title	55
14.04	Substantial Completion.....	55
14.05	Partial Utilization	56
14.06	Final Inspection.....	56
14.07	Final Payment.....	57
14.08	Final Completion Delayed.....	58
14.09	Waiver of Claims	58

Article 15 – Suspension of Work and Termination	58
15.01 Owner May Suspend Work	58
15.02 Owner May Terminate for Cause	58
15.03 Owner May Terminate For Convenience.....	60
15.04 Contractor May Stop Work or Terminate	60
Article 16 – Dispute Resolution	61
16.01 Methods and Procedures.....	61
Article 17 – Miscellaneous	61
17.01 Giving Notice	61
17.02 Computation of Times	61
17.03 Cumulative Remedies	62
17.04 Survival of Obligations	62
17.05 Controlling Law	62
17.06 Headings.....	62

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

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

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

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

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

1.02 Terminology

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

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

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

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

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

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

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

2.02 Copies of Documents

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

2.03 Commencement of Contract Times; Notice to Proceed

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

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

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

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

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

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

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the

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

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

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

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

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

- 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
- 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
- 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

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

- 1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
- 2. is of such a nature as to require a change in the Contract Documents; or

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

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

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

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other

professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

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

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

B. *Not Shown or Indicated:*

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

or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

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

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by

Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

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

5.02 *Licensed Sureties and Insurers*

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

5.03 *Certificates of Insurance*

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

- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 - 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 - 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

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

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

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

insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

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

5.07 *Waiver of Rights*

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

against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

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

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

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

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

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

2. *Substitute Items:*

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

- 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or

other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

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

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all

court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

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

- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor

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

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

6.12 *Record Documents*

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

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
1. all persons on the Site or who may be affected by the Work;
 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

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

1. *Shop Drawings:*
 - a. Submit number of copies specified in the General Requirements.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
 2. *Samples:*
 - a. Submit number of Samples specified in the Specifications.
 - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Submittal Procedures:*
1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop

Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

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

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
 6. any inspection, test, or approval by others; or
 7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor,

Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

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

6.21 *Delegation of Professional Design Services*

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

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
1. written notice thereof will be given to Contractor prior to starting any such other work; and
 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

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

7.03 *Legal Relationships*

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

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

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

8.03 *Furnish Data*

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

8.04 *Pay When Due*

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

8.05 *Lands and Easements; Reports and Tests*

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

8.06 *Insurance*

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

8.07 *Change Orders*

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

8.08 *Inspections, Tests, and Approvals*

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

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

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

8.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

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

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

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

9.02 *Visits to Site*

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

and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

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

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

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

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

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

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

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

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

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

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The

opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

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

11.01 Cost of the Work

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on

Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

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

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:*
1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

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

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

12.01 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

- c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
- d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
- e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
- f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

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

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the

control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

13.01 Notice of Defects

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

13.02 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.

- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute

resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and

equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

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

14.02 Progress Payments

A. Applications for Payments:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the

Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

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

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or

- b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

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

D. Reduction in Payment:

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or

- d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

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

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities

pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

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

14.05 *Partial Utilization*

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

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

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

14.08 *Final Completion Delayed*

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

14.09 *Waiver of Claims*

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

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer’s action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
 - 1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agrees with the other party to submit the Claim to another dispute resolution process; or
 - 3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

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

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

17.06 *Headings*

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

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SECTION 4
SUPPLEMENTARY CONDITIONS

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2007 ed.) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented herein or in the Specific Project Requirements remain in full force and effect.

SC-1.01 The terms used in these Supplementary Conditions which are defined in the General Conditions have the meaning assigned to them in the General Conditions.

SC-2.02 Delete paragraph 2.02(A) in its entirety and insert the following in its place:

Owner shall furnish one (1) printed/hard copy of the drawings and Project Manual which shall be an executed contract set and one set in electronic format (.pdf), if requested.

SC-2.03 (A) In the last sentence of 2.03A, change "sixtieth day" to "one hundred fiftieth day."

SC-2.03 (B) By submission of a bid, the bidder hereby grants consent that the award and execution period shall be extended from sixty days to one hundred twenty days after the date on which the bids are opened.

SC-4.02(A) Change "Supplementary Conditions" to read "Specific Project Requirements."

SC-4.06(G) Delete paragraph 4.06(G) in its entirety.

SC-5.03(A)(1) The required Certificate of Insurance shall be in a form satisfactory to the Owner (most current version of ACORD 25 or approved equal). If the Contractor fails to procure and maintain any specified and/or required insurance, the Owner shall have the right to procure and maintain the said insurance for and in the name of the Contractor and the Contractor shall pay the cost thereof and shall furnish all necessary information to make effective and maintain such insurance.

SC-5.04(B)(1) Change "Supplementary Conditions" to read "Specific Project Requirements."

SC-5.04(B)(2) The limits of liability for the insurance required by paragraph 5.04(A) of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

All of the limits below may be satisfied with an Umbrella/Excess Liability as needed to increase the Primary Policy to required limits.

5.04(A)(1) and (2) Workers' Compensation, etc., under paragraphs 5.04(A)(1) and 5.04(A)(2) of the General Conditions:

(a) State	Statutory
(b) Applicable Federal (e.g., Longshoreman's):	Statutory
(c) Employer's Liability:	\$1,000,000

5.04(A)(3), (4) and (5). Contractor's Liability Insurance under paragraphs 5.04(A)(3) through 5.04(A)(5) of the General Conditions which shall also include completed operations and product liability coverage.

- (a) Bodily Injury and Property Damage, Combined Single Limit (CSL) (Except Products and Completed Operations) Property Damage liability insurance will provide Explosion, Collapse, and Underground coverage where applicable.

Each Occurrence	\$2,000,000
General Aggregate	\$4,000,000

- (b) Products and Completed Operations Aggregate \$1,000,000

Products and Completed Operations to be maintained for two (2) years after final payment and Contractor shall continue to provide evidence of such coverage to the Owner on an annual basis during the aforementioned period.

- (c) Personal and Advertising Injury (Per Person/Organization and per occurrence). \$1,000,000

- (d) Fire Damage \$100,000

- (e) If the General Liability Policy includes a General Aggregate, such policy shall be endorsed to have the General Aggregate Per Project Aggregate Limit.

5.04(A)(6) Automobile Liability - (Owned, Non-Owned, Hired)
Contractor may provide split limits or combined single limit.

- (a) Split Limits:

Bodily Injury,	Each Person:	\$2,000,000
	Each Occurrence	\$2,000,000
Property Damage,	Each Occurrence	\$1,000,000

or

- (b) Combined Single Limit

Bodily Injury and Property Damage,		
	Each Occurrence	\$2,000,000

SC-5.04(B)(3) Add the following to the end of the paragraph: “to the extent available in the

insurance industry with industry standard exclusions and as allowed under the laws and regulations in the State of Ohio;”

SC-5.04(B)(4) Add the following:

Written notice of cancellation for non-payment of premium shall be at least 10 days.

Add the following section:

SC-5.04(C) Unless otherwise stated in Specific Project Requirements, the Contractor shall purchase and provide an "Owner's and Contractor's Protective Policy" with the Owner listed as the insured for the following limits:

Each Occurrence	\$1,000,000
General Aggregate	\$2,000,000

Add the following section:

SC-5.04(D) Unless otherwise stated in Specific Project Requirements the Contractor shall purchase and maintain during the Contract Time "All Risk Builders' Risk Insurance," and/or "Installation Floater Insurance," and/or "Boiler and Machinery Insurance," and any and all insurance requirements of section GC-5.06 of the General Conditions as applicable for the type of work to be performed upon the Project to the full insurable value thereof for the benefit of the Owner, the Contractor, Subcontractors and Suppliers as their interest may appear. This insurance shall cover the work until final acceptance and final payment by the Owner. This provision shall in no way release the Contractor or Contractor's Surety from obligations under the Contract Documents to fully complete the Project. The original policy(s) shall be filed with the Owner or his designated representative.

SC-5.05 *Owner's Liability Insurance*

See SC-5.04(C) above.

SC-5.06 *Property Insurance*

Unless otherwise stated in Specific Project Requirements the Contractor, not the Owner, shall purchase and maintain during the Contract Time all property insurance required in section GC-5.06 of the General Conditions and as outlined in SC-5.04(D) above.

Add the following section:

SC-6.02(C) The Contractor shall be responsible for the Owner and/or Engineer's additional inspection and administrative costs for work performed beyond regular working hours as defined in this Section.

SC-6.07(B) Delete paragraph 6.07(B) in its entirety.

SC-6.09 (D) Add the following:
D. The contractor agrees to the requirements of RC 153.59, RC 153.591, and RC 153.60.

Add the following section:

SC-6.10(B) Add the following:

Should the Owner be exempt from Ohio State Sales and Use Taxes on materials and equipment to be incorporated in the Project, the Contractor may obtain a waiver and said taxes shall not be included in the Contract Price.

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 to Contractor does not apply to construction tools, machinery, equipment, or other property by or leased by Contractor, or to supplies or materials not incorporated into the work.

The Contractor shall withhold and/or pay all consumer, use, property, employment, income and other taxes in accordance with the laws and regulations of the United States, State of Ohio, Owner and other applicable agencies which are applicable during the performance of the work.

SC-6.17 *Shop Drawings and Samples*

Add the following new paragraphs immediately after paragraph 6.17(E):

- F. Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three (3) submittals. Engineer will record Engineer's time for reviewing subsequent materials of shop drawings, samples, or other items requiring approval and Contractor shall reimburse Owner for Engineer's charges for such time.
- G. In the event that Contractor requests a substitution for a previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time unless the need for such substitution is beyond the control of the Contractor.

SC-7.02 Delete Section 7.02 of the General Conditions in its entirety and insert the following:

SC-7.02(A) The General Construction Contractor shall be referred to and defined as the Construction Coordinator.

SC-7.02(B) Duties of the Construction Coordinator include the following:
. Scheduling and coordinating the work of the Prime Contractors including submission and periodic updating of project schedule.

2. Establishing and administrating the site safety program and procedures for the project.
3. See that permits are applied for and obtained on a timely basis. Advise the Engineer of any problems related to permit approval.
4. Monitoring compliance with Laws and Regulations.
5. Maintain project site for dust, sedimentation, debris, waste, and general site cleanliness.
6. Coordinate location and use of temporary construction facilities including but not limited to sanitary, water, power, telephone, and parking.
7. Coordinate Owner interface for utility tie-ins/shut downs.
8. Monitor shop drawing submittal and coordination of submittal information between Prime Contractors.

SC-10.01 (A) Add the following:
 The Owner may request from the Contractor and the Contractor shall provide within ten days of the request, a quote for all ordered changes in the work or work the Owner may be considering to be ordered. The quote shall be a line item, detailed, itemized breakdown of the work.

SC-11.01(A) For purposes of "Cost of the Work" delete Section 11.01(A), (B), and (C) of the General Conditions in their entirety and insert ODOT 109.05, in its place.

SC-13.07(A) In the First sentence of Section 13.07(A) remove "Substantial Completion" and insert "Final Acceptance of the entire project and final payment by the Owner."

SC-13.07(C) Remove 13.07(C) and replace with the following:

All materials and equipment shall be warranted by the respective material supplier or equipment manufacturer until the end of the Contractor's "correction period" (or longer if specified elsewhere in the contract) regardless of date of initial installation or operation of the material or equipment. The cost of such extended warranties as needed from material suppliers or equipment manufacturers to provide warranty coverage until the end of the "correction period" or other period as specified in the contract shall be the responsibility of the prime contractor and shall be assumed to have been included in his bid.

SC-14.02(A) (3) Delete Section 14.02(A) (3) of the General Conditions in its entirety and insert the following:

Until the job is 50% complete, the Contractor will be paid 92% of the estimated value of labor and material completed in acceptable form. After the work is 50% complete, no further funds shall be retained and the Contractor shall be paid 100% of the estimated value of the remaining labor and material completed in acceptable form, provided that the Contractor is making satisfactory progress and there is no

specific cause for greater withholding. Upon the Owner's agreement that the project is substantially complete, the Retainage may be reduced to twice the value of the remaining punch list work subject to the recommendation of the Engineer and the approval by the Owner.

Add the following section:

SC-14.02(A) (4)

Payment for stored materials at invoice prices or at the unit price bid for materials, or the lesser value of the two, will be made for accepted nonperishable equipment and materials which are to be incorporated into the work, when accepted, delivered, properly stored, and protected upon the site and verified to the Engineer by a copy of the invoice. For materials and equipment meeting the foregoing conditions, the Owner will pay, when properly included in an approved estimate, 92% of the invoice value of the same. Subsequent to the inclusion of a payment for delivered materials in a progress payment, Contractor shall submit no later than the next payment submission, a partial waiver of lien from each and every supplier for whom delivered materials were paid. If no such waiver is submitted prior to or along with the next payment, the amount of delivered materials paid commensurate with that particular item will be deducted from future payments. No payment for delivered materials shall be made for any items that are scheduled to be incorporated in the work within 30 days of submission of the pay estimate. Delivered materials will not be paid in any given month for a total amount less than \$5,000.00. Payment for delivered materials for such items as pipe backfill and roadway subbase will not be routinely considered.

SC-16.01 Delete Article 16 in its entirety and replace with the following:

ARTICLE 16 - DISPUTE RESOLUTION AGREEMENT - JUDICIAL SYSTEM

OWNER and CONTRACTOR hereby agree that Article 16 of the General Conditions to the Agreement between OWNER and CONTRACTOR is amended to include the following agreement of the parties:

16.01 All claims, disputes and other matters in question between Owner and Contractor arising out of or relating to the Contract Documents or the breach thereof (except for claims which have been waived by the making or acceptance of final payment as provided by Paragraph 14.09) will be decided through the Cuyahoga County Court of Common Pleas. Arbitration will be entered into only if agreed upon in writing by both parties.

END OF SECTION

01/2024

SECTION 5
SPECIFICATIONS

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 LOCATION OF THE PROJECT

- A. The project is located along the South Interceptor in the City of North Olmsted, Ohio adjacent to the Spruce Elementary School site.

1.2 RELATED DOCUMENTS

- A. The Contract Documents include the Project Manual and the Drawings.

1.3 PROJECT DESCRIPTION

- A. This project involves construction of a new 1.5 MG sanitary flow equalization facility to capture sanitary overflows and prevent surcharging and basement flooding at the South Interceptor and a corresponding newly constructed pump station.

1.4 WORK DESCRIPTION

- A. This project provides an interceptor overflow/return pipe and a means of storage. The constructed equalization storage is accomplished with an array of 11 ft diameter HDPE pipes with a capacity of 1.5 MG. **A not to exceed price and payment therefore of \$2,573,000.00 shall be made for the storage system – see Prices to Include.** Two, duplex submersible pump stations will fill the storage pipes. The pumps include four 3.33 MGD pumps, providing 10 MGD capacity with one pump out of service. Pumps will be submersibles per Sections 430000.

1.5 SPECIFICATIONS

- A. In general, these Specifications describe the work to be performed by the various trades, other than work specifically excluded. It shall be the responsibility of the Contractor and Subcontractors to perform all work incidental to their trade, whether or not specific mention is made of each item, unless such incidentals are included under another Item.
- B. It is advised that the Contractor and all Subcontractors familiarize themselves with the contents of the complete Specifications, particularly for the trades preceding, following, related or adjacent to their work.

1.6 PROJECT FUNDING

- A. This project is funded by the Water Pollution Control Loan (WPCLF) through the Division of Environmental & Financial Assistance (DEFA) and through House Bill Number 168 by the General Assembly of the State of Ohio.

END OF SECTION 011100

SECTION 011419 – USE OF SITE

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor will be allowed the use of as much of the site designated for the improvements as is necessary for his operation.

1.2 USE OF STREETS

- A. During the progress of the work, the Contractor shall make ample provisions for both vehicle and pedestrian traffic on any public street and shall indemnify and save harmless the Owner from any expense whatsoever due to their operations over said streets. The Contractor shall also provide free access to all the fire hydrants, water, and gas valves located along the line of his work. Gutters and waterways must be kept open or other provisions made for the removal of storm water. Street intersections may be blocked only one-half at a time, and the Contractor shall lay and maintain temporary driveways, bridges and crossings, such as in the opinion of the Engineer are necessary to reasonably accommodate the public.
- B. In the event of the Contractor's failure to comply with these provisions, the Owner may cause the same to be done, and may deduct the cost of such work from any monies due the Contractor under this Agreement, but the performance of such work by the Owner at its instance shall serve in no way to release the Contractor from his general or particular liability for the safety of the public or the work.
- C. The Contractor shall repair at no cost to the Owner, all existing roads, parking areas, grassed areas that are damaged due to the execution of his work. The Contractor shall remove daily all mud, soil and debris that may be tracked onto existing streets, drives, or walks by his equipment or that of subcontractors or suppliers.

1.3 CLOSING STREETS TO TRAFFIC

The Contractor may with the approval of the Engineer, close streets, or parts of streets, to vehicular traffic. The streets are to remain closed as long as the construction work or the condition of the finished work requires or as determined by the Engineer. The Engineer shall be the judge of how many streets or parts of streets it is necessary for the Contractor to close at any time, and may refuse to permit the closing of additional streets to traffic until the majority of the work on the closed streets is completed and they are opened to traffic.

1.4 RIGHTS-OF-WAY

- A. Whenever it is required to perform work within the limits of public or private property or in rights-of-way, such work shall be done in conformity with all agreements between the Owner and the owners of such. Care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the

restoration of said public or private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.

- B. The Contractor shall not (except after consent from the proper parties) enter or occupy with men, tools or equipment, any land outside the rights-of-way or property of the Owner.
- C. When the Contractor performs construction within 10 ft. of a right-of-way or easement line, he shall place tall stakes properly identified at points of change in width or direction of the right-of-way or easement line and at points along the line so that at least two stakes can be seen distinctly from any point on the line.

1.5 EASEMENTS

- A. Where the work is to be constructed upon easements, such easements will be secured by the Owner without cost to the Contractor. The Contractor shall not enter upon or occupy any private property outside of the limits of the easements furnished.
- B. Care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said public or private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.

1.6 PROTECTING EXISTING BUILDINGS, STRUCTURES AND ROADWAYS

- A. The Contractor shall, at his own expense, shore up and protect any buildings, roadways, utilities or other public or private structures which may be encountered or endangered in the prosecution of the work, and that may not be otherwise provided for, and he shall repair and make good any damages caused to any such property by reason of his operations. All existing fences removed due to the prosecution of the work shall be replaced by the Contractor. No extra payment will be made for said work or material, but the cost of this work must be included in the price stipulated for the work to be done under this contract.

1.7 SITE FACILITIES

- A. The Contractor shall furnish and place sufficient quantities of portable toilet facilities at locations convenient for use by the Contractor's personnel, Subcontractors, the Engineer, and the Owner.

1.8 RESTORATION

- A. On lump sum items or contracts, the value of the restoration work will be determined by the approved schedule of values submitted by the Contractor.
- B. All restoration shall restore the site to equal or better condition than the condition prior to its disturbance.

SECTION 011423 - ADDITIONAL WORK, OVERTIME

PART 1 - GENERAL

1.1 NIGHT, SUNDAY AND HOLIDAY WORK

- A. No work will be permitted at night, Sunday or legal holidays except as noted on the plans or in the case of emergency and then only upon written authorization of the Engineer. Where no emergency exists, but the Contractor feels it advantageous to work at night, Sunday or legal holidays, the Contractor shall notify the Engineer at least two (2) days in advance, requesting written permission. Any work performed during the absence of the Engineer will be done at the Contractor's risk and responsibility and may be subject to rejection upon later inspection.

END OF SECTION 011423

SECTION 012513 – PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 MATERIALS AND EQUIPMENT

- A. In the specifications and on the Engineer's drawings, are specified and shown certain pieces of equipment and materials deemed most suitable for the service anticipated. This is not done to eliminate other equipment and materials equally as good and efficient. The Contractor shall prepare his bid on the particular materials and equipment specified. Following the award of the contract, should the Contractor desire to use other equipment and materials, he shall submit to the Owner a written request for such change and state the advantage to the Owner and the savings or additional cost involved by the proposed substitution. The determination as to whether or not such change will be permitted rests with the Owner and the Engineer.
- B. Each major item of equipment shall be inspected by a manufacturer's representative during installation and upon completion of the work. The Contractor shall supply the Engineer with a certificate of such inspection.

END OF SECTION 012513

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 PRECONSTRUCTION MEETING

- A. Prior to the Contractor beginning any work on the project, the Owner will schedule and hold a preconstruction meeting to discuss all aspects of the contract work.
- B. The Contractor shall be present and be prepared to comment in detail on all aspects of his work.
- C. The Contractor shall bring to the preconstruction meeting a proposed construction progress schedule, erosion control plan, quality control program, concrete mix designs, asphalt mix designs (JMF), etc. Approval of each by the Engineer is required prior to the start of any work.
- D. Included in the construction progress schedule shall be an implementation sequence of the proposed erosion control efforts required by the contract.

1.2 PROGRESS MEETINGS

- A. Monthly progress meetings will be held at a location to be determined by the Owner on a regularly scheduled day mutually convenient to the Owner, Contractor, and Engineer.
- B. The Contractor shall provide an updated construction progress schedule and be prepared to comment in detail on all aspects of his work.

END OF SECTION 013119

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 PROGRESS SCHEDULE

- A. Immediately after signing the Contract, the General Construction Contractor shall prepare a graphic progress schedule, indicating the work to be executed during each month and the rate of expected progress to secure completion on the agreed-upon completion date. The progress schedule shall be approved by the Engineer and Owner prior to starting work on the site. Copies of such graphic progress charts, upon which has been indicated the actual progress, shall be furnished to the Engineer with each requisition for payment.
- B. Should the rate of progress fall materially behind the scheduled rate of progress, and unless the delay is authorized by the Engineer, each offending Contractor shall furnish additional labor, work overtime, or take other necessary means required for completion of the work on the scheduled date. No additional compensation beyond the set Contract price shall be paid for action taken or overtime expense incurred in maintaining scheduled progress.

END OF SECTION 013216

SECTION 013223 – SURVEY AND LAYOUT DATA

PART 1 - GENERAL

1.1 STAKING

- A. The Contractor shall hire a surveyor licensed in the state the work is to be installed to provide all reference points not already established and staking. The Contractor shall protect and preserve the established staking and reference points as long as required for installation of the work and field verifications by any party. The Contractor's surveyor shall replace and accurately relocate all staking and reference points so lost, destroyed or moved.

1.2 LAYOUT OF WORK

- A. The Contractor shall lay out his work and be responsible for correct locations, elevations and dimensions of all work executed by him under this Contract. The Contractor must exercise proper precautions to verify the figures shown on the Drawings before laying out the work and will be held responsible for any error resulting from his failure to exercise such precaution. The Contractor shall insure the new construction aligns with any existing work.

END OF SECTION 013223

SECTION 013236 – VIDEO MONITORING AND DOCUMENTATION

PART 1 - GENERAL

1.1 SCOPE

- A. Provide all labor, materials, equipment, and services, and perform all operations necessary to furnish to the Owner a complete color audio-video record of the surface features within the proposed construction zone of influence. This record shall include, but not be limited to, all audio-video recordings, electronic files, video logs, and indexes. The purpose of this coverage shall be to accurately document the pre-construction condition of these surface features.

1.2 PRODUCTS

- A. The color audio-video recording delivered to the Owner shall be on a high quality, electronic, format.

END OF SECTION 013236

SECTION 013319 - FIELD TEST REPORTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes, but is not limited to, services performed by an independent testing laboratory. Laboratory services covered under this section are for testing materials used for field constructed elements of the work. Performance testing of manufactured items and shop fabricated materials shall be covered under their respective specification section.
- B. All testing performed under this item shall be for the protection and benefit of the Owner and shall not be construed by the Contractor as a comprehensive quality control program intended to protect the Contractor, his subcontractors, or his suppliers. The testing frequency and types of testing shall be as scheduled herein at the discretion of the Owner.
- C. Inspections, tests, and related actions specified in this section and elsewhere in the contract documents are not intended to limit the Contractor's own quality control procedures and testing, which facilitate overall compliance with requirements of the contract documents. Requirements for the Contractor to provide quality control services as required by the Engineer, the Owner, governing authorities, or other authorized entities are not limited by the provisions of this Section.
- D. The Contractor is required to cooperate with the testing laboratories performing required inspections, test, and similar services and the Engineer or his representative.
- E. Materials and installed work may require testing or retesting at any time during progress of work. Retesting of rejected materials or installed work shall be done at Contractor's expense.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. The Contract Documents may include testing requirements furnished under other Sections. Work elements which may include other testing requirements are:
 - 1. Water distribution systems.
 - 2. Electrical systems tested and certified by the Electrical Contractor.

1.3 SELECTION AND PAYMENT

- A. The Contractor will employ an independent testing laboratory to perform specified testing. Payment shall be incidental to the related work bid item. The laboratory shall be mutually agreed upon by the Owner, Engineer, and Contractor. The laboratory shall be mutually agreed upon by the Owner, Engineer, and Contractor.
- B. Employment of testing laboratory in no way relieves the Contractor of the obligation to perform work in accordance with requirements of the contract documents.
- C. The testing laboratory and their personnel shall be under the direction of the Engineer's on-site representative, regardless of who employs their services.

1.4 REFERENCES

- A. AASHTO T-19, Standard Method of Test for Unit Weight and Voids in Aggregate.
- B. AASHTO T-37, Standard Method of Test for Sieve Analysis of mineral Filler for Road and Paving Materials.
- C. AASHTO T-230, Standard Method of Test for Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures.
- D. ASTM C-29, Standard Method of Test for Unit Weight and Voids in Aggregate.
- E. ASTM C-31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- F. ASTM C-33, Standard Specification for Concrete Aggregates.
- G. ASTM C-39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- H. ASTM C-40, Test Method for Organic Impurities in Fine Aggregates for Concrete.
- I. ASTM C-42, Standard Test Methods for Obtaining and Testing Drilled Cored and Sawed Beams of Concrete.
- J. ASTM C-88, Standard Test Method for Soundness of Aggregate by use of Sodium Sulfate or Magnesium Sulfate.
- K. ASTM C-94, Standard Specification for Ready-Mixed Concrete.
- L. ASTM C-117, Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.
- M. ASTM C-136, Standard Method for Sieve Analysis of Fine and Course Aggregate.

- N. ASTM C-142, Test Method for Clay Lumps and Friable Particles in Aggregate.
- O. ASTM C-143, Standard Test Method for Slump of Hydraulic Cement Concrete.
- P. ASTM C-172, Standard Practice for Sampling Freshly Mixed Concrete.
- Q. ASTM C-173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- R. ASTM C-231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- S. ASTM C-535, Standard Test Method for Resistance to Degradation of Large-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
- T. ASTM C-1064, Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
- U. ASTM D-698, Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb. (2.49-kg) Rammer and 12-inc. (305-mm) Drop.
- V. ASTM D-2487, Standard Test Method for Classification of Soils for engineer purposes.
- W. ASTM D-2940, Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.
- X. ASTM D-4253, Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
- Y. ASTM D-4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
- Z. ASTM D-4832, Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
- AA. ODOT Supplement 1021, Method of Test for Determination of the Percent of Fractured Pieces in Gravel.
- AB. ODOT Supplement 1029, Method of Test for Determining the Percentage of Deleterious Materials in Course Aggregate.
- AC. ODOT Supplement 1036, Method of Test for Determination of Percent Air Voids in Compacted Dense Bituminous Paving Mixtures.
- AD. ODOT Supplement 1044, Mix Design Method for Bituminous Aggregate Base.

- AE. Uni-Bell PVC Pipe Association UNI-B-6-98 for Low Pressure Air Testing of Installed Sewer Pipe.
- AF. ASTM – C969 – Standard practice for infiltration and exfiltration acceptance of installed concrete sewer pipe.

1.5 SUBMITTALS

- A. Prior to the start of work, submit testing laboratory name, address, and telephone number, and names of full-time registered Engineer and responsible officer.
- B. Submit copy of the testing laboratory's evaluation report issued by one of the evaluation authorities identified in Article 1.6 of this Section with memorandum of remedies of any deficiencies reported by the inspection.
- C. Submit the chain of custody and other QA/QC procedures for each test to be utilized by the laboratory.
- D. Submit a sample test report for review by the Engineer to demonstrate conformance with Article 3.2 herein.

1.6 QUALITY ASSURANCE

- A. Except as otherwise indicated, the testing laboratory engaged shall be prequalified by the Ohio Department of Transportation for the types of services specified herein.
- B. The field personnel utilized to perform all field-testing and preparation shall be certified for those tests being performed.

1.7 RESPONSIBILITIES

- A. Testing Laboratory Responsibilities:
 - 1. Provide qualified personnel at the site. Cooperate with the Engineer and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with the specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of the contract documents.
 - 4. Immediately notify the Engineer and Contractor of observed irregularities or nonconformance of work or products.
 - 5. Perform additional tests required by the Engineer.
 - 6. Testing personnel are to report to the Engineer or his representative upon arrival on site for instructions and requirements. Prior to leaving the site, furnish the Engineer or his representative all test results whether in a formal or informal format.
 - 7. Attend preconstruction meetings and progress meetings.

- B. Contractor Responsibilities:
1. Provide access to materials proposed to be used which require testing.
 2. Cooperate with laboratory personnel and provide access to the work.
 3. Provide incidental labor and facilities:
 - a. To provide access to work to be tested.
 - b. To obtain and handle samples at the site or at the source of products to be tested.
 - c. To facilitate tests.
 - d. To provide storage and curing of test samples as required by the testing laboratory.
 4. Notify the Engineer and laboratory 24 hours prior to expected time for operations requiring testing services for scheduling purposes. Materials will not be permitted to be placed without the proper testing being performed in conformance with this Section.

1.8 LIMITS OF LABORATORY AUTHORITY

- A. The laboratory may not release, revoke, alter, or enlarge the requirements of the contract documents.
- B. The laboratory may not approve or accept any portion of the work.
- C. The laboratory may not assume any duties of the Contractor.
- D. The laboratory has no authority to stop the work.

1.9 SCHEDULE OF TESTS

Testing anticipated on this project shall include, but is not limited to:

- A. Earthwork
 1. Special backfill material sieve analysis per ASTM C-136, one test per source.
 2. On-site trench backfill analysis per ASTM D-2487, as directed by Engineer.
 3. Pipe bedding and cover sieve analysis per ASTM C-136, one test per source.
 4. Drainage fill sieve analysis per ASTM C-136, one test per source.
 5. Soil compaction per ASTM D-698.
 - a. Embankment testing shall be at least one (1) test/5,000 S.F. of each lift;
 - b. Trench backfill testing shall be at least one (1) test/50 L.F. of each lift;
 - c. Subgrade and/or subbase testing shall be at least one (1) test/200 L.F. of pavement or 5,000 S.F. of slabs subject to greater frequency due to soil conditions or Engineer's direction.
 6. Backfill compaction per ASTM D-4253 and D-4254, one test per 50 L.F. of each lift.
 7. Low Strength Mortar testing per ASTM D-4832.

B. Concrete

1. Concrete aggregate deleterious substances per ASTM C-40, ASTM C-117, and ASTM C-142, one test per source.
2. Concrete aggregate abrasion per ASTM C-535, one test per source.
3. Sodium sulfate soundness of coarse aggregate per ASTM C-88, one test per source.
4. Sampling Fresh Concrete: ASTM C-172, except modified for slump to comply with ASTM C 94.
 - a. When cylinders and/or beam samples are made, the slumps and air test shall be made using concrete from the same batch.
 - b. Slump: ASTM C-143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 - c. Air Content: ASTM C-173, volumetric method of lightweight concrete; ASTM C-231 pressure method for normal weight concrete; at least one for each pour of each type of air-entrained concrete, and each time a set of compression test specimens is made.
 - d. Concrete Temperature: ASTM C-1064, test hourly when air temperature is 40° F. (4° C.) and below, and when 80° F. (27° C.) and above; and each time a set of compression test specimens is made.
 - e. Compression Test Specimen: ASTM C-31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 - f. Compressive Strength Tests: ASTM C-39; one set for each day's pour exceeding 5 cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days.
 - i. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
 - ii. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
 - g. Two (2) tests beams shall be made for each 250 square yards of concrete pavement and/or slabs on grade placed.
 - i. For traffic to be allowed on pavement or slab, the modulus of rupture shall be a minimum of 600 psi for Class C concrete or 400 psi for ODOT Class MS or FS.

mandrel shall be re-run through the pipe section for final acceptance testing at no additional cost to the Owner.

- g. The Contractor or subcontractor performing the test shall be experienced and qualified to perform deflection testing with the equipment and procedures utilized. The contractor shall provide all labor, materials, tools and equipment necessary to clean and test all sections of sewer pipe, locate deficient areas, repair, deficient areas, and retest all repaired areas.
- h. All sewer runs shall be cleaned prior to testing.
- i. The acceptance test shall be performed without mechanical pulling devices.
- j. All pipe failing the deflection test shall be exposed, repaired or replaced and retested at no additional cost to the Owner.

2. Leakage Testing

- a. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- b. The Contractor shall perform sufficient tests to determine that the installation of all pipe materials have been as specified and that test results are in accordance with those required for approval of the installation.
- c. The Contractor shall furnish all pressure gauges, suitable pump or pumps, pipes, test heads, and any other apparatus and materials used for these tests. These tests are to be considered as part of the work, and no additional compensation shall be made.
- d. The tests shall be conducted under the direction of the Engineer or an appointed agent. Any testing done without direction and supervision as specified shall not be considered as a proper means of approval.
- e. The Contractor may obtain water for testing as may be required by observing the rules and regulations enforced in the municipality in which the work is being done.
- f. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

3. Infiltration and Exfiltration Testing

- a. All sewers shall be tested using an exfiltration test or, where specifically allowed in writing by the Engineer, an infiltration test.
- b. All sewers shall be tested. No visible leakage in the sewers or manholes shall be permitted.
- c. Bulkheads shall be used to isolate the test sections as required to perform the work. All service laterals, stubs and fittings shall be plugged or capped at the connection to the test section.
- d. Each manhole run shall be tested separately.

4. Exfiltration Testing

- a. The test shall be performed first with a minimum head of water of three (3) feet above the top of the high end of the sewer or two (2) feet above the high end of the highest lateral in the section or sections to be tested, or three (3) feet above the existing groundwater elevation, whichever is higher.
- b. The exfiltration test shall be conducted between two manholes by sealing the downstream end of the test section and all inlet sewers at the upstream manhole with pipe stoppers.
- c. The average internal pressure in the system shall not exceed 11.6 feet of water or 5 psi and the maximum internal pipe pressure at the lowest end shall not exceed 23 feet of water or 10 psi.
- d. Water shall be added to the pipe section at a steady rate from the upstream manhole to allow air to escape from the sewer until the water is at the specified level above the crown of the pipe. The water may stand in the pipe and manhole up to seventy-two (72) hours prior to measurement of leakage to allow for absorption by the pipe and bleeding of air. After absorption into the pipe and manhole has stabilized, the water in the upstream manhole shall be brought to test level.
- e. The leakage rate shall be determined by measurement of the drop in water elevation measured in the upstream manhole and the loss of water calculated. The test period shall be a minimum of sixty (60) minutes duration. Use the following table to determine loss of water as measured in the manhole:

Water Level Change in Test Manhole		Volume of Leakage	
		4 Ft. Dia. MH	5 Ft. Dia. MH
(Inches)	(Feet)	(Gals.)	(Gals.)
1/8	0.01	0.98	1.53
1/4	0.02	1.96	3.06
3/8	0.03	2.94	4.59
1/2	0.04	3.92	6.12
5/8	0.05	4.90	7.65
3/4	0.06	5.87	9.18
7/8	0.07	6.85	10.71
1	0.08	7.83	12.24
1-1/8	0.09	8.81	13.77
1-1/4	0.10	9.79	15.30
1-3/8	0.11	10.77	16.83
1-1/2	0.12	11.75	18.36
1-5/8	0.13	12.72	19.89
1-3/4	0.14	13.71	21.42
1-7/8	0.16	14.69	22.90
2	0.17	15.67	24.48

5. Infiltration Testing

- a. An infiltration test shall be conducted for all sections of sewer, only when the ground water level is two (2) feet or more above the elevation of the inside crown of pipe at the upstream limit of the section being tested.

- b. The use of well point pumps or other dewatering devices shall have been discontinued for 24 hours prior to testing to permit the groundwater table to return to a static condition.
- c. The leakage rate shall be measured by a weir, by determination of the time required to fill a container of known volume, or other measuring device approved by the Engineer in the lower end of the sewer section to be tested.
- d. The incoming sewer or sewers in the upper end of the test section shall be securely sealed.

6. Allowable Leakage

- a. The maximum allowable leakage for either infiltration or exfiltration shall be 100 gallons per inch of internal pipe diameter per mile per day.
- b. If actual leakage measured exceeds the limits specified, the Contractor must locate and repair or remove and replace the defective pipe sections to the satisfaction of the Engineer and retest the section accordingly at no additional cost to the Owner.
- c. All sanitary manholes shall be tested separately by using an exfiltration test (or infiltration test where groundwater conditions permit) to two (2) feet above the highest joint with no measurable leakage for a one hour test.

7. Low Pressure Air Testing

- a. PVC sanitary sewers 54-inch diameter and less may be air tested as specified. If the groundwater level is two (2) feet or more above the top of the pipe at the upstream end or if the air pressure required for the test is greater than 5 psig, the air test method should not be used for RCP sanitary sewers.
- b. Each manhole run shall be tested separately, unless otherwise approved by the Engineer, as the construction progresses. Backfill shall be brought to final grade before testing. Testing shall be done prior to surface restoration, and preferably with not more than four (4) manhole runs constructed ahead of testing.
- c. Test equipment consists of valves and pressure gages to control airflow and to monitor pressure within the test section.
- d. The sewer shall be flushed and cleaned prior to testing to clean out any debris. The pipe surface should be wet for more consistent results.
- e. The section of pipe to be tested shall be plugged at each end and the ends of laterals, stubs and fittings to be included in the test section shall be plugged and securely braced to prevent air leakage, and possible blowouts.
- f. Equipment used shall meet the following minimum requirements and be approved by the Engineer:
 - i. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.

- ii. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
- iii. All air used shall pass through a single control panel.
- iv. Three (3) individual hoses shall be used for the following connections:
 - a). From control panel to pneumatic plugs for inflation.
 - b). From control panel to sealed line for introducing the low pressure air.
 - c). From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
- g. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be used for the test. The sealed pipe shall be pressurized to 9 psig. The plugs must hold against this pressure without having to be braced. No persons shall be allowed in the alignment of the pipe during plug testing.
- h. After a manhole to manhole run of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole. Low pressure air shall be slowly introduced into this sealed line until the internal air pressure reaches approximately 4 psig greater than the average groundwater back pressure, but not greater than 9 psig for PVC pipe or 5 psig for RCP.
- i. In areas where groundwater is known to exist, the Contractor must determine the average groundwater back pressure. The Contractor shall install a 1/2-inch diameter capped pipe nipple, approximately 10 inches long, through the manhole wall on top of one of the sanitary sewer lines entering the manhole. See Figure No. 1. This shall be done at the time the sanitary sewer line is installed or install an 8-inch diameter stand pipe outside of the manhole backfilled with a column of clean stone of 2-inch minimum diameter to subgrade. Immediately prior to the performance of the low pressure air test, the ground water back pressure shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the nipple. The plastic tube shall be vertical and a measurement of the height, in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. This height, divided by 2.307, will equal the average groundwater back pressure.
- j. At least two (2) minutes shall be allowed for the air to stabilize when the specified internal air pressure has been obtained. When the pressure has stabilized and is at or above 3.5 psig, the air hose from the control panel to the air supply shall be disconnected. The portion of the line being tested shall be termed "acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average groundwater back pressure calculated) shall not be less than the time in the tables in Reference Table 1.

- k. If a one (1) psi drop in pressure does not occur within the test time, the line has passed. If the pressure drop is more than one (1) psi during the test time, the line is presumed to have failed the test. If the line fails the test, segmented testing may establish the location of any leaks.
 - l. The Contractor must repair the leak or remove and replace the defective pipe section and re-test the section to the satisfaction of the Engineer at no additional cost to the Owner.
 - m. The pneumatic plugs must be installed in such a way as to prevent blowouts. Inasmuch as a force of 250 pounds is exerted on an 8-inch plug by an internal pipe pressure of 5 psi, it should be realized that sudden expulsion of a poorly installed plug or a plug, which is partially deflated before the pipe pressure is released, can be dangerous.
 - n. The Contractor should internally restrain or externally brace the plugs to the manhole wall as an added safety precaution throughout the test.
 - o. Pressurizing equipment shall include a regulator or relief valve set at no higher than 9 psig for PVC pipe or 5 psig for RCP pipe to avoid over-pressurizing and damaging an otherwise acceptable line.
 - p. No one shall be allowed in the trench or manholes during testing.
 - q. Plugs shall not be removed until all pressure has been released.
 - r. All sanitary manholes shall be tested separately by using an exfiltration test (or infiltration test where groundwater conditions permit) to two (2) feet above the highest joint with no measurable leakage for a one hour test.
 - s. The air test data sheet marked Exhibit "A" at the end of this section shall be filled out for each section of piping tested in this manner.
 - t. Testing concrete pipe sewer lines by the low pressure air test method will be per ASTM C924-02 and C1103.
8. Hydrostatic Testing – Pressure Pipe, For Watermain and Force Main
- a. The pipe to be tested must be sufficiently backfilled to prevent movement while under test pressure.
 - b. Joint restraint at fittings should be permanent and constructed to withstand test pressure. If concrete thrust blocks are used, sufficient time must be allowed before testing to permit the concrete to cure. A cure time of seven (7) days is recommended when Type I Portland Cement is used; three (3) days is recommended when Type III high-early Portland Cement is used.
 - c. Test ends should be restrained to withstand the appreciable thrusts that are developed under test pressure.
 - d. Air pressure testing of installed pressure pipe is expressly prohibited.
 - e. Any testing performed without the knowledge of the Engineer shall not be considered a test for the purpose of this specification.

- f. The hydrostatic testing sheet marked “Exhibit D” following this section shall be filled out for each section of piping tested in this manner.
- g. After the pipe is laid and before backfill is placed around the joints, such lengths of the force main as determined by the responsible agency shall be tested under a hydrostatic pressure of 1.25 times the working pressure at the highest point along the test section, but, in no case, shall such force mains be tested at less than 150 pounds per square inch.
- h. Each section of pipeline shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a booster pump connected to the pipe in a manner satisfactory to the Engineer. The duration of the test shall be for a minimum of sixty (60) minutes.
- i. No pipe installation will be accepted unless the leakage rate for the section of pipe being tested does not exceed a rate as shown on hydrostatic test chart, during a 24-hour test duration.
- j. The Contractor shall furnish suitable means for determining the quantity of water lost by leakage during the test.

9. Manhole Vacuum Testing

- a. Temporarily plug all pipe entering the manhole. Each plug must be installed at a location beyond the manhole/pipe gasket (i.e. outside the manhole wall), and shall be braced to prevent the plug or pipe from being drawn into the Manhole.
- b. The test head shall be placed inside the rim of the cast iron frame at the top of the manhole and inflated, in accordance with the manufacturer’s recommendations.
- c. A vacuum of at least 10 inches of mercury (10” Hg) shall be drawn on the manhole. Shut the line on the vacuum line to the manhole and shut off the pump or disconnect the vacuum line from the pump.
- d. The pressure gauge shall be liquid filled, having a 3.5” diameter face with a reading from zero to thirty inches of mercury.
- e. The manhole shall be considered to pass the vacuum test if the vacuum reading does not drop more than 1” Hg (i.e from 10” to 9” Hg) during the Table 1 minimum test time.
- f. If a manhole fails the vacuum test, the manhole shall be repaired with non-shrinkable grout or other material or method approved by the engineer. The manhole surfaces shall be properly prepared prior to any repairs. Once the repair material has cured according to the manufacturer’s recommendations, the vacuum test shall be repeated. This process shall continue until a satisfactory test is obtained.
- g. All temporary plugs and braces shall be removed after each test.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 SEQUENCING AND SCHEDULING

- A. The Contractor shall coordinate the sequence of work activities so as to accommodate required testing and shall allow sufficient time for testing of materials by the laboratory so as to cause no delay in the work or the work of any other Contractor. In addition, the Contractor shall coordinate his work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests.

3.2 LABORATORY TEST RESULTS

- A. The testing laboratory shall submit a certified written report of each inspection, test, or similar service concurrently to the Owner, Engineer, and Contractor.
- B. Written reports of each inspection, test, or similar service shall include, but not be limited to, the following:
 1. Name of testing laboratory.
 2. Project name and construction contract reference number.
 3. Dates and locations of samples and tests or inspections.
 4. Date of report.
 5. Names of individuals making the inspection or test.
 6. Designation of the work and test method.
 7. Test results.
 8. Notation of significant ambient conditions at the time of sample taking and testing.

END OF SECTION

UNI-B-6-98

FIGURE NO. 1

**MANHOLE CROSS-SECTIONAL VIEW
OF THE PROPER METHOD FOR
DETERMINING GROUND WATER HEIGHT**

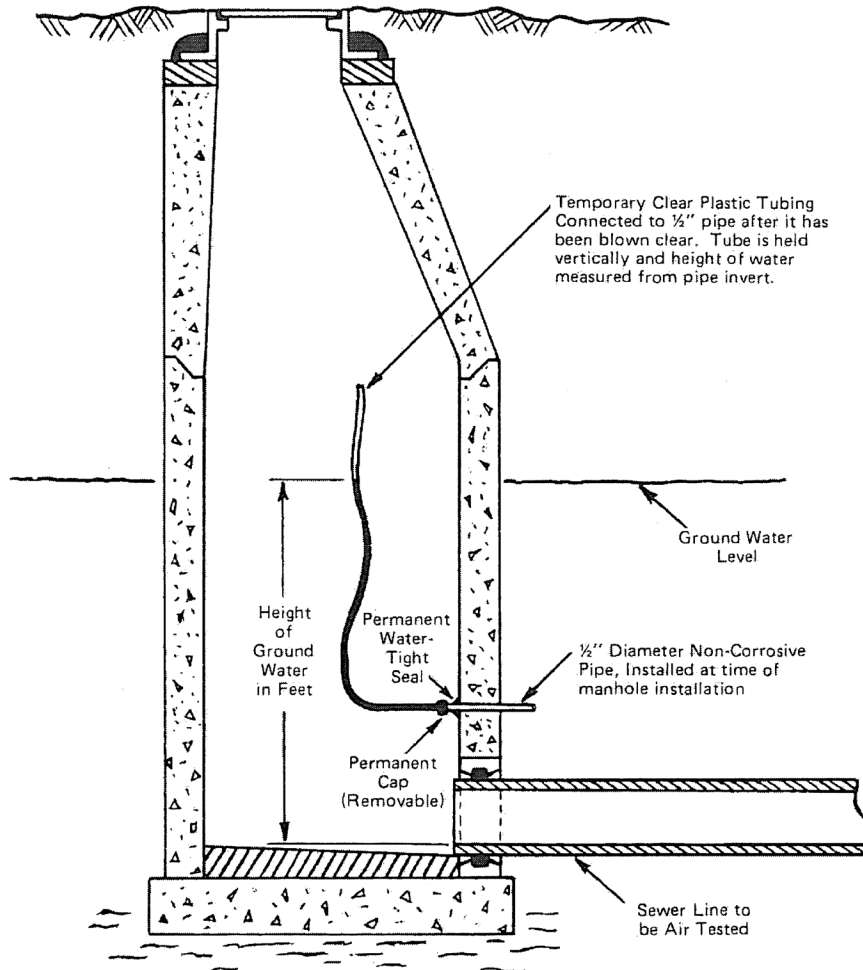


TABLE IMinimum specified time required for a 1.0 P.S.I.G. Pressure Drop

1 Pipe Diame ter (Inche s)	2 Minim um Time (Min:S ec)	3 Length for Minim um Time (Ft.)	4 Time for Longer Length (Sec)	Specification Time for Length (L) Shown (Min:Sec)								
				100 Ft.	150 Ft.	200 Ft.	250 Ft.	300 Ft.	350 Ft.	400 Ft.	450 Ft.	
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24	
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:5 7	115:2 2	129:48	
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:3 8	142:2 6	160:15	
33	31:10	72	28.852 L	43:05	64:38	86:10	107:43	129:16	150:4 3	172:2 1	193:53	
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:2 9	205:0 7	230:46	
42	39:48	57	41.883 L	69:48	104:4 2	139:37	174:30	209:24	244:1 9	279:1 3	314:07	
48	45:34	50	54.705 L	91:10	136:4 5	182:21	227:55	273:31	319:0 6	364:4 2	410:17	
54	51:02	44	69.236 L	115:24	173:0 5	230:47	288:29	346:11	403:5 3	461:3 4	519:16	
60	56:40	40	85.476 L	142:28	213:4 1	284:55	356:09	427:23	498:3 7	569:5 0	641:04	

for size and length of pipe indicated for Q = 0.0015

NOTE: If there has been no leakage, (zero P.S.I.G. drop), after one hour of testing, the test shall be accepted and the test complete. (See Section 7.5)

TABLE II

Minimum specified time required for a 0.5 P.S.I.G. Pressure Drop
for size and length of pipe indicated for $Q = 0.0015$

1 Pipe Diameter (Inches)	2 Minimum Time (Min:Sec)	3 Length for Minimum Time (Ft.)	4 Time for Longer Length (Sec)	Specification Time for Length (L) Shown (Min:Sec)							
				100 Ft.	100 Ft.	100 Ft.	100 Ft.	100 Ft.	100 Ft.	100 Ft.	100 Ft.
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23
42	19:54	57	20.942 L	34:54	52:21	69:49	87:15	104:42	122:10	139:37	157:04
48	22:47	50	27.352 L	45:35	68:23	91:11	113:58	136:46	159:33	182:21	205:09
54	25:31	44	34.618 L	57:42	86:33	115:24	144:15	173:05	201:56	230:47	259:38
60	28:20	40	42.738 L	71:14	106:51	142:28	178:05	213:41	249:18	284:55	320:32

NOTE: If there has been no leakage, (zero P.S.I.G. drop), after one hour of testing, the test shall be accepted and the test complete. (See Section 7.5)

CT CONSULTANTS, INC.
HYDROSTATIC LEAKAGE TEST

JOB. NO. _____ PROJECT: _____

CONTRACTOR: _____ CLIENT: _____

WATERLINE TESTED AT: _____
 (Street Name) (Station of Gauge)

FROM STATION _____ TO STATION _____ ON _____

WATERLINE SIZE _____ TYPE _____

TESTED _____, _____ AT _____ FOR _____
 TOTAL L.F. PIPE SIZE PSI DURATION

ALLOWABLE LEAKAGE _____ PER 1,000 L.F. OR _____ PER _____
 GALS./HR. TOTAL GALS. TOTAL L.F.

1ST TEST _____, _____ AND _____
 PASS / FAIL PRESSURE LOST GALLONS LOST

2ND TEST _____, _____ AND _____
 PASS / FAIL PRESSURE LOST GALLONS LOST

APPROVED BY _____
 (INSPECTOR)

COMMENTS: _____

ALLOWABLE LEAKAGE PER 1,000 FEET OF WATERMAIN:

<u>PIPE SIZE</u> <u>INCH DIAMETER</u>	<u>ALLOWABLE LEAKAGE</u> <u>GALS. / 1,000 FEET</u>
6	1
8	1.3
10	1.6
12	1.9
16	2.5
20	3.2
24	3.8
30	4.8
36	5.7

NOTE: IN NO CASE SHALL THE TESTED SECTION EXCEED 2,000 FEET IN LENGTH.



PROJECT: _____ **SHEET NO. 1 OF** _____

JOB NO. _____ **STREET:** _____

CONTRACTOR: _____ **PROJECT REP:** _____

MANHOLE VACUUM TEST

M.H. NO.	M.H. Diameter (in.)	M.H. Depth (ft.) (btm.m.h. cover to shelf)	Vacuum Required (in Hg)	Vacuum Attained (in Hg)	Vacuum Drop (in Hg)	Holding Time Required (sec.)	Pass/Fail	Date Tested	Contractor Attest	Engineer Attest	Remarks

TABLE 1 – Minimum Test Times for Various Manhole Diameter

Depth (ft)	30	33	36	42	48	54	60	66	72
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
39	42	49	59	69	81	91	101	113	121
42	45	53	63	74	87	98	108	121	121

Note: Allowable drop equals 1 in. Hg for time shown

PROJECT REP: _____

DATE: _____

SECTION 013320 - SUBMITTALS

PART 1 - GENERAL

1.1 GENERAL

- A. All submittals to be submitted electronically to the Engineer's project ftp website inbox or other means as approved. Submittal procedures will be further explained by the Engineer at the Preconstruction Meeting.
- B. Submittals for approval of materials and equipment shall be in conformance with the requirements of the General Requirements and of the product specifications, except that the Engineer may order any additional submittal necessary to fulfill the requirements of the General Requirements.
- C. Shop drawings shall provide details, dimensions, and other information that, with required certificates, will show the product is in conformance with the specifications. Details and dimensions shall be adequate for proper installation of the product.
- D. Manufacturer's or supplier's certificates shall state that the products have been sampled and tested in accordance with provisions and meet the requirements of specifications included and designated herein and shall be signed by an authorized agent of the manufacturer.
- E. Test certificates shall show results of tests by an independent laboratory compared to specification requirements and shall be signed by an authorized agent of the laboratory.
- F. In addition to specific submittal requirements listed in the technical specifications, the Contractor shall submit, at a minimum, the following information along with other pertinent items that the Engineer requires to determine whether the equipment is capable of meeting the design criteria and specifications:
 - 1. Catalog data
 - 2. Design data
 - 3. Complete list of all component parts including:
 - a. Manufacturer's name and model number
 - b. Material of construction
 - c. Accessories
 - d. Performance data
 - 4. Fabrication drawings
 - 5. Assembly drawings
 - 6. Installation drawings
 - 7. Dimension drawings
 - 8. Wiring diagrams with alpha-numeric code for remote connections where required as shown on the Contract Drawings.
 - 9. Cast-in-place concrete placement drawings with dimensions of each placement and a number to each placement.
 - 10. Conduit drawings. Detailed drawings showing all conduit sizes, types, material and wire size and color to be pulled.

- G. The Contractor shall submit a written statement from the manufacturer that the material or equipment is suitable for the intended use and will meet the requirements of the specifications.
- H. The Contractor shall submit the supplier's written report that the materials or equipment:
 - 1. Has been properly installed.
 - 2. Is in accurate alignment.
 - 3. Components have been tested and operated satisfactorily.
- I. Where required, bid submittals in no way reduce the requirements for shop drawing submittals. Award of the Contract does not constitute approval of the equipment or material on which the Contractor's bid is based.

END OF SECTION 013320

SECTION 013323 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 GENERAL

- A. The Contractor shall submit detailed drawings, acceptable catalog data, specifications and material certifications for all equipment and materials specified or required for the proper completion of the work.
- B. The intent of these items is to demonstrate compliance with the design concept of the work and to provide the detailed information necessary for the fabrication, assembly and installation of the work specified. It is not intended that every detail of all parts of manufactured equipment be submitted, however sufficient detail will be required to ascertain compliance with the specifications and establish the quality of the equipment proposed.

Shop Drawings shall be sufficiently clear and complete to enable the Engineer/Architect and Owner to determine that items proposed to be furnished conform to the specifications and that items delivered to the site are actually those that have been reviewed.

- C. It is emphasized that the Engineer/Architect's review of Contractor's submitted data is for general conformance to the contract drawings and specifications but subject to the detailed requirements of drawings and specifications. Although the Engineer/Architect may review submitted data in detail, such review is an effort to discover errors and omissions in Contractor's drawings. The Engineer/Architect's review shall in no way relieve the Contractor of his obligation to properly coordinate the work and to Engineer/Architect the details of the work in such manner that the purposes and intent of the contract will be achieved. Such review by the Engineer/Architect shall not be construed as placing on him or on the Owner any responsibility for the accuracy and for proper fit, functioning or performance of any phase of the work included in the contract.
- D. Shop Drawings shall be submitted in proper sequence and with due regard to the time required for checking, transmittal and review so as to cause no delay in the work. The Contractor's failure to transmit appropriate submittals to the Engineer/Architect sufficiently in advance of the work shall not be grounds for time extension.
- E. The Contractor shall submit Shop Drawings for all fabricated work and for all manufactured items required to be furnished in the Contract in accordance with the General Provisions and as specified herein. Shop Drawings shall be submitted in sufficient time to allow at least twenty-one (21) calendar days after receipt of the Shop Drawings from the Contractor for checking and processing by the Engineer/Architect.
- F. It is the responsibility of each Prime Contractor to furnish to all other Prime Contractors and especially the General Construction Contractor reviewed Shop Drawings for guidance in interfacing the various trades; i.e., sleeves, inserts, anchor bolts, terminations, and space requirements.

- G. No work shall be performed requiring Shop Drawings until same have been reviewed by Engineer/Architect.
- H. Accepted and reviewed Shop Drawings shall not be construed as approval of changes from Contract plan and specification requirements.
- I. The Engineer/Architect will review the first and second Shop Drawing item submittals at no cost to the Contractor. Review of the third submittal and any subsequent submittal will be at the Contractor's expense. Payment will be deducted from the Contract amount at a rate of 2.8 times direct labor cost plus expenses.

1.2 SUBMITTAL PROCEDURE

- A. All required submissions shall be made to the Engineer/Architect by the Prime Contractor(s) only. Any data prepared by subcontractors and suppliers and all correspondence originating with subcontractors, suppliers, etc., shall be submitted through the Contractor.
- B. Contractor shall review and approve all Shop Drawings prior to submission. Contractor's approval shall constitute a representation to Owner and Engineer/Architect that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.
- C. Submittal Preparation: Mark each submittal with a permanent label or page for identification. Provide the following information on the label for proper processing and recording of action taken:
 - 1. Location
 - 2. Project Name
 - 3. Contract
 - 4. Name and Address of Engineer/Architect
 - 5. Name and Address of Contractor
 - 6. Name and Address of Subcontractor
 - 7. Name and Address of Supplier
 - 8. Name of Manufacturer
 - 9. Number and Title of appropriate Specification Section
 - 10. Drawing Number and Detail References, as appropriate.
 - 11. Submittal Sequence or Log Reference Number.
 - a. Provide a space on the label for the Contractor's review and approval markings and a space for the Engineer/Architect's "Action Stamp".
- D. Each Shop Drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor:

Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.

Signature

Date

Company

- E. Shop Drawings shall be submitted in not less than six (6) copies to the Engineer/Architect at the address specified at the Preconstruction Conference. Single mylar or sepia reproducible copies of simple Shop Drawings may be submitted with prior approval of the Engineer/Architect.
- F. At the time of each submission, Contractor shall in writing identify any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.
- G. Drawings shall be clean, legible and shall show necessary working dimensions, arrangement, material finish, erection data, and like information needed to define what is to be furnished and to establish its suitability for the intended use. Specifications may be required for equipment or materials to establish any characteristics of performance where such are pertinent. Suitable catalog data sheets showing all options and marked with complete model numbers may, in certain instances, be sufficient to define the articles which it is proposed to furnish.
- H. For product which require submittal of samples, furnish samples so as not to delay fabrication, allowing the Engineer reasonable time for the consideration of the samples submitted. Properly label samples, indicating the material or product represented, its place of origin, the names of the vendor and Contractor and the name of the project for which it is intended. Ship samples prepaid. Accompany samples with pertinent data required to judge the quality and acceptability of the sample, such as certified test records and, where required for proper evaluation, certified chemical analyses.

1.3 REVIEW PROCEDURE

- A. Engineer/Architect will review with reasonable promptness all properly submitted Shop Drawings. Such review shall be only for conformance with the design concept of the Project and for compliance with the information given in the plans and specifications and shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
- B. The review of a separate item as such will not constitute the review of the assembly in which the item functions. The Contractor shall submit entire systems as a package.
- C. All Shop Drawings submitted for review shall be stamped with the Engineer/Architect's action and associated comments.

- D. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer/Architect will review each submittal, mark to indicate action taken, and return accordingly. Compliance with specified characteristics is the Contractor's responsibility.

Action Stamp: The Engineer/Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. If Shop Drawings are found to be in general compliance, such review will be indicated by marking the first statement.
 2. If only minor notes in reasonable number are needed, the Engineer/Architect will make same on all copies and mark the second statement. Shop Drawings so marked need not be resubmitted.
 3. If the submitted Shop Drawings are incomplete or inadequate, the Engineer/Architect will mark the third statement, request such additional information as required, and explain the reasons for revision. The Contractor shall be responsible for revisions, and/or providing needed information, without undue delay, until such Shop Drawings are acceptable. Shop Drawings marked with No. 3 shall be completed resubmitted.
 4. If the submitted Shop Drawings are not in compliance with the Contract Documents, the Engineer/Architect will mark the fourth statement. The Contractor will be responsible to submit a new offering conforming to specific products specified herein and/or as directed per review citations.
- E. No submittal requiring a Change Order for either value or substitution or both, will be returned until the Change Order is approved or otherwise directed by the Owner.

APPLICATION FOR USE OF SUBSTITUTE ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Page	Paragraph	Description
A.		The undersigned requests consideration of the following as a substitute item in accordance with Article 6.05 of the General Conditions.
B.		Change in Contract Price (indicate + or -) \$ _____
C.		Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.
D.		Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitute does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule, or specified warranty requirements. (If proposed substitution affects construction schedule, indicate below using + or -)

_____ CONSECUTIVE CALENDAR DAYS

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item, and agrees to reimburse the OWNER for the charges of the ENGINEER for evaluating this proposed substitute item.

E. Signature:

Firm:

Address:

Telephone:

Date:

Attachments:

For use by ENGINEER:

_____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

_____ Accepted as evidenced by included CHANGE ORDER.

_____ Not accepted as submitted. See Remarks.

_____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

_____ Not accepted. Do not resubmit.

By:

Date:

Remarks:

APPLICATION FOR USE OF "OR-EQUAL" ITEM

TO: _____

PROJECT: _____

SPECIFIED ITEM:

Page	Paragraph	Description
------	-----------	-------------

A. The undersigned requests consideration of the following as an "or-equal" item in accordance with Article 6.05 of the General Conditions.

B. Change in Contract Price (indicate + or -) \$ _____

C. Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.

D. Signature:

Firm: _____

Address: _____

Telephone: _____ Date: _____

Attachments: _____

For use by ENGINEER:

_____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

_____ Accepted as evidenced by included CHANGE ORDER.

_____ Not accepted as submitted. See Remarks.

_____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

_____ Not accepted. Do not resubmit.

By: _____ Date: _____

Remarks: _____

END OF SECTION 013323

SECTION 013325 - WARRANTY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section provides procedures and requirements for warranting the Work. The enumerated warranties herein are in no way intended to abrogate any implied warranties as associated with goods supplied under this Contract.

1.2 SUMMARY

- A. Work Included:
 - 1. Preparation of Warranties for submittals.
 - 2. Requirements for the content and submittal of Warranties.

1.3 RELATED DOCUMENTS

- A. This Section includes minimum requirements for the warranty of the equipment. See also all equipment specification sections for additional requirements.
- B. Section 013323, Shop Drawings, Product Data, and Samples.

1.4 SUBMITTALS

- A. As a part of the submittals for each item of equipment or a group of equipment items, include a DRAFT Warranty containing all of the language and terms specified.
- B. Following completion of the terms for establishment of the Warranty specified, prepare Warranties for submittal per section 013323 and the following:
 - 1. Warranties for projects or portions of the work, established on a particular date as specified herein, may be submitted as a group.
 - 2. Label each submittal with the title 'WARRANTY,' the project name and effective date; the Contractor's names, address and telephone number.
 - 3. A Table of Contents shall be included identifying each item with a number and title of specification section and the name of the product or Work item.
 - 4. Separate Warranty for each specification section item with index tab sheets. Label tables to conform to the Table of Contents.
- C. The Warranty shall contain, as applicable:
 - 1. Effective starting date and end date of the Warranty period.
 - 2. Statement of the terms and conditions of the Warranty, if any.
 - 3. Statement that all Operating and Maintenance information has been provided and approved.
 - 4. Statement that all training and training materials have been provided and approved.

5. Statement that the equipment or system commissioning is complete and has been reviewed and accepted by the manufacturer in accordance with provisions of the individual Sections in Divisions 1 through 46 of the Project Manual, as applicable.
 6. Certifications by the Contractor and/or Manufacturer that the statements noted above are true and correct. This certification shall be signed by a person authorized to sign documents on behalf of the Contractor.
- D. Special warranties, as required by individual Sections in Divisions 1 through 46 of the Project Manual, shall be submitted in accordance with the requirements of this Section.

PART 2 – PRODUCTS

2.1 WARRANTIES

A. Term or Period

1. The Warranty shall extend for two (2) calendar years from the date of acceptance by Owner unless a longer period is required in the provisions of the individual Sections in Divisions 1 through 46 of the Project Manual, as applicable.

B. Contractor's Responsibilities

1. During the Warranty period, the Contractor is responsible for repair or replacement of all failures and defects, exclusive of ordinary and routine maintenance and failures directly traceable to the lack thereof. This requirement shall be thoroughly explained by the Contractor to all prospective equipment suppliers. Repairs or replacement shall be performed in accordance with the General Conditions.

PART 3 – EXECUTION

3.1 EXECUTION OF WARRANTY

- A. The approved DRAFT Warranty will be executed and places in effect as the FINAL Warranty on the date of Final Completion of the Work for the specific equipment item or group named in the Warranty.

END OF SECTION 013325

SECTION 013326 – PRODUCT TESTING AND CERTIFYING

PART 1 - GENERAL

1.1 QUALITY OF MATERIALS

- A. Where the specifications call for mill or shop tests, the Contractor shall furnish duplicate copies of attested manufacturer's certificates showing details of quality or performance sufficient to demonstrate conformity to contract requirements. Mill, shop or witness tests shall be subject to view by the Engineer's representative, but the Engineer's representation shall not relieve the Contractor from the necessity of furnishing certificates specified. The Engineer shall be notified by the Contractor in writing, sufficiently in advance of the time of making tests, so that proper arrangements may be made. Waiving of witness of tests by the Engineer may be in writing only by the Engineer. All costs for travel, lodging, food and transportation that are necessary for the Engineer's representative and the Owner's representative to attend witness tests shall be included in the Contractor's bid for those item(s) specifically designated as being subject to witness testing.
- B. Unless otherwise specified, all materials, equipment and articles shall be erected, installed, applied, or connected, used, cleaned and conditioned in accordance with the printed instructions and directions of the manufacturer.
- C. The installation shall be so made that its several component parts will function together as a workable system. It shall be complete with all accessories necessary for its operation and shall be left with all equipment properly adjusted and in working order.
- D. The work shall be executed in conformity with the best practice and so as to contribute to efficiency of operation, minimum maintenance, accessibility and sightliness. It shall also be executed so that the installation will conform and accommodate itself to the building structure, its equipment and usage.
- E. Whenever in the contract documents a particular brand, make of material, device or equipment is shown or specified, such brand, make of material, device or equipment is to be regarded merely as a standard and such trade name shall be followed by "or equal".

1.2 QUALITY ASSURANCE

- A. The equipment and materials to be furnished under this Contract shall be the products of well established and reliable firms which have had ample experience for at least five (5) years in the manufacture of equipment or materials similar in design and of equal quality to that specified. If required, the manufacturer shall submit a list of installations of similar equipment which have been in successful operation for at least five (5) years.

1.3 EXPERIENCE CLAUSE REQUIREMENT AND PERFORMANCE BONDS FOR MANUFACTURER

- A. For every piece of equipment furnished under this Contract, the manufacturer will be required to have a minimum of five (5) years of experience in providing this specific type of equipment. In lieu of this experience requirement, the manufacturer will be required to provide performance bond(s) for the faithful performance of the equipment and guarantee payment in a sum of not less than one hundred and fifty percent (150%) of the total equipment price for the completed work for that item. In the absence of verifiable experience, the manufacturer will be required to provide the performance bond(s) for the same number of years that the manufacturer was found lacking in experience from the specified five (5) year period. The performance bond(s) shall be from an approved surety company, to the satisfaction of the Owner's Law Director.
- B. Agents of bonding companies which write bonds for the performance and payment of the contract shall furnish power of attorney bearing the seal of the company, evidencing such agent's authority to execute the particular type of bond to be furnished, and evidencing also the right of the surety company to do business in the State of Ohio. Copy of this proof shall be attached to each copy of the contract.
- C. The bond shall be purchased through a surety company with a local agent upon whom service of process can be made.
- D. In event of failure of surety or co-surety, the manufacturer shall immediately furnish a new bond, as required herein. The manufacturer's bond will not be released until all provisions of the contract have been fulfilled.
- E. The surety used for the bid bond and performance bond shall be listed in the latest U.S. Treasury Circular 570 and the Penal Sums shall be within the maximum specified for such company in said Circular 570.

END OF SECTION 013326

SECTION 013543 - ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 UNNECESSARY NOISE, DUST AND ODORS

- A. The Contractor's performance of this contract shall be conducted so as to eliminate all unnecessary noise, dust and odors.

1.2 SEWAGE, SURFACE AND FLOOD FLOWS

- A. The Contractor shall take whatever action is necessary to provide all necessary tools, equipment and machinery to adequately handle all sewage, surface flows and flood flows which may be encountered during the performance of the work. The entire cost of and liability for handling such flows is the responsibility of the Contractor and shall be included in the price for the appropriate item.

1.3 WORK IN FREEZING WEATHER

- A. Written permission from the Engineer shall be obtained before any work is performed which, in the judgment of the Engineer, may be affected by frost, cold, or snow. When work is performed under such conditions, the Contractor shall provide facilities for heating the materials and for protecting the finished work.

1.4 POLLUTION CONTROL

- A. It shall be the responsibility of the Contractor to prevent or limit pollution of air and water resulting from his operations.
- B. 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. This work shall conform to all local ordinances and/or regulations, if any, and if not otherwise regulated by local ordinances or regulations shall at a minimum conform to the Ohio EPA General Storm Water NPDES Permit for Construction Activities and the Ohio Department of Natural Resources Rainwater and Land Development manual. This work may consist of but not be limited to construction and continual maintenance of silt fence, bio bag filters, sedimentation traps, stilling basins, check dams, temporary seeding, temporary mulching, erosion mats and other means to clarify waters containing suspended materials from excavations, embankments, cleared and grubbed or stripped areas, stockpiles, well points, and disposal sites and shall be commensurate with the contractor's schedule, sequence of work, means and methods. If a SWPPP plan is not required for the project, the contractor shall at a minimum submit a plan of his proposed erosion control prevention methods for approval by the Owner and/or other regulatory authorities having jurisdiction prior to starting any construction activities which may cause erosion.

- C. The Contractor shall perform work required to prevent dust attributable to his operations from entering the atmosphere. Dust on unsurfaced streets or parking areas and any remaining dust on surfaced streets shall be controlled with water and/or calcium chloride dust palliative as needed.
- D. Any material removed from sanitary or storm sewers shall be disposed in accordance with all applicable regulations.

END OF SECTION 013543

SECTION 014126 - GENERAL REGULATIONS AND PERMITS

PART 1 - GENERAL

1.1 PERMITS

The Contractor shall apply for and pay for all permits from the Owner and/or other authorities having jurisdiction.

1.2 ARCHAEOLOGICAL DISCOVERIES

Contractors and subcontractors are required under O.R.C. Section 149.53, to notify the Ohio Historical Society and the Ohio Historic Site Preservation Board of Archaeological Discoveries located in the project area, and to cooperate with those entities in archaeological and historic surveys and salvage efforts if such discoveries are uncovered within the project area.

Contact: Ohio's State Historic Preservation Office
Diana Welling, Resource Protection & Review Department Manager
Phone: 1-614-298-2000
Email: dwelling@ohiohistory.org

Should archaeological discoveries or other activities delay progress of the work, an adjustment in contract time will be made.

END OF SECTION 014126

SECTION 014223 - INDUSTRY STANDARDS

PART 1 - GENERAL

1.1 ABBREVIATIONS

- A. Abbreviations, as used, designate the following:

AASHTO	-	American Association of State Highway and Transportation Officials
ACI	-	American Concrete Institute
AIEE	-	American Institute of Electrical Engineers
AISC	-	American Institute of Steel Construction
ANSI	-	American National Standards Institute
ASTM	-	American Society of Testing and Materials
AWWA	-	American Water Works Association
CMS	-	Construction and Material Specifications
NEMA	-	National Electrical Manufacturers Association
ODOT	-	Ohio Department of Transportation
ORC	-	Ohio Revised Code
UL	-	Underwriters Laboratories, Inc.

1.2 REFERENCE TO OTHER SPECIFICATIONS

- A. Where reference is made to specifications such as ASTM, AWWA or AASHTO, the latest edition shall be used, unless otherwise noted on the plans or in the specifications.

1.3 CODES AND STANDARDS

- A. All work provided for by these specifications must be installed according to the provisions of the State and local building codes, subject to inspection and acceptance by the State and local inspectors.

END OF SECTION 014223

SECTION 014323 – QUALIFICATIONS OF TRADESMEN

PART 1 - GENERAL

1.1 CHARACTER OF WORKMEN AND EQUIPMENT

- A. The Contractor shall employ competent and efficient workmen for every kind of work. Any person employed on the work who shall refuse or neglect to obey directions of the Engineer or his representative, or who shall be deemed incompetent or disorderly, or who shall commit trespass upon public or private property in the vicinity of the work, shall be dismissed when the Engineer so orders, and shall not be re-employed unless express permission be given by the Engineer. The methods, equipment and appliances used on the work and the labor employed shall be such as will produce a satisfactory quality of work, and shall be adequate to complete the contract within the specified time limit.

- B. In hiring of employees for the performance of work under this Contract, or any Subcontract hereunder, no Contractor or Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall, by reason of race, sex, creed or color, discriminate against any citizen of the State of Ohio in the work to which the employment relates. No Contractor, Subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, sex or color.

END OF SECTION 014323

SECTION 015113 - TEMPORARY HEATING, LIGHTING AND POWER

PART 1 - GENERAL

1.1 APPLICABLE CONTRACTORS

- A. General Construction Contractor (Referenced as GCC or GC)

1.2 General Construction Contractor shall provide and/or install the following:

- A. All costs of electrical current consumed by all Contractors. The General Construction Contractor shall make arrangements with the local electric utility company to have the periodic bill sent directly to the General Construction Contractor.
- B. Temporary heating system, as required, to protect the work until the work is complete and ready for occupancy by the Owner. Such system shall meet all requirements of the N.E.C., O.B.B.C. and the local codes for temporary construction services.
- C. All costs of natural gas, propane, fuel oil, electric power or other energy consumed and costs related to provide temporary heat.
- D. All piping necessary to provide fuel for the temporary heating system.
- E. All ductwork and vents necessary for the temporary heating system.
- F. Power
 - 1. Temporary power facilities for construction purposes (including temporary groundwater pumping) shall include the cost of running temporary metered service from the utility supply to the various project construction areas. Power shall be provided in accordance with the General Construction Contractor's construction schedule.
 - 2. The electrical work for construction purposes shall conform to all Federal, State (Ohio Safety Code IC-3, Specific Safety Requirements) as well as requirements of the National Electric Code. The General Construction Contractor shall obtain and pay for required applications, permits and inspection pertaining to this work. This cost shall also be included in the General Construction Contractor's price.
 - 3. All utility charges or fees for permits, step down transformers, metering or other materials.
 - 4. Temporary work shall be installed in such a manner as not to interfere with the permanent construction. If such interference does occur, it shall be the responsibility of the General Construction Contractor to make such changes as may be required to overcome the interference.
 - 5. The General Construction Contractor shall arrange for the installation of temporary service for construction purposes as well as making provisions to adequately protect the transformer and any associated temporary power equipment throughout the course of construction.

G. Heating

1. The electrical facilities for temporary heating and ventilating systems. All temporary systems shall be connected directly to the project temporary power system.

H. Lighting

1. Provide labor and material for the installation and maintenance of temporary light and power as may be required during the period of construction.

END OF SECTION 015113

SECTION 015136 - TEMPORARY WATER AND DISTRIBUTION

PART 1 - GENERAL

1.1 WATER

- A. The Contractor shall be responsible for an adequate supply of water suitable for his use for construction and drinking. At his own expense, he shall provide and maintain adequate supplies and supply lines in such locations and installed in such a manner as may be satisfactory to the Engineer. Connection to existing water service must be approved by the Owner and metered and will accept the customary water rate charge of the Owner.

END OF SECTION 015136

SECTION 015213 - FIELD OFFICES AND FIRST AID

PART 1 - GENERAL

1.1 CONTRACTOR'S OFFICE

- A. Each Contractor shall provide and maintain an office on the site of the work during the construction period of the contract, at which he or his authorized agent shall be present at all times while the work is in progress.

1.2 AID TO THE INJURED

- A. The Contractor shall keep in his office and on the work site, all articles necessary for giving "First Aid to the Injured." He shall also have standing arrangements for the immediate removal and hospital treatment of any employee or other person who may be injured on the work site.

END OF SECTION 015213

SECTION 015526 - TEMPORARY TRAFFIC CONTROL DEVICES

PART 1 - GENERAL

1.1 BARRICADES, SIGNS AND LIGHTS

- A. The Contractor shall employ watchmen on the work when and as necessary. The Contractor shall erect and maintain such strong and suitable barriers and such lights as will effectively prevent the occurrence of any accident to health, limb or property. Lights shall be maintained between the hours of one-half (1/2) hour after sunset and one-half (1/2) hour before sunrise.
- B. No manhole, trench, excavation will be left open awaiting connection or removal at a later date by the Contractor's forces or others but shall be temporarily backfilled and resurfaced if applicable with a temporary pavement passable to traffic at no additional cost to the Owner.
- C. In addition to other safety requirements, a minimum of four (4) foot high fence will be incorporated around any shaft or manhole or other excavation left open at the end of a day's work.

1.2 MAINTENANCE OF TRAFFIC

- A. The Contractor is required to provide maintenance of traffic in conformance with the Ohio Manual of Uniform Traffic Control Devices and Item 614 of the current Construction and Material Specifications of the Ohio Department of Transportation.
- B. This work shall include providing suitable and satisfactorily trained and properly attired flagmen for use at any location where existing roadway is narrowed to a width of less than 2 full lanes (18 feet).
- C. The Contractor is also responsible for maintaining local access to all residences and businesses along the route of the construction and to provide whatever temporary materials are necessary to provide a safe, adequate drive surface.
- D. At all boring locations, Contractor shall provide suitable flashers, barricades, and traffic control devices as may be deemed necessary by the Engineer or the responsible authority in the case of the Department of Transportation, Turnpike Commission, or affected railroad. This may extend to maintain facilities on a 24-hour basis until such time as the areas are completely backfilled.

END OF SECTION 015526

SECTION 016600 - PRODUCT HANDLING AND PROTECTION

PART 1 - GENERAL

1.1 DELIVERY AND STORAGE OF MATERIALS

- A. The Contractor shall be responsible for delivery and storage of all materials.
- B. The Contractor shall coordinate with the Engineer on the arrangement for storing construction materials and equipment. Deliveries of all construction materials and equipment should be made at suitable times.
- C. The Contractor shall store all materials required for the performance of this contract at sites designated by the Engineer.
- D. All stockpiles shall be neat, compact, completely safe, and barricaded with warning lights if necessary.
- E. Precautions shall be taken so that no shade trees, shrubs, flowers, sidewalks, driveways or other facilities will be damaged by the storage of materials. The Contractor shall be responsible for the restoration of all stockpile sites to their original condition.
- F. Materials, tools and machinery shall not be piled or placed against shade trees, unless they shall be amply protected against injury therefrom. All materials, tools, machinery, etc. stored upon public thoroughfares must be provided with red lights at night time so as to warn the traffic of such obstruction.
- G. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the construction site may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefore must be provided by the Contractor at his expense. Private property shall not be used for storage purposes without written permission of the property owner or lessee, and copies of such written permission shall be furnished the Engineer. All storage sites shall be restored to their original condition by the Contractor at his expense.

END OF SECTION 016600

SECTION 017800 - FINAL COMPLIANCE AND SUBMITTALS

PART 1 - GENERAL

- 1.1 The following forms and related sign-offs shall be documented in accordance with provisions of the contract. These forms shall be completed by the Contractor and approved by the Owner before final retainer is approved for release. Forms for Items A to E will be attached to the Contractor's executed copy of the contract.
- A. Certificate of Substantial Completion (To be submitted at time of Substantial Completion).
 - B. Contractor's Certification of Completion.
 - C. Contractor's Affidavit of Prevailing Wage.
 - D. Consent of Surety Company for Final Payment.
 - E. Affidavit of Final Acceptance Date and Correction Period.
 - F. Before the OWNER will approve and accept the work and release the retainer, the CONTRACTOR will furnish the OWNER a written report indicating the resolution of any and all property damage claims filed with the CONTRACTOR by any party during the construction period. The information to be supplied shall include, but not be limited to, name of claimant, date filed with CONTRACTOR, name of insurance company and/or adjuster handling claim, how claim was resolved and if claim was not resolved for the full amount, a statement indicating the reason for such action.
 - G. DBE Subcontractor Participation Forms SR-EPA.7-8 (Applicable for WPCLF & WSRLA funded projects only).

END OF SECTION 017800

SECTION 017821 - CLEANING AND PROTECTION

PART 1 - GENERAL

1.1 GENERAL

- A. On or before the completion date for the work, the Contractor shall tear down and remove all temporary structures built by him, all construction plant used by him, and shall repair and replace all parts of existing embankments, fences or other structures which were removed or injured by his operations or by the employees of the Contractor. The Contractor shall thoroughly clean out all buildings, sewers, drains, pipes, manholes, inlets and miscellaneous and appurtenant structures, and shall remove all rubbish leaving the grounds in a neat and satisfactory condition.
- B. As circumstances require and when ordered by the Engineer, the Contractor shall broom sweep and/or hose-wash the hard surface of the road or any driveway or sidewalk surface on which construction activity under this contract has resulted in dirt or any other foreign material being deposited.
- C. Failure to comply with this requirement when ordered by the Engineer or his representative, may serve as cause for the Engineer to stop the work and to withhold any monies due the Contractor until such order has been complied with to the satisfaction of the Engineer.
- D. As the work progresses, and as may be directed, the Contractor shall remove from the site and dispose of debris and waste material resulting from his work. Particular attention shall be given to minimizing any fire and safety hazard from form materials or from other combustibles as may be used in connection with the work, which should be removed daily.
- E. The Contractor shall wash all windows and other glass surfaces, leaving all areas free from any dirt or dust resulting from construction activities.
- F. During and after installation, the Contractor shall furnish and maintain satisfactory protection to all equipment against injury by weather, flooding or breakage thereby permitting all work to be left in a new condition at the completion of the contract.

END OF SECTION 017821

SECTION 017823 - MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance information shall be submitted for all manufactured items, i.e. equipment, hardware, pumps, valves, motors, etc.
- B. This manual will either contain or make reference to all information that has been issued during the construction and start-up periods, as well as information necessary for the proper operation and maintenance of equipment.
- C. It shall be the responsibility of the Contractor who supplies such equipment to obtain from his vendors the required information and submit to the Engineer. This information will be accepted only if properly identified and only after it has been revised, where necessary, to conform to previous transmittals of the same material that have been "approved as noted" by the Engineer. All submittals shall be on 8-1/2" X 11" size paper or folded to that size.
- D. In general and where applicable, the information shall consist of, but not be limited to, six (6) sets of 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 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. Performance guarantee.
 - 10. Parts list.
 - 11. Recommended spare parts list with part and catalog number.
 - 12. Lubrication recommendations and instructions.
 - 13. Schematic wiring diagrams.
 - 14. Schematic piping diagrams.
 - 15. Instrumentation data.
 - 16. Drive dimensions and data.
 - 17. Control data.
 - 18. Operating instructions.
 - 19. Maintenance instructions including troubleshooting guidelines and preventative maintenance instructions with task schedule.
 - 20. Required tools and equipment for operation and maintenance.
 - 21. Safety considerations for O & M procedures.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORDS, DRAWINGS

PART 1 - GENERAL

1.1 RECORD DRAWINGS

- A. The Contractor shall furnish an authentic set of marked-up drawings showing the installation insofar as the installation shall have differed from the Engineer's drawings. The drawings shall be delivered to the Engineer for making revisions to the original drawings immediately after final acceptance by the Owner.
- B. The Contractor shall furnish dimensioned drawings indicating locations of all underground mechanical and electrical facilities.

1.2 SERVICE CONNECTION RECORDS

- A. The Contractor shall record the location of all service and property connections, new or existing, made to utilities constructed under this contract. Such records shall be turned over to the Owner upon completion of the work. The cost of making such records shall be included in the various unit or lump sum prices stipulated for the various items of the work.
- B. The location of each sewer connection as measured along the sewer from the nearest downstream manhole and its description with respect to the sewer shall be recorded. The record shall include the depth of new stubs for future connections and the depth of existing connections as measured from the surface grade. Also, the use of any vertical riser pipe shall be noted.
- C. The location of each water connection as measured along the water line from the nearest fire hydrant.

END OF SECTION 017839

SECTION 017850 - STARTING OF SYSTEMS/COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section includes general requirements for the commissioning of the Work and start-up and operation of systems and equipment.

1.2 SUMMARY

- A. Starting, testing, and operating the completed Work including systems and equipment until Substantial Completion is achieved and operation of the completed Work including systems or equipment are accepted by the Owner. Contractor shall cooperate and coordinate with the Owner in the operation, maintenance, and adjustment of the Work.

1.3 RELATED SECTIONS

- A. Section 013320, Submittals
- B. Section 013323, Shop Drawings, Product Data and Samples
- C. Section 017860, Testing, Adjusting and Balancing
- D. Section 017900, Maintenance

1.4 DEFINITIONS

- A. **Commissioning:** Commissioning is the series of activities, or process, necessary to ensure that systems and equipment are designed, installed, functionally tested, started up and capable of being operated and maintained to perform in conformity with the design intent for the facility improvements. Commissioning includes, but is not limited to factory testing, field testing, dry testing, wet testing, performance testing, manufacturer's checkout, start-up, and Operational Demonstration.

- B. **Factory Testing:** Factory Testing is performance testing, operation testing, or documentation verification conducted in the production facilities, or specialized test facilities, of the equipment supplier. Such testing shall conform to the requirements of the individual sections of the Contract Documents.

"Witnessed" Factory Testing shall mean that the testing is witnessed by the Owner or his designated representative.

- C. **Field Testing:** Field Testing is performance testing, operation testing, or documentation verification conducted in the field after installation, to provide comparison with the results obtained in the Factory Testing.

- D. Dry Testing: Dry Testing is performed by the Contractor without introducing either process material or other test material into the component, system, or unit process.
- E. Wet Testing: Wet Testing is testing performed by the Contractor utilizing test material in the component, system, or unit process. Tankage shall be filled with test material to operating level.
- F. Performance Testing: Performance Testing is performed by the Contractor to demonstrate system performance in accordance with the Project Manual requirements.
- G. Manufacturer's Check-Out: Field inspection, testing, adjustments, and sign off by the approved representative of the Manufacturer, indicating that the component, system, or unit process meets the manufacturer's requirements.
- H. Start-Up: Narrowly defined as placing a component, system, or unit process on-line. Start-up can be a commissioning activity or a normal operating activity.
- I. Operational Demonstration: A commissioning activity performed by the Contractor wherein the Contractor operates and maintains a fully functional component, system, or unit process for a period of time after stable operation has been achieved.

1.5 SUBMITTALS

- A. Quality Control Submittals:
 - 1. Field Installation Reports – Submit reports by Manufacturer's Representative in accordance with Paragraph 3.4 of this Section.
- B. Commissioning Documentation: Contractor shall prepare and submit all documentation for review and approval. The documentation shall include, but not be limited to, the following:
 - 1. Certification by the preparer that he/she is the person responsible for the data, and that the data is authentic and accurate.
 - 2. Certification by the Contractor or equipment or unit process systems supplier that the equipment or the unit process systems were operated continuously for the specified period and that the equipment or unit process systems operated in compliance with the specified operating conditions, parameters and performance: and that the equipment or unit process systems are suitable for Performance Testing.
 - 3. Pertinent background information shall include, but not be limited to, the following:
 - a. Equipment or unit process systems Started-Up and Commissioned
 - b. Start-Up and Commissioning dates

- c. Items or performance criteria tested clearly showing requirements and field data that verify requirements were met.
 - d. Names of witnesses for Start-Up and Commissioning.
 - e. Any repairs, corrections, or modifications required for the equipment or unit process systems to successfully complete Start-Up and Commissioning.
 - f. Loop diagrams accurately depicting the installed condition of instrumentation and controls.
 - g. Any other important background information.
4. Appendix
- a. A summary of all data used in the calculation, including source, formulas with all terms defined.
 - b. Calculations for all data submitted, fully defined.
 - c. Copies of all raw field data sheets, including those indicating sampling point locations, and notes.
 - d. Production and/or operational data.
 - e. Calibration procedures and worksheets for sampling equipment.
 - f. Copies of calibration records for instrumentation.
 - g. PLC Ladder logic documented with comments.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

- A. The Contractor shall inspect systems and equipment prior to each start-up and verify their readiness for start-up. Conditions hazardous to equipment or personnel shall be corrected by the Contractor prior to start-up of equipment.
1. Start-up operations shall not proceed using temporary power or temporary instrumentation and control wiring. All electrical and control connections shall be permanent and complete, and all such electrical components and equipment fully functional.
 2. Use of repair parts during start-up operations shall not be permitted, except in such situations where the actual on-site verification of such repair parts' operability is specified.
 3. The Contractor shall verify that all initial copies of the Maintenance and Operating Instructions have received an acceptable disposition as defined in Section 013320, and the only outstanding item is the field verification of the Instructions.
- B. On successful completion of Start-up, process flows and solids shall be used for commissioning the equipment and unit process systems to show the equipment and unit process systems function properly. Commissioning shall confirm the proper operation of the equipment and unit process systems with process fluids and process solids, adjustment shall be made, and the equipment or unit process systems shall be optimized and brought into compliance with design criteria in preparation for Operational Demonstration.

- C. The Contractor shall coordinate all Start-up and Commissioning activities for equipment and unit processes. The Contractor shall develop a detailed start-up and commissioning plan that includes the following as a minimum:
 - 1. Description of the overall general start-up and commissioning process.
 - 2. List of equipment and unit process systems included for start-up and commissioning activities.
 - 3. Detailed start-up and commissioning sequence of activities.
 - 4. Listing of staff and responsibilities for activities.
 - 5. Contractor shall use a form that will be provided by the Owner.

3.2 PREPARATION

- A. Prior to start-up of equipment or systems, all necessary test equipment shall be in place and operable.
- B. Approved representative(s) of the Manufacturer and Contractor shall be present for the initial start-up of systems or equipment.
- C. The Contractor shall request permission to start-up equipment, including electrical gear, and notify the Owner using a standard Start-Up Request form.
 - 1. The Start-Up Request shall be submitted to the Owner a minimum of 72 hours before the scheduled start-up. Requests shall be made during normal working hours.
 - 2. The Contractor shall provide all information in the first Section of the Start-Up Request form.
 - 3. The Owner will indicate approval or disapproval of the request.
 - 4. Approval of the request is based solely on impact on plant operations. Approval does not relieve the Contractor of any responsibility for plant and personnel safety.
 - 5. The Contractor shall obtain the approved Start-Up Request prior to the system or equipment start-up.
 - 6. If training is to be conducted in conjunction with the start-up this should be indicated on the Start-Up Request form. All requirements of Section 017890, Instruction of the Owner's Personnel must be met for training sessions.
 - 7. Start-ups performed at the direction of the Contractor, per paragraph 3.3(G) of this Section, do not require advance notification to the Engineer.
- D. Normal installation checks, such as for rotation, are not considered start-ups and do not normally require start-up notification. For all equipment and systems so designated in the Contract Documents, or so designated by the Engineer, such checks shall be under the supervision of the approved representative of the manufacturer, and shall be reviewed by the Engineer.
 - 1. All electrical apparatus which is energized shall be clearly marked.

3.3 CONDUCT OF START-UP AND COMMISSIONING

- A. Start-up:
1. All initial start-ups of equipment or systems shall be performed under the technical direction of the approved representative of the manufacturer.
 2. Any lack of readiness of associated systems or failure of a system or equipment previously started prior to the date of Final Completion of the Project shall require additional initial start-up service to be performed, under the direction of the approved representative of the manufacturer.
 3. The Contractor shall repair, replace or modify any equipment or system which fails to perform as specified in the Contract Documents. Such repair, replacement or modification of deficient work shall be performed under the terms of the General Conditions.
 4. During the Operational Demonstration period per Section T01670, Operational Demonstration and at other times when the system is on-line and an integral part of the Wastewater Treatment Plant operations and process, start-ups shall be performed as required by the Contractor.
- B. The Contractor shall be responsible for commissioning all work. Final acceptance shall be by the Owner.
- C. The Contractor is responsible for the performance and operation of the systems and equipment during commissioning.
- D. When Owner personnel are operating systems or equipment, the Contractor shall make available, at all times, persons knowledgeable about the systems or equipment to direct the Owner personnel in its operation.
- E. The Contractor shall make all adjustments and corrections necessary to achieve normal, stable operation of systems. Adjustment and corrections shall be in accordance with Sections 017860, Testing, Adjusting, and Balancing and 017900, Maintenance.
- F. Any failures of equipment or systems operated under the direction of the Contractor shall be considered deficiencies and shall be corrected in accordance with the General Conditions.
- G. During the Operational Demonstration period as defined in Section T01670, Operational Demonstration and at other times, the work will be on-line and an integral part of the Wastewater Treatment Plant operations and process. The Owner maintains control of Wastewater Treatment Plant operations and processes at all times. Therefore:
1. The Contractor shall not commence, resume, terminate, or suspend the operations without the permission of the Owner and only in a sequence and manner suitable to the Owner.

2. The Contractor shall immediately, on a 24 hour per day, 7 day per week basis, adjust or repair any malfunction in the work which in the opinion of the Owner jeopardizes or may jeopardize the proper operation of the Wastewater Treatment Plant.
3. The Contractor shall not start-up, shut down, adjust, or otherwise alter the operation of any component, system, or unit process without the permission of the Owner except in the case of an emergency and in accordance with the General Conditions.

3.4 QUALITY CONTROL

A. Reports of the Approved Representative of the Manufacturer:

1. The approved representative of the manufacturer shall prepare a daily report on each site visit for each system or item of equipment inspected, adjusted, started-up, or worked on.
2. The report shall state the purpose of the visit, the representative's observations and conclusions, and recommendations for further visits or action.
3. The reports shall be submitted in accordance with Section 013320, Submittals within 3 days of the visit.

END OF SECTION 017850

SECTION 017860 – TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION

- A. This Section includes general requirements for the conduct of testing, adjusting and balancing.

1.2 SUMMARY

- A. Testing, adjusting and balancing shall be performed in accordance with recognized industry standards and as specified in the Contract Documents.

1.3 RELATED DOCUMENTS

- A. Section 013320, Submittals
- B. Section 017850, Starting of Systems / Commissioning

1.4 DEFINITIONS

- A. Dry Testing:

Dry Testing is performed by the Contractor without introducing either process material or other test material into the component, system, or unit process.

- B. Wet Testing:

Wet Testing is performed by the contractor utilizing test material in the component, system, or unit process. Process Tankage shall be filled with test material to operating level.

- C. Performance Testing:

Performance Testing is performed by the Contractor to demonstrate system performance in accordance with Contract Document requirements.

- D. Factory Testing:

Factory Testing is performance testing, operation testing, or documentation verification conducted in the production facilities, or specialized test facilities, of the equipment supplier. Such testing shall conform to the requirements of individual sections of the Contract Documents.

- E. Field Testing:

Field testing is performance testing, operation testing, or documentation verification conducted in the field after installation, to provide comparison with the results obtained in the factory testing. All field testing shall be witnessed by the Contractor.

1.5 SUBMITTALS

A. Quality Control Submittals:

Test Reports shall be submitted to the Contractor within 48 hours of the completion, suspension, or termination of the test unless otherwise approved by the Contractor. Submit Test Reports per Section 013320, Submittals.

B. Project Record Documents:

Test, adjustment and balancing data shall be recorded by the Contractor per the Specifications.

1.6 REGULATORY REQUIREMENTS

- A. The requirements of this Section are in addition to those specification by Regulatory Agencies. Except as specification prohibited or modified by the Specifications, comply fully with all requirements of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. The Contractor shall supply all materials and equipment used in testing, adjusting and balancing.
- B. Materials and equipment used shall be of good quality and suitable for the intended service. The use of miscellaneous items found at the job site is not acceptable.
- C. Select capacity or range of test equipment to provide meaningful test results. Select pressure or differential pressure gauges so that test pressure is 50% to 75% of the gauge capacity.

2.2 FABRICATION

- A. The Contractor shall fabricate temporary equipment used in testing.

2.3 SOURCE QUALITY CONTROL

- A. All test instruments shall be calibrated to recognized standards, traceable to NBS standards, by the instrument manufacturer or a qualified independent calibration laboratory. Submit instrument calibration data for the Contractor's review prior to the test.

PART 3 – EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

- A. Verify the equipment, component, or system is completely and correctly installed before beginning tests.
- B. Review the design and installation of the system or equipment to ensure that the proposed test will not result in a hazard to personnel or equipment.

3.2 PREPARATION

- A. Design, fabricate, and install test equipment before commencing the test.
- B. Where required by the Contract Documents, or when required by the Contractor, an approved representative of the manufacturer shall be on site to provide technical direction.
- C. Notify and obtain approval of the Contractor not less than 72 hours prior to each test. See Section 017850, Starting of Systems/Commissioning.

3.3 TESTING, ADJUSTING, AND BALANCING

- A. Dry Testing:
 - 1. All equipment and systems shall be tested, adjusted, aligned, lubricate, and balanced in accordance with the manufacturer's instructions prior to witnesses testing.
 - 2. Test individual components prior to testing the system of which they are a part.
- B. Wet Testing:
 - 1. Test all equipment and systems with a test material, such as potable water, rain water or lake water. If lake water is available, Contractor shall submit a State of Ohio, Temporary Water Withdrawal Facility Registration Form, with the Ohio Department of Natural Resources, Columbus, Ohio. Potable water shall be used to test potable waterlines. All costs, including materials and equipment, for delivery of the test material shall be at the Contractor's expense. Any cost to the Owner for test material shall be backcharged to the Contractor. Test materials obtained from the Owner are not guaranteed as to their pressure, quality or quantity available. Test each component or item of equipment to demonstrate compliance with the design criteria or range of criteria.
 - 2. After testing, adjusting, and balancing, test all equipment and systems for a minimum of 72 hours under the design operating conditions utilizing test material.
 - 3. Suspend or secure all tests in the event of test failures, or if hazardous conditions occur. Make repairs, replacements, or adjustments and re-start test in its entirety.

4. The Contractor will dispose of the test material to the approval of the Owner at no additional expense to the Owner.
5. The Contractor shall clean all equipment systems and structures upon conclusion of testing, unless otherwise directed by the Owner, at no additional expense to the Owner.

C. Factory Testing

1. Conform to the specific test requirements, as given in individual sections of the Project Manual.
2. If equipment or materials fail or if testing must be extended beyond the original approved duration due to additional testing required as a result of the appearance of defect in the work or if testing could not be completed or conducted as outlined in the approved schedule, the cost of such re-testing, including additional or extended conveyance and maintenance of the Owner shall be borne by the Contractor.
3. Delays to the Contractor's Detailed Construction Network as specified in the Contractor's Progress Schedule due to failed, delayed or extended testing and the need for subsequent re-testing shall not entitle the Contractor to an extension of the contract time or additional cost. If the scheduling of the re-testing causes any activities shown on the Contractor's Detailed construction network to fall behind schedule to the extent that specific milestones or completion dates are in jeopardy, the Contractor shall prepare a recovery schedule and submit such to the Owner prior to the re-testing of the equipment.

D. Field Testing

1. Conform to the specific test requirements as given in individual sections of the Project Manual. Provide all necessary assistance to Owner personnel, at no additional cost to the Owner. All field testing shall be witnessed by the Owner.

3.4 FIELD QUALITY CONTROL

- A. Submit Test Reports for all tests, successful or unsuccessful in accordance with Section 013320, Submittals.
- B. Test shall be repeated per the General Conditions if results of testing fail to meet test criteria, whether the failure is identified in the field at the time of testing or through Test Report review.

END OF SECTION 017860

SECTION 017870 – OPERATIONAL DEMONSTRATION

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION

A. Work Included:

A demonstration of the operation of all systems is required. This Operational Demonstration shall be conducted, coordinated and recorded by the Contractor in accordance with the requirements specified herein.

1.2 SUMMARY

A. Section Includes:

1. Requirements for the conduct and reporting of the Operational Demonstration. This work is additional to any other installation, shop and factory testing, field testing, dry testing, wet testing, performance testing, balancing, or adjustments required elsewhere in the Contract Documents.

1.3 RELATED SECTIONS

- A. Section 017850, Starting of Systems / Commissioning
- B. Section 017860, Testing, Adjusting and Balancing

1.4 DEFINITIONS

- A. Operational Demonstration is defined in Section 017850, Starting of Systems/Commissioning.
- B. Operational Demonstration Log: A chronological record of the status of the system and equipment during the Operational Demonstration. All changes in status or system parameters, adjustments, and results of tests shall be included. Entries shall be made, noting the date and time, at the occurrence of each event. Operational Demonstration Logs shall be on a form acceptable to the Owner.

1.5 SUBMITTALS

A. Quality Control Submittals:

1. Test Reports:
 - a. Operational Demonstration log per subparagraph 3.4.A of this Section.
 - b. Report of Operational Demonstration per subparagraph 3.4.B.2 of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

- A. Before beginning the Operational Demonstration, the Contractor shall verify that:
1. All required construction activities are completed, including any activities by any entity that would interrupt the normal operations of the system. Coordinate with the Owner to resolve such conflicts.
 2. All required testing, adjusting, and balancing is completed in accordance with Section 017860, Testing, Adjusting and Balancing.
 3. Adequate parts and supplies for routine maintenance and replacement are on hand to support system operation through the demonstration period.
 4. Start-up of equipment and systems per Section 017850, Starting of Systems/Commissioning has been completed.
 5. All Repair Parts and Maintenance Materials have been delivered to the Owner.
 6. Certain Instruction of Operating Personnel (training) has been scheduled to take place during the Operational Demonstration where specified. All other training will occur within 45 days prior to initiation of Operational Demonstration. The training of Operations Personnel shall be scheduled to take place during the first half of the demonstration period, and the remaining training of Electrical, Instrumentation and Maintenance Personnel shall be scheduled to be complete before the end of the Operational Demonstration.
 7. The field verification of the Initial Maintenance and Operating Inspections has been completed in accordance with the Specifications.

3.2 PREPARATION

- A. The Contractor shall provide two (2) representatives, a prime and an alternate, who will be responsible for the Operational Demonstration. These representatives will:
1. Demonstrate the operation of systems and equipment to the Owner's operating personnel.
 2. Direct maintenance and repair work, by either the Contractor or the approved representative of the manufacturer of the system components and equipment.
 3. Maintain a log of the Operational Demonstration, as described herein.
 4. Be available at all times during the Operational Demonstration to perform these duties.

- B. Submit start-up notification to the Owner per Section 017850, Starting of Systems/Commissioning.

3.3 OPERATIONAL DEMONSTRATION

- A. The Contractor shall perform an Operational Demonstration of the work. Unless otherwise specified, the Operational Demonstration shall be a continuous 30-day, (720 hours) period during which the work is operated and maintained in a continuously on-line, fully functional process status.
- B. The Operational Demonstration shall encompass the entire work, or the portion thereof designated for Substantial Completion.
- C. Filling, draining, heating or cooling to temperature, stabilizing, adjusting, or other start-up activity time shall not be counted as Operational Demonstration time.
- D. During the Operational Demonstration period, the Contractor shall provide 24 hour per day, 7 days per week on-site supervision, in addition to the requirements of supervision as stated in the General Conditions. The Contractor shall provide labor and sufficient material to fully operate and maintain the work 24 hours per day, 7 days per week.
- E. When systems are on-line, conform to the requirements of Section 017850, Starting of Systems/Commissioning, Paragraph 3.3(G) for alterations in the Wastewater Treatment Plant processes.
- F. During the first half of the Operational Demonstration of the system and equipment, Owner personnel will observe the Contractor's personnel operating systems and equipment. The Contractor shall cooperate with this familiarization process.
- G. After the first 15 days of Operational Demonstration of system and equipment, operation of equipment will be assumed by the Owner personnel, under the direction of the Contractor, as described in Section 017850, Starting of Systems/Commissioning.

The Owner remains in control of the plant processes per Section 017850, Starting of Systems/Commissioning. The Contractor shall provide technical direction in the operation of equipment and systems.

- H. Start-up and operation of the system and all associated equipment shall be in accordance with the Initial Maintenance and Operating Instructions which have received an acceptable disposition from the Owner. If deviations from these instructions are necessary, these shall be noted in the Operational Demonstration Log, and subsequently submitted as revisions to the Maintenance and Operating Instructions. During the period of time between the completion of the Operational Demonstration and the Date of substantial Completion, the system and equipment will be operated and maintained under the requirements of the second half of the Operational Demonstration. The Owner will not assume full responsibility for maintenance of the system and equipment until all conditions for Substantial Completion have been satisfied and both the Contractor and Owner and accepted the Certificate of Substantial Completion.

- I. All required maintenance and servicing prior to the Date of Substantial Completion shall be performed by the Contractor at the specified interval and as necessary. All maintenance and servicing shall be noted in the Operational Demonstration Log.
- J. All outages of equipment, system(s), or the plant should be noted in the Operational Demonstration Log. Plant outages are considered a part of normal plant operation and will not invalidate the Operational Demonstration. The Contractor is responsible for the safe and orderly shutdown and restart of equipment as necessary in the event of an outage. Outage time is not to be included in the Operational Demonstration period.
- K. The Contractor shall attend operational coordination meetings as called by the Owner to review operating conditions of equipment and systems.
- L. If, during the Operational Demonstration, any part of the work fails to fully conform to the requirements of the Contract Documents, the Operational Demonstration shall be considered to have failed, and the work shall not be considered to be Substantially Complete as defined in the General Conditions and the Owner shall so notify the Contractor in writing. If, during the Operation Demonstration, the provisions of the General Conditions are evoked to stop the work, the Operational Demonstration will also be considered to have failed.
- M. Upon failure of the Operational Demonstration, the Contractor shall promptly remedy any defects in the work and shall promptly reschedule and re-start the complete 30 day, (720 hours) Operational Demonstration time period. No Operational Demonstration time will be considered to have accrued to any part of the work by reason of a failed Operational Demonstration.
- N. During the Operational Demonstration, the Owner may require or permit the Operational Demonstration to be suspended:
 - 1. As provided in the General Conditions.
 - 2. Upon the written request of the Contractor to correct or adjust the work when in the judgment of the Owner such required correction or adjustment is insufficient to deem the Operational Demonstration to have failed.
 - 3. If the Operational Demonstration is suspended for any reason except failure, Operational Demonstration time shall accrue to the work from the time of the beginning of the Operational Demonstration to the time of the suspension.

3.4 REPORTING

- A. Daily: Copy of the Operational demonstration Logs shall be submitted to the Owner by 9:00 a.m. the following day.
- B. Within two (2) weeks of the termination or completion of the Operational Demonstration, the Contractor shall submit for approval:
 - 1. Any changes to the Maintenance and Operating Instructions.
 - 2. A report of the Operational Demonstration, describing the equipment utilized and any repairs, modifications, adjustments, or other work performed during the demonstration period.
- C. In the event the conduct of the Operational Demonstration or the submittals are unacceptable to the Owner, the Contractor shall perform the additional work or demonstrations required per the General Conditions.

END OF SECTION 017870

SECTION 017900 - MAINTENANCE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section provides general requirements for the maintenance of equipment in the field. Storage maintenance requirements are provided by Section 016600, Product Handling and Protection. Specific maintenance requirements are provided by manufacturers per individual Sections in the Project Manual.
- B. Maintenance is performed to ensure delivery to the Owner of equipment in an undeteriorated and fully serviceable condition.
- C. This Section also includes requirements for preventive and corrective maintenance during operation of the equipment prior to the commencement of the Warranty period.

1.2 RELATED SECTIONS

- A. Section 016600, Product Handling and Protection.

1.3 DEFINITIONS

- A. Storage maintenance consists of establishing and maintaining the environment required by the stored materials and performing periodic servicing.
- B. Preventive maintenance consists of activities performed on a periodic basis to maintain operating or operational items or equipment.
- C. Corrective maintenance consists of correcting faults or failures in an item or equipment. This may include adjustments or replacement of defective parts.

1.4 SUBMITTALS

- A. The Maintenance Log shall be submitted to the Owner upon completion of the Operational Demonstration and before the start of the Warranty period.
- B. No submittals are required by this Section, except as noted above. Maintenance schedules and practices shall conform to approved submittals required by individual Sections in the Project Manual.

PART 2 – PRODUCTS

2.1 COMPONENTS, ACCESSORIES AND REPAIR PARTS

- A. All components, accessories and repair parts used in maintenance shall be supplied by or approved by the equipment manufacturer for use on the equipment.

2.2 SOURCE QUALITY CONTROL

- A. All parts and materials used in maintenance shall meet the quality control requirements provided for the item or equipment. These are specified in individual Sections of the Project Manual.

PART 3 – EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

- A. The Contractor shall prepare a Maintenance Log for all equipment.
 - 1. This log shall include a list of required maintenance services and inspections, as provided by the manufacturer and submitted under individual Sections of the Project Manual.
 - 2. The Maintenance Log shall include checklists for the periodic services and inspections required.
 - 3. The Contractor shall initial and date the requisite log entries upon completion of the individual servicing or inspection.
 - 4. The Maintenance Log shall be located in the Contractor's Field Office and shall be available for review by the Owner until it is submitted for record purposes upon completion of the Operational Demonstration and the start of the Warranty period.

3.2 PREPARATION

- A. Before removing an item from storage per Section 016600, the Contractor shall review the installed location. Protection and services at the installed location must meet the equipment storage requirements.
- B. Before moving equipment to the installed location, the Contractor shall have available materials for temporary shelter or services required to establish the proper storage environment after the equipment is installed until it is placed in service in its final operating environment.

3.3 PERFORMANCE OF MAINTENANCE

- A. The Contractor shall perform all storage and preventive maintenance and inspections required by the manufacturer at the specified intervals.
- B. When notified by the Owner, the Contractor will perform corrective maintenance. This will be performed at no cost to the Owner. Corrective maintenance will be performed per manufacturer's written instructions or by direction of the approved representative of the manufacturer.

- C. The Contractor shall restore equipment to its operating condition before start-up.
- D. The Contractor shall re-establish storage maintenance in the event an item or equipment is removed from service.
- E. When the equipment warranty becomes effective, the Owner will assume responsibility for its maintenance.

END OF SECTION 017900

SECTION 018000 - SYSTEM PERFORMANCES

PART 1 - GENERAL

1.1 GENERAL

- A. It is the intent of this Contract that the final installation shall be complete in all respects.
- B. The Contractor shall be responsible for all minor details, whether or not shown on the Drawings or specifically included in these Specifications.

1.2 BUILDINGS

- A. The building and components shall function properly and in accordance with the plans, specifications and industry standards.
- B. The following components are included, but not necessarily limited to, the following:
 - 1. Roofing
 - 2. Doors
 - 3. Windows
 - 4. Painting Systems
 - 5. Floor Coverings
 - 6. Equipment
 - a. Architectural
 - b. Mechanical
 - c. Electrical

1.3 FACILITIES

- A. The facilities and equipment shall function properly and in accordance with plans, specifications and industry standards.
- B. The following equipment includes, but is not necessarily limited to, the following:
 - 1. Valves
 - 2. Pumping Equipment
 - 3. Rotating Equipment
 - 4. Aeration Equipment
 - 5. Flotation Equipment
 - 6. Blowers
 - 7. Telemetry
 - 8. HVAC
 - 9. Electrical

1.4 CERTIFICATION

- A. The Contractor shall provide written certification from the manufacturers and/or installers that the various major components are in working order or have been installed in accordance with the manufacturer's instructions.

END OF SECTION 018000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 035300 "Concrete Topping" for emery- and iron-aggregate concrete floor toppings.
 - 2. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
 - 3. Section 321313 "Concrete Paving" for concrete pavement and walks.
 - 4. Section 321316 "Decorative Concrete Paving" for decorative concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site to comply with requirements of Division 1 Section "Project Meetings"
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 1. Location of construction joints is subject to approval of the Architect.
- E. Samples: For waterstops, vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer, manufacturer, and testing agency.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Fiber reinforcement.
 6. Waterstops.
 7. Curing compounds.
 8. Bonding agents.
 9. Adhesives.

10. Vapor retarders.
11. Joint-filler strips.
12. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

G. Field quality-control reports.

H. Minutes of pre-installation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301
 - 2. ACI 117

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials complying with U.S. Product Standard PS-1 “B-B (Concrete Form) plywood” Class I, Exterior Grade or better mill oiled and edge sealed with each piece bearing legible inspection trademark.
 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.
- E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars, cut true to length with ends square and free of burrs.

- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray or white.
 2. Fly Ash: ASTM C 618, Class F
 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C 260/C 260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- F. Water: ASTM C 94/C 94M [and potable].

2.6 FIBER REINFORCEMENT

- A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.

2.7 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: As indicated.
 - 2. Dimensions: [4 inches by 3/16 inch thick (100 mm by 4.75 mm thick)] [6 inches by 3/8 inch thick (150 mm by 10 mm thick)] [9 inches by 3/8 inch thick (225 mm by 10 mm thick)] <Insert dimensions>; nontapered.
- B. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: As indicated.
 - 2. Dimensions: [4 inches by 3/16 inch thick (100 mm by 4.75 mm thick)] [6 inches by 3/8 inch thick (150 mm by 10 mm thick)] [9 inches by 3/8 inch thick (225 mm by 10 mm thick)] <Insert dimensions>; nontapered.

2.8 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials [Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:]
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Slag Cement: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.05 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Structural Concrete: Normal Weight Concrete
 - 1. Minimum Compressive Strength: As indicated at 28 days.
 - 2. Maximum W/C Ratio: As Indicated.
 - 3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 - 4. Air Content: [6] percent, plus or minus 1.5 percent at point of delivery for nominal maximum aggregate size.
- B. Foundation Walls: Normal-weight concrete.
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.45
 - 3. Slump Limit 8 for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

4. Air Content: [6] percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

C. Concrete Toppings: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi)] at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd. (309 kg/cu. m)
3. Slump Limit: 4 inches , plus or minus 1 inch.
4. Air Content: [6] percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished toppings to exceed 3 percent.
6. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd..
7. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of [4.0 lb/cu. yd. (2.4 kg/cu. m)] [5 lb/cu. yd. (3 kg/cu. m)] <Insert dosage>.

2.14 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M[and ASTM C 1116/C 1116M], and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. [Class A, 1/8 inch (3.2 mm)] <Insert dimension> for smooth-formed finished surfaces.
 - 2. [Class B, 1/4 inch (6 mm)] [Class C, 1/2 inch (13 mm)] [Class D, 1 inch (25 mm)] <Insert dimension> for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Roughen surface and Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 .
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 - 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces [indicated] [exposed to view] [or] [to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system] <Insert locations>.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155 , for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 - d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
 3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch
- C. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces [indicated] [where ceramic or quarry tile is to be installed by either thickset or thinset method]. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases as indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer[unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project].
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than 28 days' old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches = deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area 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.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas 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. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.

4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; [ASTM C 173/C 173M, volumetric method, for structural lightweight concrete;]one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi
 10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 034000 - PRECAST CONCRETE TANKS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

- A. The precast concrete manufacturer shall be NPCA (National Precast Concrete Association) certified in order to provide consistent and high quality precast concrete products.

1.2 DESCRIPTION OF WORK

- A. This section covers the work necessary for the design, submittals, construction and testing of the concrete structures as described in the following specifications and as shown on the contract documents.
- B. Furnish all labor, materials, equipment, scaffolding, etc. required to construct floor slab, walls, walkways, stairways, ladders and hand railings as shown on the contract drawings and specified herein.
- C. The entire tank structure shall be built by a specialty tank contractor, using its own trained personnel and equipment.

1.3 SUBMITTALS

- A. Submit shop drawings of all concrete structures, including joint designs and related details for field assembly. Include certification of conformance with contract documents and the appropriate ASTM specification.
- B. Submit structural design calculations for the tank structure to the Engineer for approval prior to fabrication or erection. The design calculations shall be signed and sealed by a registered Professional Engineer licensed in the State that the project is located in. The engineer's approval does not in any way relieve the Contractor of his responsibility for the accuracy and completeness of the project.
- C. Alternate manufacturers shall provide drawings, details, and manufacturer's qualifications a minimum of two (2) weeks prior to bid to be considered a pre-approved manufacturer.

1.4 MANUFACTURER

- A. The concrete tank manufacturer shall be Mack Industries, Inc., Valley City, Ohio, or approved equal.

PART 2 - PRODUCTS

2.1 DESIGN

- A. A Professional Engineer registered in the state of the project location shall provide complete structural design and buoyancy calculations. Calculations shall be sealed and signed.
- B. All dead loads, live loads, flotation, non-gravity loads, erection, and temperature factors shall be considered in the design of the tank.
- C. Geotechnical soil reports, water table and flood elevations shall be considered.
- D. The tank structures shall be precast post-tensioned concrete and shall meet or exceed the requirements of ACI-318 (latest edition) as modified by ACI-350 (if applicable).
- E. Bolted wall panels shall not be used. Tank designs that rely on bolted connections will not be considered.

PART 3 - EXECUTION

- A. The entire installation and construction of the precast post-tensioned concrete structure shall be in strict accordance with the approved drawings, layouts, details, and structural calculations.

END OF SECTION 034000

SECTION 034000.02 - PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Under this section, the Contractor shall furnish and construct precast concrete manholes, including drops and manhole stacks of types and at locations shown on the Drawings and/or scheduled.
- B. This section includes additional excavation to widen and deepen sewer trenches for manhole construction, furnishing and installing concrete of classes called for, brick, Portland cement mortar, reinforcing steel, precast concrete pipe, integral base sections, bottom riser sections, transition sections, riser sections, eccentric cones, flat slab tops and adjusting rings, flexible manhole connections, pipe for drop connections, plugging lifting holes, pointing joints, forming channels through manhole bottoms, making watertight connections to new and existing sewers, and other work incidental to manhole construction.

1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.4 DEFINITIONS

- A. The various types of manholes are as shown on the Drawings or in the Standard Details.

1.5 SUBMITTALS

- A. Manufacturer's Shop Drawings, Certificates and Technical Data
 - 1. Precast Concrete Manhole Sections and Specials
 - 2. Flexible Joints
 - 3. Concrete Materials
 - 4. Reinforcing Materials
- B. Supplier's Certificates
 - 1. Reinforced Concrete Pipe Manhole Sections.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Precast Concrete Pipe Manhole Sections

1. Precast concrete pipe manhole sections, transition sections, eccentric cones, flat slab tops, and adjusting rings shall conform to ASTM Specification C 478. Reinforcing in transition sections shall be equal to that specified for wall sections of the larger diameter.
2. Joints shall be O-ring type conforming to ASTM Specification C 443.
3. The standard length of riser sections shall be 48 in. Lengths of 32 in. or 16 in. shall be used to meet required dimensions and as specified.
4. Openings for connecting pipes in riser sections, bottom riser sections, and integral base sections, and for access in flat slabs shall be preformed or cored by the manufacturer. 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.
5. Specified manhole steps shall be factory installed to provide a continuous ladder of 16 in. c/c 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 nonshrink mortar to insure a watertight joint. If the outer surface of the pipe wall is pierced, the patch shall be completely covered with a bituminous sealer.
6. 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.

B. Manhole frames, covers, and steps utilized shall comply with their respective specification.

C. Mortar

1. Mortar used for the structures herein specified shall conform to Specifications for Mortar for Unit Masonry, ASTM Designation C 270 Type S, containing no masonry cement. The mortar shall be composed of one part Portland cement to two parts sand by volume.
2. Materials for nonshrinking grout shall conform to CRD-C "Corps of Engineers Specifications for Non- Shrink Grout". Approved products are "Sauereisen F-100 Grout" by Sauereisen Cements Co.; "Five Star Grout" by U.S. Grout Corporation; "Masterflow 713" by Master Builders; "Euco N-S" by Euclid Chemical Company.

D. All cast-in-place concrete used for forming channels in manhole bottoms shall be Class B as specified in the Section 030000.

E. Reinforcing steel used in cast-in-place concrete shall meet the requirements of Section 030000.

F. Flexible joints for precast manhole pipe openings herein specified shall conform to ASTM designation C 923, "A-Lok" Type as manufactured by A-Lok Products; or an approved equivalent.

- G. The pipe and size for manhole drops shall conform to the Standard Details and its respective specification contained herein.
- H. Brick used for catch basin and manhole construction shall conform to Specifications for Sewer and Manhole Brick (made from clay or shale), ASTM Designation C 32, and shall be Grade "MS" unless otherwise specified.

PART 3 - EXECUTION

3.1 LOCATION AND CONSTRUCTION

- A. Location and type of manhole 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 under this section.

3.2 EXCAVATION

- A. Excavation for manhole construction shall be prepared as directed in the applicable paragraphs of Section 310000.

3.3 INSTALLATION OF INTEGRAL BASE SECTIONS

- A. Class B concrete shall be poured so as to provide a minimum of 4-in. thick pad under the entire area of the manhole base. Place the manhole on the pad before the concrete is completely set so that final leveling adjustment can be made.
- B. 6" Granular backfill bedding can be used in lieu of Class B concrete.

3.4 CHANNELING MANHOLE BOTTOMS

- A. The bottoms of all manholes shall be channeled to conduct flow in the planned direction. Channels shall be the true shape of the lower half of the sewer pipe and shall match inverts of connecting pipe at the manhole wall.
- B. In integral base sections (only) channels may be constructed using brick and Portland cement mortar. Mortar shall be 3/4-in. thick minimum between bricks and between bricks and concrete and 1-in. thick minimum on all exposed surfaces.

3.5 PRECAST CONCRETE RISER SECTIONS

- A. The shortest length of riser section to be incorporated into the manhole shall be installed immediately below the flat slab top.
- B. Pipe section joints shall be pointed and lifting holes filled with nonshrinking mortar.

3.6 SPECIAL PROVISIONS

- A. The intent of this section is to identify requirements only associated with improvements, or rehabilitation of existing sewerage manholes.
- B. The installation of bottom riser sections shall be as follows:
 - 1. The base shall be of Class A concrete as specified in Section 03310, 9 in. thick minimum placed on undisturbed earth.
 - 2. 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.
 - 3. On straight runs the Contractor may carry the sewer pipe through the manhole and break out the top half after the fill concrete has set. In all cases the sewer pipe shall extend through the manhole wall to the inside face.
- C. All manholes for sanitary sewers shall have an application of Thoro-Seal or other approved coating (any color but gray).

END OF SECTION 034000.02

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes joint sealants for the following locations:
 - 1. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below:
 - a. Control and expansion joints in unit masonry.
 - b. Perimeter joints between materials listed above and frames of doors and windows.
 - c. Other joints as indicated.
 - 2. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - e. Perimeter joints of toilet fixtures.
 - f. Other joints as indicated.
- B. Related Sections: The following Sections contain requirements that relate to this Section:

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

- B. Product data from manufacturers for each joint sealant product required.
 - 1. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.
- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch (13-mm) wide joints formed between two 6-inch (150-mm) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- F. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.
- G. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Pre-Installation Conference: Conduct conference at Project site to comply with requirements of the Division 1 Section covering this activity.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.

2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4 deg C).
3. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

B. Products: Subject to compliance with requirements, provide one of the products specified in each Elastomeric Joint Sealant Data Sheet.

2.3 LATEX JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

- B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acrylic-Emulsion Sealant:
 - a. "AC-20," Pecora Corp.
 - b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
 - c. "Tremco Acrylic Latex 834," Tremco, Inc.

2.4 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
 - 1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.
- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acoustical Sealant:
 - a. "SHEETROCK Acoustical Sealant," United States Gypsum Co.
 - b. "AC-20 FTR Acoustical and Insulation Sealant," Pecora Corp.
 - 2. Acoustical Sealant for Concealed Joints:
 - a. "BA-98," Pecora Corp.
 - b. "Tremco Acoustical Sealant," Tremco, Inc.

2.5 PREFORMED FOAM SEALANTS

- A. Preformed Foam Sealants: Manufacturer's standard preformed, precompressed, impregnated open-cell foam sealant manufactured from high-density urethane foam impregnated with a nondrying, water repellent agent; factory-produced in precompressed sizes and in roll or stick form to fit joint widths indicated and to develop a watertight and airtight seal when compressed to the degree specified by manufacturer; and complying with the following requirements:
 - 1. Properties: Permanently elastic, mildew-resistant, nonmigratory, nonstaining, and compatible with joint substrates and other joint sealants.
 - 2. Impregnating Agent: Manufacturer's standard.

3. Density: Manufacturer's standard.
4. Backing: None.
5. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Emseal," Emseal Corp.
 - b. "Wil-Seal 150," Wil-Seal Construction Foams Div., Illbruck.

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
 2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf (40 kg/cu. m) and tensile strength of 35 psi (240 kPa) per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.
 3. Any material indicated above.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Remove laitance and form release agents from concrete.
 - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
 - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 2. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.
- G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

PRODUCT DATA SHEET 1 - ELASTOMERIC JOINT SEALANT

- A. Elastomeric Joint Sealant Designation: ES# 1
- B. Base Polymer: Urethane.
- C. Type: S (single component).
- D. Grade: NS (nonsag).
- E. Use Related to Exposure: NT (nontraffic).
- F. Available Products:
 - 1. "Chem-Calk 900"; Bostik Construction Products Div.
 - 2. "Chem-Calk 2639"; Bostik Construction Products Div.
 - 3. "Vulkem 116"; Mameco International, Inc.
 - 4. "Vulkem 921"; Mameco International, Inc.
 - 5. "Dynatrol I"; Pecora Corp.
 - 6. "Permapol RC-1"; Products Research & Chemical Corp.
 - 7. "Sikaflex-1a"; Sika Corp.
 - 8. "Sikaflex-15LM"; Sika Corp.
 - 9. "Sonolastic NP 1"; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
 - 10. "Dymonic"; Tremco Inc.

END OF SECTION 079200

SECTION 099700 - SPECIAL COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

1.2 SUMMARY

- A. Work covered by this Section includes the furnishing and application of paints, stains, primers, varnishes and other finish, decorative and protective coatings.
- B. Shop priming and factory prefinishing are required on some, but not necessarily all, of the items described in other sections.
- C. Extent of work:
 - 1. All new process equipment and process piping.
 - 2. All building and room surfaces as indicated on the plans or as scheduled.
 - 3. All conduits, ducts, drains, etc. of other trades unless such product is deemed having an acceptable factory pre-finish, under the following conditions:
 - a. When exposed items are related to room surfaces scheduled to painting.
 - b. When specifically called out as requiring special coating protection.

1.3 DEFINITIONS

- A. Special coating systems are defined as those types of materials and methods of application requiring more than normal skills and techniques for mixing, handling and application, as specified in the "Painting" section.
 - 1. The term "special coating systems" as used in this section includes applied materials used in prime, intermediate and finish coats.
 - 2. The word "paint", as applied in this and or other Sections shall apply to all special coatings required herein for the protection of materials from corrosive environment, weathering processes, or for aesthetic or other reasons.
 - 3. The term "exposed surfaces" is defined to include areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place in areas to be coated. Extend special coatings in these areas as required to maintain the coating system integrity and provide desired protection.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information including basic materials analysis and application instructions for each coating material specified.

1. List each material and cross-reference to the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.
2. In the event that the submittal requests a substitution then the following ASTM test results from an independent testing laboratory for the referenced products shall be included: Performance Criteria:
 3. ASTM B 117 Salt Fog
 4. ASTM D 3359 (Method A and B) Adhesion Test
 5. ASTM G8, Method A Cathodic Disbondment
 6. ASTM D 4541 (Elcometer)
 7. ASTM D 4060 Taber Abrasion
 8. ASTM D 522 (Conical Mandrel)
 9. ASTM D 3363 Pencil Hardness
 10. ASTM D 2794 Impact
 11. ASTM G 53 QUV Exposure
 12. ASTM D 2240 Durometer, Shore D
 13. ASTM D 870 Immersion (Potable Water)
 14. ASTM E 96 Moisture Vapor Transmission
 15. ASTM D 2370 Tensile Strength and Elongation
 16. ASTM D 638 Tear Strength
- B. Manufacturer's representative color and texture sample cards shall be submitted to the Engineer at least 30 days prior to paint application. Contractor shall coordinate work so as to allow sufficient time for paint to be delivered to the job site.

1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Provide primers and other undercoat material produced by the same manufacturer as the finish coats. Use only thinners recommended by the manufacturer, and only within recommended limits.
- B. Coordination of Work: Review other sections of these specifications in which other coatings are to be provided to ensure compatibility of the total coatings systems for various substrates.
 1. Upon request, furnish information on the characteristics of pre-primed materials, to ensure that provisions for specified finish coats can be appropriately applied.
 2. Notify the Engineer of any anticipated problems involved in using the coatings systems as specified.
- C. Job Mock-up:
 1. Minimum 50 sq. ft. application of each specified coating system on each type of substrate. At Engineer's discretion.
 2. Mock-ups will serve as standard for acceptance of work.
 3. Leave approved mock-ups in place as part of completed project.
 4. Manufacturer's representative shall be available to advise applicator on proper application techniques and procedures.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, new, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Name or title of material.
 - 2. Federal Specification number, if applicable.
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Manufacturer's name.
 - 5. Contents by volume, for major pigment and vehicle constituents.
 - 6. Thinning instructions.
 - 7. Application instructions.
 - 8. Color name and number.
 - 9. Handling instructions and precautions.

- B. Store materials not in actual use in tightly covered containers at a minimum ambient temperature of 45 deg. F (7 deg. C) in a well-ventilated area. Maintain containers used in storage of coatings in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all necessary precautionary measures to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of stains.

1.7 PROJECT CONDITIONS

- A. Apply coatings only when the temperature of surfaces to be coated and surrounding air temperatures are above 45 deg. F (7 deg. C), unless otherwise permitted by manufacturer's printed instructions.

- B. Do not apply coatings in snow, rain, fog or mist, or when the relative humidity exceeds 85%, or to damp or wet surfaces unless otherwise permitted by manufacturer's printed instructions. Allow wet surfaces to dry thoroughly and attain the temperature and conditions specified before proceeding with or continuing with the coating operation.
 - 1. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and the temperature within the area can be maintained within limits specified by the manufacturer during application and drying periods.

- C. Report to responsible person such as safety personnel, General Trades Superintendent, etc., any condition which may pose a threat to the health and welfare of employees.

- D. Keep working area clean and safe.

- E. Obey all job site rules and regulations.

- F. Surfaces not to be painted; unless specifically stated otherwise:
 - 1. Face brick
 - 2. Pre-finished wall panels, partitions and ceiling tile
 - 3. Items with acceptable factory-applied final finish
 - 4. Concealed ducts, pipes and conduit.
 - 5. Glass, Aluminum, Copper, Bronze, Stainless Steel

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Tnemec Company, Inc., North Kansas City, Missouri
 - 2. Carboline Company, St. Louis, Missouri
 - 3. Sherwin Williams Company, Cleveland, Ohio
- B. Material Quality: Provide the best quality grade of the various types of coatings as regularly manufactured by acceptable coating manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- C. Proprietary names to designate colors or materials are not intended to imply that products of named manufacturers are required to the exclusion of equivalent products of other manufacturers.
- D. Request for substitution shall include manufacturer's literature for each product giving the name, product number, generic type, descriptive information, solids by volume, recommended dry film thickness and certified test reports showing results to equal the performance criteria of the products listed herein.

2.2 COATING SYSTEMS

- A. Ferrous Metal:
 - 1. Submerged, Non-Potable
 - Surface Preparation: SSPC-SP10 Near White Blast
 - First Coat:
 - Tnemec Series N69 Hi-Build Epoxoline II @ 3.0-5.0 mils dry
 - Carboline Carboguard 890 @ 3.0 - 5.0 DFT
 - Sherwin Williams Dura-Plate 235 at 3.0-5.0 mils DFT
 - Second Coat:
 - Tnemec Series N69 Hi-Build Epoxoline II @ 6.0-8.0 mils dry
 - Carboline Carboguard 890 @ 4.0 - 6.0 DFT
 - Sherwin Williams Dura-Plate 235 at 5.0-8.0 mils DFT

NOTE: If shop primed, field surface preparation for weld seams and abraded areas is SSPC-SP-10 and spot prime with Series 161 @ 3-5 mils dry or Carboline Carboguard 890 @ 3.0 - 5.0 DFT or Sherwin Williams Dura-Plate 235 @3.0-5.0 mils DFT.

2. Submerged, Potable
Surface Preparation: SSPC-SP10 Near White Blast
First Coat: Tnemec Series N140-1255 Pota-Pox Plus @ 4.0-6.0 mils dry
Carboline Carboguard 891 @ 4.0 - 6.0 DFT
Sherwin Williams Macropoxy 646 PW at 4.0-6.0 mils DFT

Second Coat: Tnemec Series N140-15BL Pota-Pox Plus @ 6.0-8.0 mils dry
Carboline Carboguard 891 @ 6.0 - 10.0 DFT
Sherwin Williams Macropoxy 646 PW at 6.0-8.0 mils DFT

NOTE: If shop primed, field surface preparation for weld seams and abraded areas is SSPC-SP-10 and spot prime with Series N140 @ 3-5 mils dry or Sherwin Williams Macropoxy 646 PW at 3.0-5.0 mils DFT.

3. Non-Submerged, Interior Exposure
Surface Preparation: SSPC-SP6 Commercial Blast
First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 3.0-5.0 mils
dry Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT

Second Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 4.0-6.0 mils dry
Carboline Carboguard 60 @ 4.0 - 6.0 DFT
Sherwin Williams Macropoxy 646 at 4.0-6.0 mils DFT

NOTE: If shop primed, field surface preparation for weld seams and abraded areas is SSPC-SP-10 and spot prime with Series N69 @ 3-5 mils dry or Carboline Carboguard 60 @ 3.0 - 5.0 DFT or Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT.

NOTE: Non-submerged, Interior Exposure light gauge steel framing (including roof trusses) shall be galvanized as indicated in "Galvanized Steel" below.

4. Non-Submerged, Exterior Exposure
Surface Preparation: SSPC-SP6 Commercial Blast
First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 3.0-5.0 mils
dry Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT

Second Coat: Tnemec Series 1075 Endura-Shield II @ 2.0-4.0 mils dry
Carboline Carbothane 133 LH @ 3.0 - 5.0 DFT
Sherwin Williams Acrolon 218 HS or Hi-Solids
Polyurethane at 3.0-5.0 mils DFT

NOTE: If shop primed, field surface preparation for weld seams and abraded areas is SSPC-SP-6 and spot prime with Series N69 @ 3-5 mils dry or Carboline Carboguard 60 @ 3.0 - 5.0 DFT or Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT.

5. Galvanized Steel (including Bar Joist and Galvanized Structural & Miscellaneous Steel)
Surface Preparation: SSPC-SPI Solvent Clean on galvanized surfaces.

SSPC-SP7 Brush-Off blast to lightly profile surface.

First Coat: N69 Hi-Build Epoxoline II @ 2.0-4.0 mils dry
Carboline Carboguard 888 @ 3.0 - 4.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-4.0 mils DFT

NOTE: Light gauge steel framing may be galvanized to Coating G90 per ASTM A653 unless noted otherwise. The light gauge steel roof trusses over the north half of the MBR Building shall be galvanized to Coating G90 per ASTM A653. The light gauge steel roof trusses over the Chemical Storage Building shall be galvanized to Coating G60 per ASTM A653. The light gauge steel framing for the interior walls and ceiling of the Electrical Room (Motor Control Center Room) in the Blower Room shall be galvanized to Coating G60 per ASTM A653. See also Specifications including 05310 Steel Deck, 074100 Metal Roofing System, and 13125 Metal Building Systems for coating requirements of light gauge steel items.

B. Non-Ferrous Metals:

1. Interior Exposure

Surface Preparation: SSPC-SP1 Solvent Clean and Scarify per SSPC-SP 3
First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 2.0-3.0 mils dry
Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT
Second Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 3.0-5.0 mils dry
Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT

2. Exterior Exposure

Surface Preparation: SSPC-SP1 Solvent Clean and Scarify per SSPC-SP 3
First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 2.0-3.0 mils dry
Carboline Carboguard 60 @ 3.0 - 5.0 DFT
Sherwin Williams Macropoxy 646 at 3.0-5.0 mils DFT
Second Coat: Tnemec Series 1075 Endura-Shield @ 2.0-4.0 mils dry
Carboline Carbothane 133 LH @ 3.0 - 5.0 DFT
Sherwin Williams Acrolon 218 HS or Hi-Solids
Polyurethane at 3.0-5.0 mils DFT

C. Concrete

1. Submerged, Non-Potable, poured in place or precast

Surface Preparation: SSPC-SP 13/NACE#6 "Surface Preparation of Concrete"

First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 150 sq. ft. per gal.
Carboline Carboguard 890 @ 150 sq. ft. per gal
Sherwin Williams Dura-Plate 235 at 150 sq. ft. per gal
Second Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 150 sq. ft. per gal.
Carboline Carboguard 890 @ 150 sq. ft. per gal
Sherwin Williams Dura-Plate 235 at 150 sq. ft. per gal

2. Non-submerged, poured in place or precast, Interior Exposure

Surface Preparation: Clean and dry

- First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 150 sq. ft./gal.
Carboline Carboguard 60 @ 150 sq. ft. per gal
Sherwin Williams Macropoxy 646 at 150 sq. ft. per gal
- Second Coat: Series N69 Hi-Build Epoxoline II @ 150 sq. ft./gal.
Carboline Carboguard 60 @ 150 sq. ft. per gal
Sherwin Williams Macropoxy 646 at 150 sq. ft. per gal
3. Non-submerged, poured in place or precast, Exterior Exposure
Surface Preparation: Clean and dry
First Coat: Tnemec Series 156 Envirocrete @ 150 sq. ft. per gal.
Carboline Flexxide Elastomer @ 150 sq. ft. per gal
Sherwin Williams Loxon XP at 6.0-8.0 mils dft
Second Coat: Tnemec Series 156 Envirocrete @ 150 sq. ft. per gal.
Carboline Flexxide Elastomer @ 150 sq. ft. per gal
Sherwin Williams Loxon XP at 6.0-8.0 mils DFT
4. Concrete block walls, Interior Exposure
Surface Preparation: Clean and dry
First Coat: Tnemec Series 130-6601 Envirofill @ 75 sq. ft. per gal
Carboline Sanitile 600 @ 75 sq. ft. per gal.
Sherwin Williams Cement Plex 875
NOTE: Material should be rolled, or sprayed and back rolled, then squeegeed to provide a smoother surface.
Second Coat: Tnemec Series N69 Hi-Build Epoxoline II @150 sq. ft./gal.
Carboline Carboguard 60 @ 150 sq. ft. per gal.
Sherwin Williams Macropoxy 646 at 150 sq. ft. per gal
Third Coat: Tnemec Series N69 Hi-Build Epoxoline II @150 sq. ft./gal.
Carboline Carboguard 60 @ 150 sq. ft. per gal.
Sherwin Williams Macropoxy 646 at 150 sq. ft. per gal
5. Concrete block walls, Exterior Exposure
Surface Preparation: Clean and dry
First Coat: Tnemec Series 156 Envirocrete @ 100 sq. ft. per gal.
Carboline Flexxide Elastomer @ 100 sq. ft. per gal.
Sherwin Williams Loxon XP at 6.0-8.0 mils DFT
Second Coat: Tnemec Series 156 Envirocrete @ 100 sq. ft. per gal.
Carboline Flexxide Elastomer @ 100 sq. ft. per gal.
Sherwin Williams Loxon XP at 6.0-8.0 mils DFT
6. Floors – **NOT REQUIRED**
Surface Preparation: SSPC-SP 13/NACE#6 "Surface Preparation of Concrete"
First Coat: Tnemec Series 201 Epoxoprime @ 250 sq. ft. per gal.
Carboline Carbotguard 1340 @ 3.0 - 4.0 DFT
Sherwin Williams GP 3579 at 6.0-8.0 mils DFT
Second Coat: Tnemec Series 280 Tneme-Glaze @ 150 sq. ft. per gal. If non-skid is desired then randomly broadcast with 30/50 mesh silica sand into wet epoxy intermediate
Carboline Santile 944HB @ 6.0 - 8.0 DFT
Sherwin Williams GP 3745 at 6.0-8.0 mils DFT
Third Coat: Tnemec Series 291 CRU @ 250 sq. ft per gal.
Carboline Sanitile 934 @ 2.0 - 3.0 DFT
Sherwin Williams GP 4638 at 3.0-4.5 mils DFT

7. Foundations – **NOT REQUIRED**

Surface Preparation: Clean and dry

First Coat: Tnemec Series 46H-413 80 sq. ft. per gal.
Carboline Bitumastic 300 M @ 80 sq. ft. per gal.
Sherwin Williams Hi-Mil Sher-Tar at 80- sq. ft. per gal

D. Plaster and Gypsum Wallboard

Surface Preparation: Clean and dry

First Coat: Tnemec Series 51-792 PVA Sealer @ 275 sq. ft. per gal.
Carboline Carbocrylic 120 @ 1.0 - 2.0 DFT
Sherwin Williams Pro Mar 200 Laztex Primer at 1.0-2.0
mils DFT

Second Coat: Tnemec Series 113 Tneme-Tufcoat @ 200 sq. ft. per gal.
Carboline Sanitile 255 @ 200 sq. ft. per gal
Sherwin Williams Pro Industrial Hi-Bild Waterbased
Catalyzed Epoxy at 4.0-6.0 mils DFT

Third Coat Tnemec Series 113 Tneme-Tufcoat @ 200 sq. ft. per gal.
Carboline Sanitile 255 @ 200 sq. ft. per gal
Sherwin Williams Pro Industrial Hi-Bild Waterbased
Catalyzed Epoxy at 4.0-6.0 mils DFT

E. Wood

Surface Preparation: Clean and dry

First Coat: Tnemec Series 36-603 Undercoater @ 300 sq. ft. per gal.
Carboline Carbocrylic 120 @ 1.0 - 2.0 DFT
Sherwin Williams Multi Purpose Primer at 1.0-2.0 mils
DFT

Second Coat: Tnemec Series 23 Enduratone @ 400 sq. ft. per gal.
Carboline Carbocoat 8215 @ 400 sq. ft. per gal.
Sherwin Williams Pro Mar 200 Alkyd at 400 sq. ft. per gal

Third Coat Tnemec Series 23 Enduratone @ 400 sq. ft. per gal.
Carboline Carbocoat 8215 @ 400 sq. ft. per gal.
Sherwin Williams Pro Mar 200 Alkyd at 400 sq. ft. per gal

F. PVC Pipe

Surface Preparation: Lightly sand

First Coat: Tnemec Series N69 Hi-Build Epoxoline II @ 200 sq. ft. per
gal.
Carboline Carboguard 60 @ 200 sq. ft. per gal.
Sherwin Williams Macropoxy 646 at 200 sq. ft. per gal

G. Insulated Pipe (Insulation)

PVC or Aluminum Jacket: None.

Craft Paper /All Purpose Jacket:

Surface Preparation: Clean and dry

First Coat: Tnemec Series 1029 Enduratone @ 300 sq. ft. per gal.

Second Coat: Carboline Carbocrylic 3359 @ 300 sq. ft. per gal.
Sherwin Williams DTM Acrylic at 2.5-4.0 mils DFT
Tnemec Series 1029 Enduratone @ 300 sq. ft. per gal.
Carboline Carbocrylic 3359 @ 300 sq. ft. per gal.
Sherwin Williams DTM Acrylic at 2.5-4.0 mils DFT

H. Insulated Pipe (Pipe)

Surface Preparation: Clean and dry
First Coat: Tnemec Series 27 F.C. Typoxy @ 400 sq. ft. per gal.
Carboline Santile 120 @ 400 sq. ft. per gal
Sherwin Williams Pro Industrial Pro Cryl Primer @ 400 sq.
ft. per gal

Second Coat: Tnemec Series 113 Tneme-Tufcoat @ 325 sq. ft. per gal.
Carboline Carboguard 60 @ 325 sq. ft. per gal
Sherwin Williams Pro Industrial Hi-Bild Waterbased
Catalyzed Epoxy at 4.0-6.0 mils DFT

2.3 COLOR CODING AND PROCESS SYSTEM IDENTIFICATION

A. Color coding for processing piping, equipment and appurtenances is a suggested system unless otherwise specified or requested by owner. Final coding to be determined in the field:

1. Equipment - light gray with O.S.H.A. orange coupling guards and O.S.H.A. yellow belt guards.
2. Pipe Supports - hangers to be same color as piping applied, floor post to be same as adjacent wall color, and fabricated racks to be manufacturer's standard protective finish or paint same as adjacent wall color if not having a suitable protective finish.
3. Process piping-exposed interior or exterior:
 - a. Submerged Pipe or Supports - Black
 - b. Intermittently Submerged Metals - Black (unless piping as defined otherwise)
 - c. Natural Gas - OSHA Red*
 - d. Process/L.P. Gas - OSHA Orange
 - e. Potable (City) water - OSHA Blue*
 - f. Well or Non-Potable Water — Aqua
 - g. Seal water, wash water — white plant effluent
 - h. Raw wastewater - Medium Grey*
 - i. Equipment drains - Black
 - j. Sanitary drains - Black with tags
 - k. Chemical feed - Aqua
 - l. Vents Ivory
 - m. Compressed air - Green
 - n. Chlorine - OSHA Yellow w/Red Stripes*
 - o. Raw Sewage - Light Gray
 - p. Grit Light Gray w/Yellow Stripes
 - q. Primary Sludge - Dark Brown

- r. Return Sludge - Black w/Brown Stripes
- s. Waste Sludge or Liquor - Dark Green*
- t. Supernatant - OSHA Green
- u. Fuel Oil - Dark Gray
- v. Sample Lines - Light Blue
- w. Fire Protection System - OSHA Red Sprinkler Piping
- x. Hoist and Trolleys - OSHA Yellow

*These colors are recommended as standard.

- 4. Walls - Color to be selected by Owner from Manufacturer's standard colors.
- 5. Miscellaneous, non-process related items such as electrical conduit, duct work, roof drains, etc. are to be properly prepped and finished to match adjacent wall or ceiling color in rooms scheduled for finish wall and/or ceiling paint.

B. Signs and Labels

- 1. There shall be stenciled on each pipeline in each room a minimum of two legends describing the function of the pipeline, such as "natural gas", on each side of the pipe. It is intended that all pipelines shall bear legend at the most visible point and meet ANSI A13.1 Scheme for the identification of piping system for size, type and vantage point of legends.
- 2. Signs shall be furnished and securely fastened to each pipeline showing its destination such as "Aeration Tank No. 1".
- 3. Where the flow of a pipeline is in one direction only, then a flow arrow shall be stenciled in front of each legend on the pipe.
- 4. For pipes smaller than 1 in. in outside diameter, a white plastic tag with black lettering shall be used.
- 5. The legends and flow arrows shall be stenciled with approved stencil paint. Following the completion of other work under this Item, all stencils used shall remain the property of the Owner.
- 6. Each hydrant, hose bib, sillcock, and yard hydrant connected to plant water shall be stenciled with the words "Unsafe Water - Do Not Drink". The size of the stenciled letters shall be 1 inch. Stencil on the hydrants is to be on the nozzle section. The hose bibs shall have a 15" x 5" x 1/2" thick plaque made of marine plywood, where the stenciled letters are to be applied. The Plaque shall be fastened to the structure directly above the hose bib connection, (Plaques to have white letters with aqua background).
- 7. Preprinted plastic-coated adhesive labels may be used in lieu of stencils, on interior piping only.
- 8. All rooms in which equipment is operated automatically shall have signs mounted on the walls which are visible at entrances. The Contractor shall furnish twenty 14 in. x 20 in. black or yellow porcelain signs meeting OSHA requirements. Signs shall include mounting accessories. Each sign shall read: **Warning: The equipment in this room operates automatically and may start or stop at any time.**

PART 3 - EXECUTION

3.1 PRE-WORK INSPECTION

- A. Examine surfaces to be coated and report conditions that would adversely affect appearance or performance of coating systems and which cannot be put into an acceptable condition by preparatory work specified in Paragraph 3.02.
- B. Do not proceed with surface preparation and application until surface is acceptable or authorization to proceed is given by the Owner's representative.

3.2 SURFACE PREPARATION

A. General:

- 1. Dislodge dirt, rust, plaster nibs, mortar spatter and other dry material by scraping or brushing. Remove dust and loose material by brushing, sweeping, vacuuming or blowing with high-pressure air.
- 2. Remove oil, wax and grease by scraping off heavy deposits and cleaning with mineral spirits or a hot trisodium phosphate solution followed by a water rinse.
- 3. Verify that surfaces to be coated are dry, clean and free of dust, dirt, oil, wax grease or other contaminants.

B. Non-Submerged Concrete, Masonry and Cement Stucco:

- 1. Allow new concrete and masonry to cure 28 days
- 2. Scrape and grind fins and protrusions flush with surface.
- 3. Patch holes and cracks flush with surface.
- 4. Rake mortar joints clean.

C. Plaster:

- 1. Allow to cure for 28 days.
- 2. Remove nibs and other protrusions by scraping flush with surface.
- 3. Patch voids and cracks with spackling compound to match texture or surface.

D. Gypsum Board:

- 1. Sand joint compound smooth and flush with surface using fine grit sand paper.
- 2. Fill nicks, scratches, holes and uneven spots with spackling compound and after dry, sand flush with surface.

E. Non-Ferrous Metal:

- 1. SSPC-SPI solvent cleaning to remove all contaminants.

F. Ferrous Metal:

- 1. Enclosed: Remove loose rust, mill scale and other foreign matter by hand (SSPC-SP2) or power tool (SSPC-SP3) cleaning and apply specified coating before rusting occurs.
- 2. Non-Submerged, Architecturally Exposed: Society of Protective Coatings, SSPC-SP6 Commercial Blast.
- 3. Submerged Steel: Society of Protective Coatings, SSPC-SP10 Near White Blast.

G. Galvanized Metal:

- 1. Remove contaminants and protective mill coating by SSPC-SP1 Solvent Cleaning or steam cleaning.

All surfaces shall be prepared by light brush blasting to achieve a minimum 1.0 mil abrasive blast profile

H. Wood:

1. Remove surface deposits of sap and pitch by scraping and cleaning with mineral spirits.
2. Seal knots and pitch pockets with a product manufactured for this specific purpose.
3. Sand rough spots of smooth siding and finish woodwork.
4. After prime coat is dry, fill cracks, holes and scratches with suitable wood filler or spackling compound and when dry, sand flush with surface.
5. Sand lightly between coats.

I. Concrete Floors:

1. Prepare concrete floors in accordance with SSPC-SP 13/NACE #6 "Surface Preparation of Concrete."

J. Submerged Concrete:

1. Prepare in accordance with SSPC-SP 13/NACE #6 "Surface Preparation of Concrete" to remove laitance and expose all cavities and honeycombs. If immersion service condition will have an exposure outside of neutral pH (6-9) then all cavities shall be filled using Tnemec Series 218 Mortarclad or Sherwin Williams Corobond 300. Product is trowel applied to all vertical walls with exposed cavities.

3.3 APPLICATION

A. General: Apply special coatings by brush, roller, spray, squeegee, or other applicators in accordance with the manufacturer's directions. Brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

1. Coating colors, surfaces treatments and finishes are indicated in the "Schedules" of the contract documents.
2. Provide finish coats that are compatible with the primers used.
3. The number of coats and coating film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the coating manufacturer. Sand between coating applications where sanding is required to produce an even smooth surface in accordance with the coating manufacturer's directions.
4. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces.
5. Coat the back sides of access panels, removable or hinged covers, and similar hinged items, to match exposed surfaces.

B. Minimum Coating Thickness: Apply each material at not thinner than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire coating system as recommended by the manufacturer.

- C. Prime Coats: Before the application of finish coats, apply a prime coat, as recommended by the coating manufacturer, to material that is required to be painted or finished, and which has not been prime coated by others.
 - 1. Recoat primed and sealed substrates where there is evidence of suction spots or unsealed areas in the first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- D. Brush Application: Brush-out and work brush coats into surfaces in an even film. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.
 - 1. Apply primers and first coats by brush unless the manufacturer's instructions permit use of mechanical applicators.
- E. Mechanical Applications: Use mechanical methods for coating application when permitted by the coating manufacturer's recommendations, governing ordinances, and trade union regulations.
 - 1. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double-back with spray equipment building-up film thickness of 2 coats in one pass, unless recommended by the coating manufacturer.
- F. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or recoat work not in compliance with specified requirements.

3.4 INSPECTION

- A. Request acceptance of each coat before applying succeeding coats.
- B. The Contractor shall furnish the Engineer a suitable thickness detector of a type recommended by the paint manufacturer.
- C. Any field painting found to be defective shall be removed and the surfaces repainted as the Engineer may direct at no additional cost to the Owner.
- D. Before final approval of the work, all damaged surfaces of paint (field or factory applied) shall be cleaned and repainted or touched up as directed.

3.5 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following material testing procedure at any time, and at any number of times during the period when coating operations are being conducted.
 - 1. The Owner will engage the services of an independent testing laboratory to sample the coating being used. Samples of material delivered to project site will be taken, identified and sealed, and certified in the presence of the Contractor.
 - 2. The testing laboratory will perform appropriate tests for any or all of the following characteristics as required by the Owner:
 - a. Quantitative materials analysis.
 - b. Absorption.
 - c. Accelerated weathering.

3.6 CLEANING

- A. Clean-Up: At the end of each work day during progress of work, remove rubbish, empty cans, rags and other discarded materials from the site.
 - 1. Upon completion of the work, clean window glass and other spattered surfaces. Remove spattered coatings by washing, scraping or other proper methods, using care not to scratch or otherwise damage adjacent finished surfaces.

3.7 PROTECTION

- A. Protect work of other trades, whether to be coated or not, against damage from coating operations. Correct damage by cleaning, repairing or replacing, and recoating as acceptable to the Architect. Leave the work in an undamaged condition.
- B. Provide "Wet Paint" signs as required to protect newly-coated finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of coating operations.
- C. At completion of the work of other trades, touch-up and restore damaged or defaced coated surfaces.

END OF SECTION 099700

SECTION 110923 - UNDERGROUND HDPE STORAGE TANK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Underground HDPE Storage Tank and Accessories
- B. Excavation and Backfill
- C. Manufacturing and Welding
- D. Piping Connections

1.2 RELATED SECTIONS

- A. Geotechnical Report
- B. Section 310000 Earthwork

1.3 SUBMITTALS

- A. Submit under provisions of Section 013320
- B. Product Data: Contractor to submit the Manufacturer's:
 - 1. Fabrication Drawings and Calculation Signed and Sealed in the State of Ohio
 - 2. Pipe and Fitting Manufacturing Quality Control Documentation
 - 3. Installation Guidelines
 - 4. Field Welding and Testing Reports
- C. Field Geotechnical Data: Contractor to submit field quality control inspection reports including:
 - 1. Subgrade and Adjacent Soil excavation inspection.
 - 2. Subgrade preparation and compaction inspection.
 - 3. Backfill gradation and installation inspection.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Pipe to be offloaded using two straps and spreader bar, or forklift/front loader with strapping.
- B. Pipe to be stored on level ground with blocking to ensure that it does not roll.
- C. Pipe Storage bedding to be free of large sharp rocks or debris that could damage the pipe.

- D. Manufacturer and Contractor to coordinate delivery sequence based upon available storage area and the contractor's mobilization schedule and sequence of construction.

1.5 PROJECT CONDITIONS

- A. Review installation procedures and coordinate work with preparation and adjacent work, including but not limited to grading, excavation, utilities, or erosion control. Do not permit construction traffic or loads greater than design loads over completed installation.
- B. Weather:
 - 1. HDPE must be above 40 degrees F (5 degrees C) to Weld.
 - 2. Contractor to provide heating of pipe prior to welding, per manufacturer's instructions.
 - 3. Do not build on frozen work or wet, saturated, or muddy subgrade.
 - 4. HDPE cannot be welded in the presence of water.
 - 5. Contractor to protect all welding areas from rain with tarps until completion of welding.
- C. Groundwater and Surface Water
 - 1. Contractor to maintain groundwater and surface water dewatering until acceptance by the owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: The HDPE Pipe Material and Fittings specified shall be manufactured in accordance with ASTM F894, by a manufacturer with a minimum of 10-Years of experience producing pipe and fittings of equivalent size. The basis of design of the system specified is Weholite 132" ID Profile Wall HDPE manufactured by Infra Pipe Solutions, Ltd. (formerly Uponor Infra, formerly KWH Pipe).

Contact: Mark Lister
Weholite Sales Manager North America
mark.lister@infrapipes.com
416-882-6751

- B. The manufacturer must present recognized (NSF or equivalent) third party certification of pipe deflection testing methods identified under the appropriate ASTM procedures. Deflection testing must be performed for the diameters and properties of the pipe specified on this project.

- C. The manufacturer must present a quality control plan in accordance with ISO 9001. The quality control plan shall identify quality procedures for pipe production and the fabrication of all fittings.
- D. Alternate materials will be considered provided that the alternate manufacturer demonstrates the minimum experience and quality certifications identified in this section. Alternates must be submitted to the engineer of record for approval 14 calendar days prior to the published bid date. Contractor bids with unapproved alternate materials may be rejected. The substitution of alternate materials following bid is not permitted.
- E. The manufacturer shall provide a 2-Year Warranty for manufactured materials and field welds.

2.2 HDPE WELDING

- A. All Field and Factory Welds are to be Hot Air HDPE Extrusion Welds (Leister/Wegener or equivalent) performed in accordance DVS Welding Standards. Small hand tool fusion welding is reserved for part setup and shall not be used as a primary structural welding technique.
- B. All Welding Technicians shall possess current welding certificates issued by the manufacturer under the supervision of a certified DVS Extrusion Welding Trainer.
- C. All field assembled components shall be joined by single wall 'Dual ID Weld'. Welds are to be performed and certified by the manufacturer.

2.3 MATERIALS

- A. Underground HDPE Storage Tank (System) Components including:
 - 1. ASTM F894 132" ID Barrel Manifolds and Straight Pipe Array providing 1.5 MG storage with 48" Manhole risers and stubs per plans.

2.4 APPLICABLE STANDARDS

- A. The HDPE Storage Tank will conform to the following American Society of Testing and Materials (ASTM) standard specifications, as relevant and applicable to the system specified.

ASTM F2487	Standard Practice for Infiltration and Exfiltration Acceptance Testing
ASTM D3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Pipe
ASTM D3350	Standard Specification for Polyethylene Plastic Pipes and Fittings Materials

ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe
ASTM F1759	Standard Practice for Design of High Density Polyethylene Manholes
ASTM C1147	Standard Practice for Determining Weld Strength of Thermoplastics
ASTM F2620	Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers
ASTM F894	Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine prepared excavation and conditions for smoothness, compaction, and level. Do not commence system installation until unsatisfactory conditions are corrected.
- B. Verify height of water table; do not install if high water table will be above the bottom of excavation.
- C. Verify system does not interfere with new or existing underground structures, utility lines, and piping.
- D. Commencement of installation constitutes acceptance of existing conditions and responsibility for satisfactory performance. If existing conditions are found unsatisfactory, notify Engineer of Record in writing and request resolution.

3.2 INSTALLATION

- A. Installation of this system shall be in accordance with ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- B. Excavate trenches to ensure that sides will be stable under all working conditions. Slope trench walls or provide supports in conformance with City of Bartlett and OSHA standards for safety. Open only as much trench as can be safely maintained by available equipment.
- C. When vertical support of excavation is required (Sheeting, Slide Rails, Trench Shields or Boxes), refer to ASTM D2321 for recommendations regarding the placement and movement of excavation support to ensure backfill and existing soils are protected during installation, movement, and removal of excavation support.
- D. If trench sidewalls slough off during any part of excavating or installing the pipe, remove all sloughed and loose material from the trench.
- E. Dewatering shall be maintained below foundation bedding until all HDPE welding and Joint testing is complete, and finished grade is achieved.
- F. When excavating while depressing ground water, ensure the ground water is below the bottom of cut at all times to prevent washout from behind sheeting or sloughing of exposed trench walls.

- G. Control running water emanating from drainage of surface or ground water to preclude undermining of the trench bottom or walls, the foundation, or other zones of embedment. Provide dams, cutoffs or other barriers periodically along the installation to preclude transport of water along the trench bottom.
- H. Trench Bottom--Install Class I Well Graded Bedding Material to a minimum depth of 6” and compact to 95% SPD. Provide a firm, stable, and uniform bedding for the pipe barrel and any protruding features of its joint.
- I. Where the excavated trench bottom is unstable or shows a “quick” tendency, excavate to a depth as required by a licensed Geotechnical Engineer and replace with a foundation of Class I material compacted to 95% SPD or as otherwise recommended by the Geotechnical Engineer. Use a suitably graded material where conditions may cause migration of fines and loss of pipe support. Control of quick and unstable trench bottom conditions may be accomplished with the use of appropriate geofabrics.
- J. Where in-situ soils contain organic matter, fines, or otherwise deemed susceptible to migration by the Geotechnical Engineer, use of a geotextile separation fabric may be required.
- K. Prior to Backfill, confirm that all alignments, elevations, pipe joints and connections have been installed per the approved drawings and manufacturer's recommendations.
- L. Backfill within the Critical Backfill Zone (CBZ) to be ASTM D2321 Class I angular crushed rock with 100% passing 1-1/2in. sieve, $\leq 15\%$ passing #4 sieve, $\leq 25\%$ passing 3/8in. sieve and $\leq 12\%$ passing #200 sieve.
- M. CBZ Backfill is to be placed in uniform lifts to a maximum depth of 8” and compacted to a minimum of 90% SPD. Backfill shall be compacted by utilizing a walk behind vibratory plate compactor with minimum impact load of 5000 LBS, and 4 pass minimum, or as otherwise recommended by the Geotechnical Engineer for the backfill material selected.
- N. Refer to Backfill Section for details above for minimum offsets, cover, geometry, and other requirements.
- O. The minimum cover over the system is 4.0 FT of compacted material to 90% SPD, un-rutted fill for any Highway Legal HS20 vehicle. For all other construction vehicle loading, the contractor shall submit vehicle data to the manufacturer for recommendations prior to loading.
- P. Construction vehicle traffic shall be kept to directional travel across the system. Repetitive turning, spinning, or other vehicle movements may rut the compacted backfill and damage the pipe.

- Q. Temporary Stockpiling of material over top of this system is prohibited without the express written acceptance of a temporary stockpile plan prepared by the contractor and approved by the manufacturer.
- R. All Vertical Structures shall be protected during backfill activities.
- S. The contractor shall report any damage to the system to the manufacturer.

3.3 TESTING

- A. All Factory Welds are to be locally tested by the manufacturer with Air to 5 psi for 4 Minutes.
- B. Field Welds shall be “Dual ID Welds” and tested locally with air to 2 psi for 5 Minutes. Localized Field Air Testing shall be conducted by the manufacturer under the oversight of the project’s quality control supervisor.
- C. The contractor shall conduct Infiltration/Exfiltration testing in accordance with ASTM F2487, under the oversight of the project’s quality control supervisor.

Where groundwater is present above the crown of the system, Infiltration Testing is the preferred method for identifying and locating leaks. Dewatering is turned off, groundwater is allowed to rise above crown, and the system is then inspected for leaks. Dewatering is turned back on, groundwater is brought below invert, and all leaks are repaired.

Where groundwater is not present, Exfiltration Testing can be used to identify total system watertightness. The system is filled with water to a marked and recorded elevation, drawdown is observed over a 24-hour period. If a drawdown occurs, refill the system to the recorded elevation and observe for an additional 24-hours. ASTM2487 defines the max allowable exfiltration rate of 50 US Gallons per inch of pipe diameter per mile of pipe per day. In the event that draw down exceeds max allowable, the manufacturer shall provide recommendations for repair.

3.4 SHAPE MONITORING

- A. The Contractor shall measure and record the Inside Diameter of each pipe section utilizing a laser distance meter, measuring stick or approved similar device. ID Measurements are to be taken at 6 uniformly spaced circumferential locations and recorded to a 1/10” (2.54 mm) accuracy. The manufacturer shall provide a system layout with measurement tracking and location recommendations. ID Measurements shall be taken at the following milestones during installation:

- 1. Pipe Set

2. Backfill 12" over crown of pipe.
3. Immediately following backfill at fished grade.
4. 30 Days following backfill at finished

B. The maximum allowable deflection measured at 30 Days following backfill at finished grade is 5% of the base ID in accordance with ASTM F894. The manufacturer shall review all field measurements taken and provide written confirmation that all measurements are within allowable limits.

3.5 CLEANING

A. The entire system shall be washed clean of all sediment and debris following installation and prior to acceptance.

END OF SECTION 110923

SECTION 200010

GENERAL PROVISIONS - ALL MECHANICAL DIVISIONS

PART 1 GENERAL

1.01 REFERENCE

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda, and Division 1 are a part of this specification. Contractors and Subcontractors shall examine same as well as other Divisions of the specifications which affect work under this Division.
- B. The requirements of this Section shall govern all Mechanical Division work for this project. Bidders are referred to in this section as "Mechanical Contractors" and all provisions apply to each contractor and their subcontractors.
- C. The contractor shall be solely responsible for construction means, methods, sequences of construction and the safety of workmen.

1.02 DESCRIPTION OF WORK

- A. Mechanical, Architectural, Structural, Electrical and all other project drawings, as well as the Specifications for all the Divisions, are a part of the Contract Documents. Work of this section is shown on the mechanical drawings.
- B. Drawings and Specifications are to be considered as supplementing each other. Work specified but not shown, or shown but not specified, shall be performed or furnished as though mentioned in both Specifications and Drawings. All systems shall be complete and fully operational upon completion of the project.
- C. Contractors shall not construe any correspondence or verbal communications with or by the engineer or his representative as authorization for "extra" construction payment. All requests for additions to this contract shall be submitted in writing by the contractor to the architect for consideration by the owner's representative. Work performed without a written change order from the owner and architect will be the contractor's sole responsibility without additional compensation.
- D. Contractor shall comply with and schedule work according to the phased schedule of construction specified in Division 1. All work shall be completed within these time constraints.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Divisions 1 through 14
- B. Division 20 - General Mechanical Requirements
- C. Division 22 - Plumbing
- D. Division 23 - Heating, Ventilating and Air Conditioning

E. Division 26 - Electrical

1.04 QUALITY ASSURANCE

A. Codes and Permits:

- 1) Work shall be installed in full accordance with all applicable codes, rules and regulations of public authorities and/or utilities. Included shall be N.F.P.A., OSHA, State and local Building Codes. Additionally, plumbing work shall conform to Health Department Rules and Regulations. Each of these Codes, Rules and Regulations are hereby incorporated into this specification.
- 2) Comply with Owner's insurance underwriter's regulations applicable to this project.
- 3) Comply with specification requirements in excess of Code requirements where no conflicts exist.
- 4) Prior to starting any work, mechanical contractors shall secure all required permits and inspection certificates. All fees for permits, utility connection charges, inspections and certificates shall be paid for by the contractor.
- 5) Deliver official record of permits and approvals, by governing agencies, to architect for transmittal to owner, prior to starting work.

B. Standards:

- 1) Comply with applicable provisions of code approved editions of following National Standards:

National Plumbing and Sanitary Code
NFPA
Pressure Piping and Mechanical Refrigeration Systems and Equipment Codes
SMACNA Duct Construction Standards
ASTM Standards
Americans with Disability Act
American Welding Society Code
National Pressure Vessel Code
National Electrical Code
Underwriters Laboratory
ASSE Standards
NAIMA Insulation Standards

1.05 SUBMITTALS

A. Shop Drawings:

- 1) Submit shop drawings for mechanical equipment and fixtures with adequate details and scales to clearly show construction. Indicate the operating characteristics for each required item. Clearly identify each item on the submittal as to mark, location and use, using same identification as provided on design drawings.

- 2) Contractor shall review and indicate his approval of each shop drawing prior to submittal for review. Do not start work or fabrication until shop drawings have been reviewed by the Engineer and returned to the Contractor.
- 3) Submittals will be reviewed only for general compliance with the contract documents and not for dimensions or quantities. The submittal review shall not relieve the contractor of responsibility for purchase of any item in full compliance with the contract documents or its complete and proper installation.
- 4) Where submittals vary from the contract requirements, the contractor shall clearly indicate on submittal or accompanying documents the nature and reason for variations.
- 5) Refer to various sections for listing of shop drawings required on this project.
- 6) Each manufacturer or his representative must check the application of his equipment and materials and certify at time of shop drawing submittal that it has been properly applied and can be installed, serviced and maintained where indicated on drawings. Advise engineer in writing with submittal drawings of any items that do not comply with manufacturer's installation instructions. The manufacturer shall be responsible for any changes that might be necessary because of physical characteristics of equipment that have not been called to the engineer's attention at the time of submittal.

B. Record Drawings:

- 1) Each contractor or subcontractor shall keep one (1) complete set of the contract working drawings on the job site on which he shall regularly record any deviations or changes from such contract drawings made during construction.
- 2) These drawings shall record the location of all concealed equipment, piping, electric service, sewers, wastes, vents, conduit and other piping, by measured dimensions to each such item from readily identifiable and accessible walls or corners of the building. Plans also shall show invert elevation of sewers and top elevation of all other below-grade lines.
- 3) Record drawings shall be kept clean and undamaged and shall not be used for any purpose other than recording deviations from working drawings and exact locations of concealed work.
- 4) After the project is completed, these sets of drawings shall be delivered to the Architect in good condition, as a permanent record of the installation as actually constructed.

1.06 COORDINATION AND SUPERVISION

- A. Examine work of other trades which comes in contact with or is covered by the work. Do not attach to, cover, or finish against any defective work, or install work of this Division in a manner which will prevent other trades from properly installing their work. Consult all drawings, specifications and details of other Divisions of the work.

- B. Proper clearances for architectural design and equipment access and service shall be maintained for all items and components. Refer to architectural reflected ceiling plans for locations of all items installed in ceilings.
- C. Contractors shall report any interferences between their and other work or construction as soon as discovered. If contractor proceeds without coordination, correction shall be the responsibility of the installing contractor without cost to the owner.
- D. Drawings are diagrammatic and show approximate location of ducts, piping, etc. Take all measurements and establish exact locations in the field and indicate same on submittal drawing. Adapt to construction and work of other trades as required for coordination of the work. Provide all offsets required to accomplish this work.
- E. Each contractor shall be responsible for layout and coordination of openings and chases required for the mechanical installations, when they are specified to be provided by other trades. Provide dimensioned drawing and fully coordinate this work with the contractor providing opening or chase. All openings and chases not provided by other trades shall be provided by this contractor.
- F. Each contractor shall provide adequate competent supervision on job during all mechanical trades working hours with authority and instructions to answer questions and carry out instructions of Architect or his representative.

1.07 DRAWINGS AND SPECIFICATIONS

- A. Drawings and specifications are supplemental to each other. It is intended that work covered by these specifications and drawings comply with code requirements and include everything requisite and necessary to make the various systems complete and operative, irrespective of whether or not every item is specifically provided for. Any omission of direct reference herein to any essential item required to complete an installation in accordance with manufacturer's instructions or for compliance with code shall not excuse contractor from complying with the above intent and shall be included in project bid.
- B. In case of error or inconsistency in the bid documents, the contractor shall provide the better quality or greater quantity of work and shall comply with the more stringent requirements. Figured dimensions supersede scaled ones. Contractor shall take no advantage of, and shall promptly call Architect's attention to any error, omission or inconsistency in specifications and drawings.
- C. Special attention is directed to requirements that equipment and materials stated in specifications or indicated on drawings shall be furnished, completely installed, adjusted and left in safe and satisfactory operating condition. Accessories, appliances and connections necessary for proper operation of equipment shall be provided.
- D. Materials, apparatus or equipment specified or otherwise provided for on drawings, addenda, or change orders issued subsequent to award of contract, shall be same brand, type, quality and character originally specified, unless specifically approved by the architect.
- E. The drawings indicate required size and points of termination of mechanical systems and ducts and suggest proper routes to conform to structure, avoid obstructions and preserve

clearances. However, it is not intended that drawings indicate all necessary offsets and it shall be the work of the installing contractor to make the installation in such a manner as to conform to structure, avoid obstructions, preserve headroom and maintenance access, and keep openings and passageways clear, without further instruction or cost to the owner.

- F. It is intended that the mechanical items be located symmetrical with architectural elements, and shall be installed at exact height and locations as shown on the architectural drawings. Refer to architectural details and reflected ceiling plans in completing and correlating work. Confirm all locations with Architect prior to rough-in.
- G. Contractors shall mock-up each typical room type for Owner and Architect's review and approval. Do not proceed with suite installations until approval has been received.

1.08 PROVISIONS FOR LATER INSTALLATION

- A. Become acquainted with nature and progress of construction against which this work attaches. Review structural drawings for coordination of openings. Cut no structural members or floor slabs without Architect's written approval.
- B. When this work cannot be installed concurrently with the building construction, arrange for inserts, sleeves, access panels, etc., as necessary for installation at a later date.

1.09 LOCAL CONDITIONS

- A. Visit site and become familiar with facilities and conditions affecting work. No additional payment will be made on claims that arise from lack of knowledge of existing conditions.
- B. Exercise extra care when working in areas where underground services exist. Any costs for repair of damage to such services become responsibility of Contractor causing damage.

1.10 PROTECTION

- A. When setting up pipe shop, such as cutting and threading machines, protect area against staining and abrasion. Cost of correcting any such condition will be the contractors responsibility.
- B. Protect floors from chips and cutting oil by use of chip receiving pan on oil proof cover. Do not use cutting machines over finished floors.
- C. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
- D. Protect surfaces from paint droppings and insulation adhesive, by use of drop cloths.
- E. Contractors shall be responsible for including and maintaining adequate precautions and safeguards related to their work during all phases of construction. Include protection barriers, etc., warnings and safety devices, fire protection equipment, and equipment for protection of personnel, equipment and materials. Comply with all requirements of governing authorities, including OSHA and local Fire Marshal requirements.
- F. Upon completion of work each day, open ends of ductwork shall be closed with visqueen

taped in place and piping shall be capped to prevent entrance of dirt and debris. Refrigerant piping shall be charged with dry nitrogen and closed with pipe caps or plastic pipe inserts. Protect all equipment, acoustic lined ducts, and insulation from moisture.

- G. Provide adequate supervision and standby fire protection means during the construction period and particularly while soldering or welding within building. Comply fully with the Fire Marshal requirements.

1.11 PRODUCT HANDLING

- A. Pay all costs for transportation of materials and equipment to job site.
- B. Provide all scaffolding, tackle, hoists, rigging necessary for placing mechanical materials and equipment in their proper place. Remove temporary work when no longer required.
- C. Contractor shall keep materials clean and protected in full accordance with the manufacturer's warranty requirements from weather and/or damage before and after installation until final acceptance by the owner. Protect all openings, bearings, controls, motors, etc., from dirt and moisture.

1.12 UTILITY TIE-INS

- A. Make all utility tie-ins and service shutdowns for this project in accordance with requirements of authorities having jurisdiction, the architect, and the owner's representative.
- B. Contractor shall confirm all utility requirements for tie-in prior to bid and include all facilities required by utility for a fully coordinated and complete installation.
- C. Contractor shall verify locations, sizes and depths of all utility sources or discharge points prior to starting work.
- D. Fully coordinate service interruptions or connection to existing facilities with all parties involved for shutdown and/or tie-ins with existing systems to **minimize** interruption of service.

1.13 TEMPORARY SERVICES

- A. Temporary services shall be provided as stated in Special Conditions and Division 1 and removed upon completion of the project.
- B. Provide all temporary services and valved or capped connections as required to accommodate any phasing sequences of the project.

1.14 OPERATING INSTRUCTIONS

- A. Owner's representative shall be instructed by contractor and manufacturer's representatives on system maintenance and operation requirements. Instruction shall be complete, conducted by qualified service and maintenance specialists.
- B. Provide, as a minimum, the following formal classroom type instructions for the owner's personnel. Contractor shall submit a written agenda for each session to the architect for approval two (2) weeks in advance of the schedule date requested and session will be

scheduled by the owner with one (1) week's notice to the contractor. Contractor shall include signed attendance lists for each training session in owner's instruction manual.

- 1) HVAC systems - One (1) two (2) hour session.
 - 2) Temperature control systems - one (1) two (2) hour session.
 - 3) Plumbing systems - one (1) two (2) hour session.
- C. Qualified representatives from each major item of equipment or system shall be present to instruct the owner's personnel. Their names and topics to be discussed shall be included on the agenda.
- D. Digitally record each training module separately and store on standard USB drive for owner. Include classroom instructions and demonstrations, board diagrams and other visual aids.

1.15 DAMAGE AND EMERGENCY REPAIRS

- A. Contractor shall be held responsible for damage to work caused by his work or through the negligence of his workmen. All patching and repairing of damaged work and the cost of same shall be paid by the contractor causing the damage. All existing facilities and installations shall be restored to their original condition when damaged by the work of this Division using workmen skilled in each required trade.
- B. The owner reserves the right to make emergency repairs as required to keep equipment or facility in operation, without voiding Contractor's warranty or relieving him of responsibility during warranty period.

1.16 WARRANTY

- A. Mechanical Contractors shall warrant all material, equipment, fixtures and workmanship for a period of one (1) year from date of final acceptance. Warranty shall include replacement of refrigerant in air conditioning systems.
- B. Any equipment, piping, fixture or other component part of system which fails during warranty period and all resulting damage shall be replaced or repaired by contractor without cost to owner.
- C. Any equipment which is damaged during the warranty period shall be replaced unless the manufacturer supervises and certifies in writing the repair work and the manufacturer warranties the equipment as new for an additional one-year period from the repair date.
- D. Warranty on any repairs or replacements shall be extended from date of replacement or repair of that item for one (1) year. All equipment and fixtures shall be warranted by the manufacturer through the contract warranty period. Any extended manufacturers warranties shall be extended to the owner.
- E. Refrigeration compressors shall be warranted for a total of five (5) years on compressors. All equipment shall include a one (1) year factory parts and labor warranty. If failure occurs during warranty period, contractor shall replace component and recharge refrigeration system without charge to owner. Labor for compressor replacement or refrigerant after the one (1) year project warranty period shall be the owner's responsibility.

- F. If reliable mechanical system operation cannot be demonstrated by the contractor within the one (1) year warranty period as determined by the Project Architect, system warranty shall be extended for a period of one (1) year from final date when reliable operation has been demonstrated.
- G. The contractor is responsible to promptly service any system performance problems which occur during the warranty and be on site and assist the engineer if on-site investigations are requested.

1.17 REQUIREMENTS FOR FINAL INSPECTION

- A. All of the following items must be completed prior to final inspections. No exceptions will be made and no final payment will be made until all items are completed.
 - 1) Each contractor's foreman shall perform his own punch list and, upon completion, notify the architect that project is ready for final punch list in writing and include a copy of the foreman's completed punch list. Contractor's foreman shall accompany the engineer during his punch list site visit.
 - 2) Thoroughly clean all parts of the apparatus and equipment. Remove all shipping tags, oil and grease spots. Such surfaces shall be carefully wiped and all cracks and corners scraped out.
 - 3) Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean.
 - 4) Strainer elements shall be in place during cleaning and flushing period, after which they shall be cleaned and replaced.
 - 5) Clean systems internally before placing in operation.
 - 6) All major mechanical equipment shall be started up by the equipment manufacturers technician and a written startup certification shall be filed with the manufacturer. Certified manufacturer's startup reports are required for all major equipment.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide material and labor which is neither drawn nor specified but which is obviously a component part of and necessary to complete work or to comply with code, and which is customarily a part of work of similar character.
- B. Provide incidental concrete, reinforcing steel, masonry, mortar, miscellaneous steel, painting and the like required to complete mechanical installations; perform in manner specified in applicable Division of General Trades Specification by workmen skilled in that particular trade.
- C. All equipment and material shall be new, free from defects, U.L. listed where applicable and warranted by the manufacturer. All equipment and systems shall comply with State energy codes.

- D. Provide materials and products of the same kind from the same manufacturer for this project. Any deviations must be submitted to the architect for approval prior to installation.

2.02 MATERIAL SUBSTITUTIONS

- A. All changes required by substitutions, such as revisions to foundations, bases, piping, controls, wiring, openings and appurtenances shall be made by the substituting contractor at no additional cost to the project. Notify all other contractors affected by substitution and pay all costs related to the substitution incurred by other contractors.
 - 1) Refer to General Conditions and Division I for requirements related to material and equipment substitutions.
- B. Systems have been laid out around particular fixtures and equipment considered base items. Manufacturer first listed is base item. Other named manufacturers in this specification or on the drawings who can provide equivalent equipment are acceptable and may be bid, provided performance, construction, dimensions and quality are equivalent to base item and that they can be properly installed. Named manufacturers, other than the base manufacturer, are substitutions and shall comply with the following paragraphs.
 - 1) Should the contractor propose to furnish materials or equipment other than the base item of these specifications, the contractor must comply with the requirements of the General Conditions Division of this specification and is responsible for providing a substitution which fully meets all specified performance and dimensional requirements. It is the contractor's responsibility to fully evaluate substitutions and ascertain that the substitution is equivalent in all respects to the base specification prior to submittal.
 - 2) Substitutions are subject to approval of Architect and his decision shall be final. In submitting substitutions, include make and model number and complete literature and performance data for evaluation.
- C. Substitution of items not named in these specifications and drawings may be offered for consideration by listing them and stating the change in price on the substitution sheet included in the Proposal Form of the contract, under the following conditions:
 - 1) The proposed substitution is proven, to the satisfaction of the Project Architect, Engineer and owner, to be equal or superior to the specified item in all respects.
 - 2) Extended manufacturer's delivery schedules on specified items, which would delay timely completion of the job, will be cause for consideration of substitutions, provided that the contractor has promptly placed equipment orders with his suppliers after award of contract. The Contractor must show proof of delay in delivery from the manufacturer.
 - 3) State the amount of credit to be given to the owner if the substitution is accepted prior to contract award on the proposal form substitution sheet or, if after award of contract, submit a quotation stating cost reduction resulting from acceptance of a substitution if executed through a contract change order.
 - 4) Manufacturers of items not named in these specifications or drawings may submit a

written request with supporting product information to the engineer ten (10) days prior to the project bid date for consideration at the sole determination of the engineer to become a named product. If approved, the product name will be added to the list of named manufacturers in a written addendum issued by the architect to bidders.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Locations of piping, equipment, ducts, etc., as shown the drawings are diagrammatic; indicated positions shall be followed as closely as possible, exact locations shall be subject to building construction and interferences with other work. Difficulties preventing the installation of any part of work as indicated shall be called to the attention of the Architect. Architect shall determine locations and changes and this contractor shall install the work accordingly. Architect reserves right to make minor changes in location of any part of the work up to the time of roughing-in without additional cost.
- B. All materials and equipment shall be installed in a neat and workmanlike manner by competent specialists for each subtrade. The installation of any materials and equipment not meeting these standards, in the sole judgment of the architect, will require removal and reinstallation at no additional cost to the Owner.
- C. Install all items under this contract in accordance with best engineering practice and in conformity with manufacturer's printed instructions.
- D. Take all measurements and determine all elevations at the building prior to fabrication or rough-in.
- E. All contractors are cautioned that existing conditions limit **OR** some areas of the project have limited the available space for installation of the mechanical work and close coordination is required. If work is installed which interferes with another trade's installation or compromises the architectural intent of the project, it shall be removed and reworked at no cost to the owner.

3.02 CUTTING AND PATCHING

- A. Perform all cutting, framing and patching in existing or new construction as necessary for installation of this work. Do not cut any structural member or structural floor slab without written permission from the Architect. Openings to be cut, framed and patched by the general trades contractor are indicated on the architectural plans. All other openings shall be cut, framed and patched by this contractor.
- B. Perform all cutting and patching of existing floors, excavation and backfill required for installation of below-grade piping. Excavate to depth required to install piping at required level and pitch. Pipe to be laid on interlocking aggregate bedding to give uniform bearing along length of pipe. Backfill with interlocking aggregate to bottom of floor slab. All backfill shall be compacted in maximum 6" layers. Remove all excavate materials from site.
- C. All openings shall be cut and lintels or frames installed by workmen skilled in the particular trade.

- 1) All patching shall be by workmen skilled in the particular trade.
- D. Core drill round openings and neatly saw cut rectangular openings in floors or walls. Sleeves shall be grouted or patched to match existing wall or floor construction. Install 1" minimum width trim flange around rectangular exposed penetrations and escutcheon plate around round exposed penetrations.
- E. Install lintels in all masonry openings cut by this contractor equal to 12" or larger in width. Provide steel angle framed around all wall, roof or floor openings. Size lintels and frames per schedule on architectural or structural plans.
- F. Sleeves for floor penetrations shall extend 2" above the finished floor, be grouted in place, and sealed watertight with fire rated caulking.
- G. Where openings for mechanical items are specified to be provided by general trades contractor and specifically shown on the architectural or structural plans, this contractor shall provide dimensioned layout drawings in advance of the work to the general contractor. Provide field layouts and assist general contractor in preparing for this work. Provide and set sleeves and roof curbs for openings to be provided by others. If opening information and sleeves are not provided to other trades in advance of their work, this contractor shall provide all required openings in existing construction as specified above.

3.03 FIRE STOPPING

- A. Where pipes pass through fire rated construction, core drill opening, set steel pipe sleeve and fill voids between sleeve and rated construction with non-shrinking grout. Floor sleeves shall be set two (2) inches minimum above finished floor and sealed watertight. All penetrations shall be protected or rated construction, in accordance with an approved method listed in the U.L. Fire Resistance Directory.
- B. For all other assemblies, fill void spaces with a "UL" approved fire resistant system. Plastic pipes shall not penetrate fire rated walls, floor, partitions or assemblies. Floor sleeves shall be set two (2) inches minimum above finished floor and sealed watertight.

3.04 ACCESS DOORS

- A. Proper access for service and maintenance shall be ascertained before installation of any item.
- B. Access doors adequately sized for servicing concealed items furnished under this contract. Doors shall be fire rated where installed in rated construction and shall have concealed hinge door, screw drive latch and primed painted finish. Frames shall be compatible with adjoining construction surfaces. Door on insulated ducts shall be double wall with 1" internal insulation.
- C. In new construction access doors shall be furnished by the mechanical contractor to general trades contractor for installation.
- D. Refer to Section 200050, for access door specifications.

3.05 PAINTING

- A. Painting of mechanical systems shall be provided when specifically noted on the mechanical drawings or in the following paragraphs.
- B. All materials and equipment installed under this Division shall be left free from dirt, grease and foreign matter, ready for painting.
- C. No equipment or piping shall be painted before being tested and removal of all shipping tags and labels. All manufacturer's nameplates and control devices shall be covered.
- D. Damaged surfaces of prefinished materials and equipment furnished by this contractor shall be touch-up painted to match existing finish by this contractor in full compliance with Division 9 requirements and materials.
- E. All exterior exposed ductwork and related supports shall be primed and painted with two (2) coats of rust inhibitive paint on exterior and enamel paint on interior in accordance with the paint manufacturer's instructions. Architect shall select a custom color.

3.06 PIPE IDENTIFICATION

- A. Identify all piping systems for project in all locations of the building, including Equipment Rooms and at concealed locations as follows:
 - 1) Color code ID bands or marker backgrounds to identify contents of pipe in conformance with Scheme for Identification of Piping Systems, ANSI A13.1 and owner's identification standards.
 - 2) Provide identifying nameplate band in color at least one (1) inch wide near each valve and fitting and on both sides of pipes passing through walls. On long runs space at intervals not over 40' if exposed and 20' centers if concealed.
 - 3) Provide plastic nameplate with one (1) inch high letters on all piping indicating direction of flow and contents. Place in location so as to be easily read from floor. Band nameplates in place.
 - 4) Prefinished labels and color bands are acceptable, as manufactured by Seton, Inc. They shall be clean, dust free surfaces and mechanically banded in place.

3.07 EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment as to nature of service and system number corresponding to designation on design drawings, attaching two (2) color engraved plastic nameplates.

<u>Item</u>	<u>Type Identification</u>
All Mechanical Equipment	Nameplate
Motor Starters	Nameplate
Switches	Nameplate
Control Panels and Devices	Nameplate

- B. Nameplates shall be laminated phenolic with a black surface and white core and shall be mechanically fastened with screws to each item. Use 1/16" thick material for plates up to 2"x4". For larger sizes, use 1/8" thick material. Lettering shall be minimum 1/4" height,

spaced at four (4) per inch.

3.08 VALVE TAGS

- A. Provide a numbered two (2) color engraved plastic tag or stamped brass tag approximately one (1) inch in diameter, attached to handwheel of each valve with non-rusting "S" hook of adequate size. Local stop and shut-off valve to an equipment item need not be tagged.
- 1) Engrave each tag with number and service designation of valve. Prefix number with "P" for Plumbing, "H" for Heating, "FP" for Fire Protection, and "C" for Cooling. In color coded lines, background plastic color shall correspond to service identification color.
 - 2) Accurately record numbers and locations on the "Record" drawings.
 - 3) Provide typed valve directories, identifying each valve as to size, type, service and location. Include in operating and maintenance manuals. Refer to the General Conditions of the contract for additional requirements.

3.09 OPERATING AND MAINTENANCE MANUAL

- A. Prepare a minimum of three (3) complete operating and maintenance manuals in hardback binders describing operation of the systems and recommended maintenance schedule. Turn all equipment warranties over to the Owner. Refer to the General Conditions of the contract for additional requirements.
- B. Manuals shall be indexed, arranged in the CSI format, and include:
- 1) Job name and names of contractor with address and telephone number for service.
 - 2) Manual index.
 - 3) Identification, name, mark, number as indicated on design drawings.
 - 4) Step-by-step procedures for startup and shutdown on each system and piece of equipment.
 - 5) Normal equipment operating characteristics.
 - 6) Performance data, curves, ratings.
 - 7) Wiring diagrams.
 - 8) Manufacturer's descriptive literature.
 - 9) Automatic controls with diagrams and written description of operation.
 - 10) Manufacturer's maintenance and service manuals and manufacturer's start up report. Include signed copies of attendance sheets for each owner instruction session.
 - 11) Spare parts and replacement parts list for each piece of equipment.

- 12) Name of service agency and installer.
- 13) Final accepted shop drawings.
- 14) Maintenance and lubrication instructions.
- 15) Belt sizes, types and lengths.
- 16) Plumbing fixtures, valves parts list.
- 17) Valve tag chart and pipe identification chart.

3.10 CLEANING UP

- A. At all times keep premises and building in neat and orderly condition. Follow explicitly any instructions of Architect in regard to storing of materials, protective measures and disposing of debris. All rubbish resulting from the work herein specified shall be removed from the premises on a daily basis.
- B. Upon completion of his work, each contractor or his subcontractors shall remove from the site and properly dispose of all tools, equipment, surplus materials, and rubbish pertaining to his operations. Each contractor shall pay all costs for such removal and disposition and shall cooperate with General Contractor in final cleaning of the project. Refer to the General Conditions for details.
- C. Replace all air system filters with new clean filters at completion of work. Clean all strainers, equipment and duct systems.
- D. Provide chemical cleaning for piping systems with an approved cleaning compound detergent to remove pipe dope, slushing compounds, oils, welding slag, loose mill scale and other extraneous materials.
- E. After flushing systems, clean filters, strainers, traps, dirt legs, etc., and fill systems.

3.11 LUBRICATION, PACKING AND SUPPLIES

- A. Properly lubricate all rotating, reciprocating equipment before it is started with correct grade, type and quantity of lubricant.
- B. Maintain all lubrication gaskets and packing during construction; assure that at the time of acceptance all are in first class condition.
- C. Install initial charge of refrigerant and oil and other supplies required to place refrigeration equipment in operation.

3.12 TESTS AND ADJUSTMENTS

- A. Obtain all inspections required by law, ordinance, rules, regulations of authorities having jurisdiction and furnish certificates of such inspections to architect. Pay all fees and provide all equipment, power and labor necessary for inspections and tests.

- B. During testing period maintain on job a competent technician thoroughly familiar with all phases for as long a period as required to thoroughly adjust all systems and demonstrate that they are functioning properly. The mechanical contractor must make an independent verification and submit work sheet logs to verify that all mechanical equipment and systems have been started up and are completely calibrated and functional.
- C. Perform all tests, including but not limited to those hereinafter specified, make necessary adjustments to obtain specified equipment and system characteristics.
- D. Do not consider work under this Specification complete until Contractor has obtained required inspections, performed tests, made necessary adjustments and has submitted satisfactory evidence of completion to the architect.

E. Pressure Tests:

- 1) All piping shall be given the following pressure test without appreciable pressure loss. Equipment which would be damaged by the required test pressure shall be isolated from the system during test.

<u>Service</u>	<u>Medium</u>	<u>(PSI)</u>	<u>Hours</u>
Domestic water	Water	125	6
Condensate	Water	50	6
Waste and vent	Water	4.33	2
Sewers, storm and sanitary	Water	4.33	2

- 2) Test medium for refrigerant piping shall be oil pumped dry nitrogen with twenty-four (24) hour standing time minimum. Test the low side of the system to 150 psi and the high side to 300 psi. Tests shall conform to "Pressure Piping Systems Code" 4101:8-3 and ANSI Standard B31.5 "Refrigeration Piping."
- 3) Correct leaks in screwed joints by replacing thread or fitting or both. Caulking of threaded joints is not permitted. Repair leaks in copper tubing by sweating out joints, thoroughly cleaning both tube and fitting, and resoldering.
- 4) All tests shall be made before piping is concealed or covered. Contractor shall be responsible for completely draining the systems after hydrostatic tests are performed. Any damage from freezing prior to owner's acceptance of the completed installation shall be repaired at the sole expense of this contractor.
- 5) Schedule for the owner to witness starting and ending of pressure tests. Submit test reports to architect for review.

F. HVAC Systems Adjustments and Balance:

- 1) Provide services of an NEBB or AABC certified test agency to test and balance HVAC systems. Conduct all tests in accordance with Associated Air Balance Council, National Standards for Field Measurements and Instrumentation and work shall be performed by NEBB or AABC certified technicians. Contractor must have been in the test and balance business with a local office within 50 miles of the site for

a minimum of 5 years.

- 2) Do not begin adjustments until systems have been completed and are in full working order. Place all heating, ventilating, exhaust and air conditioning systems and equipment into full operation and continue operation of same during each working day of testing and balancing.
- 3) Prior to beginning the work on this project, the balance contractor shall schedule a meeting at the engineers office to review the scope of the balance work and intended system performance. Both the balance supervisor and the field technician are required to attend this meeting
- 4) Perform tests and balance systems in accordance with the following requirements:
 - a. Test and adjust all air handling systems for design flow, air quantity to within $\pm 5\%$ of design requirements.
 - b. During the balancing work, if any conditions arise which prevent achieving the system balance within the tolerance listed in "a", or if objectionable temperature, humidity or noise levels are present in the system the balance contractor shall immediately advise the engineer and mechanical contractor by telephone, with written confirmation. Do not proceed with the balance work unless directed in writing by the engineer. Corrections must be completed and the system retested prior to submission of the balance report.
 - c. Identify each air terminal, diffuser, grille and register as to location and area in readings and tests of diffusers, grilles and registers, tabulate required velocity and CFM, and test velocity and CFM after adjustment and list size, type and manufacturer of diffusers, grilles and registers. Adjust supply diffusers, grilles and registers for proper air distribution pattern to eliminate drafts. Supply air quantities on low pressure systems shall be adjusted by manual volume dampers with all zone control dampers in the full open position.
 - d. For each piece of air handling equipment, list fan data, motor and drive. Test and record fan motor horsepower, full load amperes, fan speed, system suction and discharge static pressure. Determine CFM by means of velocity traverse at a minimum of three (3) fan diameters from fan outlet.
 - e. Set minimum outside air damper position on air handling systems in accordance with specified air quantities. Test and adjust make-up air unit and exhaust fan to maintain negative building pressure during all modes of operation.
 - f. List design data for each pump, obtain by measurement and tabulate pump motor voltage, pump motor operating current, pump head with no flow and with full flow. Submit manufacturer's pump curves, indicating operating point of each pump.
 - g. Thoroughly test the proper operation of all temperature controls and other automatic devices. Control systems are to be fully operational and calibrated

during the balancing of the systems. The balance contractor shall notify the contractor of any malfunctioning systems and controls in writing with copy to the engineer. Balance contractor shall recheck systems after calibrations or repairs have been completed and so certify in final balance report.

- h. Balance report shall include measured air conditions entering and leaving each heating or cooling coil, HVAC unit or chiller.
- i. Furnish five (5) certified copies of balancing results. Report must certify that all controls and equipment are functional and calibrated. Include warranty certificate for project. Balance reports will be rejected if they list any qualifications for the balance work. Any deviations from the specified design or qualifications listed in the balance report must have prior engineer's approval.
- j. During one (1) complete heating-cooling season, make any minor adjustments that may be necessary to ensure uniform temperature and humidity conditions throughout the space, as requested by the engineer. Provide test equipment and technician to assist the engineer in the evaluation of any system problems during the warranty period.
- k. This contractor shall include one (1) additional set of belts and sheaves on all air handling equipment if required for rebalancing for each system for the project. All of the above work shall be at no additional cost to the owner.
- l. The air balance contractor shall provide up to four (4) hours of on-site balancing with the engineer to spot check the completed air balance.

3.13 TEMPORARY SITE FENCING

- A. Contractor shall erect a fence around the construction site and maintain it during all work phases of this project. Confirm fence location with owner prior to installation.
- B. Provide required signage on construction fence per OSHA requirements and the contractor's safety plan.
- C. Fence shall be constructed of galvanized steel chain link fence and posts.
- D. Remove fence upon project completion and restore site to its existing condition.

3.14 SITE RESTORATION

- A. Upon completion of the work, the contractor shall complete the following:
 - 1) Repair or replace all roof or building damage in a manner approved by the owner to match existing conditions.
 - 2) Remove and replace all damaged sidewalks, drives and curbs in a manner approved by the owner to match existing conditions.
 - 3) Restore all site landscaping to existing conditions. Fill low spots with topsoil, seed

and straw grass areas. Repair existing landscape beds and replace damaged shrubs to match existing conditions.

3.15 RIGGING

- A. Contractor shall meet with the architect and owner to establish a site-specific rigging plan and schedule for this project. Plan shall incorporate safety measures to be implemented during rigging operations.
- B. Coordinate all on-site travel with owner and at times designated by the owner.
- C. Contractor shall provide all equipment necessary to remove existing equipment and related demolition materials and set new equipment and related materials in place.
- D. Contractor shall provide temporary drive materials or mats as necessary to move crane and trucks into place for rigging and to protect the existing site.
- E. All rigging shall be performed in accordance with the Industry Standard of Practice. Refer to notes on drawing for additional requirements.
- F. Upon completion of project, all temporary facilities shall be removed and the site shall be restored to its original condition.

END OF SECTION

SECTION 200050

BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 REFERENCE

- A. Drawings and General Provisions of contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
- B. The requirements of this Section shall govern all Mechanical Division work for this project. Bidders are referred to in this section as "Mechanical Contractors" and all provisions apply to each contractor and their subcontractors.

1.02 WORK INCLUDES

- A. All labor, equipment, accessories, materials, and services required to furnish and install the mechanical work for the project, including the following:
 - Pipe, valves, fittings and piping accessories
 - Thermometers and pressure gauges
 - Refrigerant piping systems and accessories
 - Equipment pads
 - Inserts, sleeves, hangers, supports and drip pans
 - Electrical devices for equipment and motors
 - Vibration control
 - Excavation and backfill

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Refer to Section 200010.

1.04 SUBMITTALS

- A. Submittals are required for the following:
 - 1) Pipe materials, joints and hangers.
 - 2) Valves, strainers and expansion joints.
 - 3) Thermometers and pressure gages.
 - 4) Vibration control.
- B. Refer to Section 200010.

1.05 MATERIALS

- A. All piping, valves, pipe joining materials, and appurtenances shall be continuously rated by the manufacturer for the intended service conditions.

- B. All materials and appurtenances shall meet the requirements of the authorities having jurisdiction.
- C. Plastic piping when specified in Part 2, may be used only when approved by the authorities having jurisdiction and shall not be installed in return air plenums, kitchens or any sewer where a waste discharge temperature exceeds 120°F. Cast iron no hub piping CISPI-301 shall be installed.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

- A. Plumbing Systems Building Interior
- B. All piping systems shall be identified. Labeling shall comply with ANSI A13.1 "Scheme for the Identification of Piping Systems" regarding color, label size and letter size.
- C. Materials for above and below grade plumbing systems inside the building to 5'-0" outside building wall shall be as follows:

<u>Service</u>	<u>Size</u>	<u>Pipe Material</u>	<u>Fittings</u>
Sanitary waste below grade	All	Cast iron service weight ASTM A-74	Cast iron service weight ASTM A-74
	All	or PVC plastic Sch. 40 ASTM D-1785 solvent weld	PVC plastic ASTM D-2665 solvent weld
Sanitary waste above grade exposed in return air plenum	All	Cast iron no hub ASTM A 888	Cast iron no hub CISPI-301
Sanitary waste not in return air plenum	All	PVC plastic Sch. 40 ASTM D-1785 solvent	PVC plastic ASTM D-2665 solvent weld
Vent piping above grade exposed in return air plenum	All	Cast iron no-hub CISPI-301	Cast iron no-hub CISPI-301
		or Sch. 40 galv. steel screwed ASTM A-120	or Sch. 40 galv. steel screwed ASTM A-120
Vent piping above grade not in return air plenum	All	PVC plastic Sch. 40 ASTM D-1785 solvent weld	PVC plastic ASTM D-2665 solvent weld
Drain lines above and below grade	1/2" up to 1-1/2"	Type "L" hard drawn copper ASTM B-88	Wrought copper solder joints ASTM B-16.22

		or Type DWV hard drawn copper ASTM B-88	Wrought copper solder joints ASTM B16.22
	1-1/2" and over	Cast iron service weight ASTM A-74	Cast iron service weight ASTM A-74
	All	or PVC plastic Sch. 40 ASTM D-1785 solvent weld	PVC plastic ASTM D-2665 solvent weld
Trap primer drains below grade	All	Type "L" soft drain copper with 1" foam plastic insulation	No joints below grade are permitted.
Domestic water above grade	1/2" up to 4"	Type "L" hard drawn copper ASTM B-88	Wrought copper solder joints ASTM B16.22 or mechanical press joints
Domestic water below grade inside building	1/2" up to 2"	Type "K" hard drawn copper ASTM B-88	Wrought copper brazed joints ASTM B-16.22
Domestic water below grade outside building	All	Ductile cement-lined cast iron Class 52 ANSI A21.51	Straight pipe slip seal compression type. Changes in direction mechanical joints with restrainer rods and glands ANSI A21.11

D. Mechanical Systems Piping and Fittings

Piping and fittings for mechanical systems shall be as follows:

<u>SERVICE</u>	<u>SIZE</u>	<u>PIPE MATERIAL</u>	<u>FITTINGS</u>
Condensate drains bldg. interior	All	Sch. 40 galvanized steel ASTM A-120 or Type "M" or "DWV" copper ASTM B-88 or Sch. 40 PVC plastic ASTM D-1785	Galvanized cast iron or Wrought copper or PVC plastic
Condensate drains bldg. exterior	All	Sch. 40 PVC plastic ASTM D-1785	PVC plastic
Refrigerant piping	All	Refrigerant grade hard copper nitrogen filled with capped ends	Long radius copper fitting, silver solder joints

2.02 PIPE JOINTS

- A. All pipe materials, solders, fluxes, lubricants, adhesives, seals, etc., shall be compatible and rated by the manufacturer for the intended service.
- B. Cast iron sewer pipe connections shall be as listed below. The type of pipe used must conform to the fitting requirements for a proper, leak-tight connection. Joints must be Code approved.
- 1) Neoprene seal gaskets. A positive seal elastomeric compression type neoprene gasket to be inserted in hub, inside gasket uniformly coated with seal lubricant and pipe inserted into gasket, ASTM C-564.
 - 2) No-hub. A no-hub coupling with neoprene gasket which is placed over spigots and both spigots firmly seated to separator ring. The stainless steel shield shall be placed over gasket and tightened with adjustment screws. No-hub is not permitted below grade. Couplings shall be as manufactured by Mission Heavyweight No-Hub couplings or Husky SD4000 Series, heavy-duty type, as manufactured by Anaheim Foundry Company.
- C. Screwed pipe and fittings shall be assembled with sharp, clean, tapered threads using teflon tape on the male thread only. All cut pipe shall be reamed to the full inside diameter.
- D. Solder joints in copper tubing (except refrigerant piping) shall be made with flux meeting Copper Development Association Standard Test Method 10, and non-lead, non-toxic antimony alloy solder, ASTM B-32 Grade 95TA except underground lines below floors where all joints shall be brazed. The ends of tubing shall be cut square and the tube ends at inside of fittings burnished with emery cloth before assembly. Joints shall be wiped clean of excess flux and solder after completion.
- E. Silver Solder (Brazed) - Refrigerant and below-grade piping -brazed joints. Joints shall be prepared the same as solder joints and made with silver brazing alloy, rated for two (2) times the working pressure of the refrigerant. Purge piping with inert gas during brazing operations.
- F. Flange joints shall be made with matching ground surface flanges and composition gaskets made tight with bolts and nuts. Cast iron flanged fittings and bolting, ANSI B-16.1. Steel flanges and fittings, including bolting and gasketing, ANSI B-16.5.
- G. Solvent weld joints shall be made with a solvent cement suitable for the type of plastic specified. Above 3" use a slow setting cement. The ends of the pipe shall be cut square and chamfered with all burrs removed. Clean pipe ends and fitting jacket with manufacturer approved pipe cleaner and apply solvent cement. Insert pipe end such that pipe bottoms against fitting pipe stop.
- H. Mechanical Joints
- 1) Mechanical joints for polyethylene plastic gas piping. The ends of pipe shall be cut square and trimmed free of burrs. Cut groove into pipe using manufacturer's grooving tool. Groove shall be free of feathers. Install "O" ring shrink tight in groove. Hand tighten fitting and take up nut one-half (1/2) turn further with spanner wrench. Conform to all manufacturer's instructions for making joints and gas company regulations.
 - 2) Mechanical joints for no-hub cast iron pipe and fittings shall conform to the manufacturer's installation instructions and code requirements. Hubless coupling

gaskets shall conform to ASTM C-564.

- 3) Press Connection: Copper pipes shall be joined with copper press fittings and shall be made in accordance with the manufacturer's installation instructions by tradesman trained by the manufacturer. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting and after mechanical pressing the fitting shall have a visual indicator to confirm that the connection has been properly fabricated. The joints shall be pressed using the tool approved by the manufacturer. System shall be manufactured by Rigid, Viega or approved equivalent.

I. Ductile Iron Water Pipe

- 1) Push-On Joints: Surfaces with which the rubber gasket comes in contact shall be thoroughly cleaned just prior to assembly. The gasket shall then be inserted into the groove in the bell. Before starting joint assembly, a liberal coating of special lubricant shall be applied to the spigot end. With the spigot end centered in the bell, the spigot end is pushed home.
- 2) Mechanical Joints: Mechanical joints for metal pipe require that the spigot be centrally located in the bell. The surface with which the rubber gasket comes in contact shall be thoroughly cleaned just prior to assembly. These clean surfaces shall then be brushed with a special lubricant just prior to slipping the gasket over the spigot end and into the bell. The lubricant shall also be brushed over the gasket prior to installation to remove the loose dirt and lubricate the gasket as it is forced into its retaining space.
- 3) Bolts and nuts on below-grade mechanical joints shall be stainless steel.
- 4) Provide retainer glands and thrust blocks on all changes in direction of below-grade incoming water service lines, as manufactured by Uni-Lock or approved equivalent.

J. Grooved Piping Products

- 1) General: Mechanical grooved pipe couplings and fittings may be used for piping systems having operating conditions not exceeding 210°F and shall not be used on any below-grade piping, steam or condensate piping, and any other service not recommended by manufacturer, in lieu of welded, flanged or threaded methods. They may be installed at unions, seismic joints, flexible connections, or expansion joints, where applied in accordance with the manufacturer's published ratings. Comply fully with manufacturer's installation instructions.
- 2) Coupling Housings: Malleable iron conforming to ASTM A-47.
- 3) Coupling Housings: Ductile iron conforming to ASTM A-536.
- 4) Coupling Housings Description: Grooved mechanical type, which engages grooved or shouldered pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two (2) or more parts, secure together during assembly with nuts and bolts. Permit degree of contraction and expansion as specified in manufacturer's latest published literature.

- 5) Gaskets: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomers having properties as designated by ASTM D-2000.
 - a. Heating or Chilled Water or Glycol Solution Services: EPDM Grade E with green color code identification. Rated for temperature range from -30°F to +230°F continuous operating temperature.
 - b. Other Services: As recommended by manufacturer.
- 6) Couplings shall be Zero Flex Style 07, except at pieces of mechanical equipment requiring vibration isolation, such as pumps, chillers and cooling towers, where standard flexible couplings Style 77 shall be installed on the first three joints from equipment flanges in place of a flexible connector where installed in accordance with the manufacturer's recommendations.
- 7) Manufacturer's technical service representative shall conduct on-site training for all mechanical tradesman installing grooved piping on the project. Training shall include all manufacturers installation and testing instructions for this project. Submit a certificate of training completion with a list of attendees to the architect prior to starting any piping work on this project.
- 8) Manufacturer: Subject to compliance with requirements, provide grooved piping products by Victaulic, Inc., or equivalent by ITT Grinnell, Stockham, Inc., or Gruvlock.'

2.03 VALVES

- A. Valves shall be of the same manufacturer where possible and equal to those manufactured by Lunkenheimer, Nibco, Mueller, Milwaukee, Keystone, DeZurik, Jenkins, Victaulic, Grinnell, Crane, Metraflex, Mepco, or Demco and withstand minimum 125 lbs. steam working pressure. All valves shall be rated by the manufacturer for the pressure and service intended.
- B. Valves shall be located in mechanical rooms or above accessible ceilings. If required to install valves above solid ceiling or in wall, provide access panel compatible with wall or ceiling materials.
- C. All valves in insulated piping systems shall have extended handles and insulation kits. Any valves that cannot be insulated properly to prevent condensation from forming shall be replaced with a suitable valve.
- D. Valves shall be furnished with brass or plastic engraved tag indicating type of service and valve number. A typed valve chart shall be supplied to the owner indicating: type of service, valve number, the equipment or fixtures, and the location (room number) of equipment or fixtures served by each valve.
- E. Valves for mechanical systems shall be as follows. Other valve requirements shall be as specified in the valve section of other sections of this specification.
- F. Valve stems on chilled glycol/water systems shall be extended beyond the thickness of pipe

insulation and sealed vapor tight.

1) DOMESTIC COLD, HOT AND RECIRCULATING HOT WATER SHUT-OFF VALVES

- a. Shut-off valves 2" and smaller
Screwed
Soldered
- Ball valves: two (2) piece construction, chrome ball, reinforced TFE seats, lead free - 125 psi
Nibco #T-FP-600A-LF
Nibco #S-FP-600A-LF
- b. Shut-off valves 2-1/2" & larger flanged
- Gate Valves: C. I. bolted bonnet, O.S. &Y., resilient wedge bronze mounted, 125 psi SWP, 200 psi, WOG, lead free
Nibco #F-619-RWS-SON
or
Butterfly Valves: Water service only, lug type, 150 psi rated with EPDM liner, stainless stem, aluminum-bronze disc, lead free
- 2-1/2" through 4"
Handle operator with 10 positions,
Nibco #WD-2000
- 6" and larger
Gear driven manual operator,
Nibco #WD-2000

2) DRAIN VALVES

- a. 1/2" and 3/4"
- Brass boiler drain with hose thread and cap with 12" long beaded chain, 125 psi WOG
- Screwed Nibco #74
Solder Nibco #74-2

2.04 FLOOR, CEILING, AND WALL PLATES

- A. Fit all exposed pipe passing through walls, floor or ceilings in finished rooms with steel or brass escutcheons. Where surface is to receive a paint finish make escutcheons prime painted; otherwise, make escutcheons nickel or chrome plated. Where piping is insulated, fit escutcheons outside insulation.
- B. Pack openings in non-rated construction with fiberglass insulation to prevent noise transfer through penetrations.

2.05 EQUIPMENT PADS

- A. Except where specifically noted on architectural plans, this contractor shall provide all equipment housekeeping pads for equipment furnished under this Division.
- B. Construct pads of 2000 pound concrete complete with all necessary foundation bolts, sleeves, anchor plates, washers and nuts. All exposed portions of pads shall be smooth finish and corners shall be beveled. Dowel all equipment pads to concrete floors at 12" centers.
- C. Unless otherwise noted on Drawings, make all equipment pads a minimum of three-and-five-

eighths (3-5/8) inches thick.

- D. This contractor shall provide and pour concrete for all vibration inertia bases furnished for equipment in this Division and grout all pump base plates.

2.06 SLEEVES

- A. Where pipes pass through masonry or concrete partitions, or rated fire partitions other than solid masonry, set machine cut Schedule 40 steel pipe sleeves one (1) inch larger than outside diameter of pipe and insulation, with ends of sleeves flush with partition faces and grout sleeve in place.
- B. Where pipes pass through dry wall partitions, set fabricated sheet metal sleeves through penetration and plaster in place.
- C. Where pipes pass through floors, set machine cut Schedule 40 steel pipe sleeves one (1) inch larger than outside diameter of pipe and insulation. Top of sleeve shall be two (2) inches above finished floor and shall be grouted in place and sealed watertight to floor.
- D. Where pipes are insulated and/or firestopped, provide sleeves large enough to allow insulation and firestopping to pass through sleeve. Center pipes in sleeves.
- E. Set sleeves true to line, grade; position and plumb or level and so maintain throughout construction period.
- F. Where solid concrete or masonry walls are core drilled for pipe passage, steel sleeves are not required.
- G. Seal opening between pipe or pipe insulation and sleeve using a method listed in the U.L. Fire Resistance Directory as required to maintain the integrity of the fire rating of all walls and floors.
- H. Seal all penetrations of humidity controlled rooms and penetration of walls between air conditioned and non-air conditioned spaces vapor tight.
- I. Pipe Sleeves: Provide sleeves through penetrations as follows:
 - 1) Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snap-lock joint, welded spiral seams or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" to 6", 16 gage; over 6", 14 gage.
 - 2) Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
 - 3) Iron Pipe: Fabricate from cast iron or ductile iron pipe; remove burrs.
 - 4) Plastic Pipe: Fabricate from Schedule 40 PVC plastic pipe; remove burrs. (Limited to penetration of non-fire rated construction and shall not be installed in return air plenums.)

PART 3 EXECUTION

3.01 GENERAL PIPING

- A. Provide shut-off valves at all branch connections to main, at all fixture groupings, each piece of apparatus and in mains to sectionalize the systems and elsewhere as indicated on plans.
- B. Provide all supplemental steel necessary to rigidly support piping systems back to the building structure.
- C. Install valves with stems at or above horizontal position.
- D. Install all valves and equipment with unions or flanges to facilitate removal.
- E. Provide hose end drain valves at all low points, trapped sections, at system isolation valves, and on equipment side of all branch valves to permit draining of all parts of liquid piping systems. Install manual vent valves at high points of equipment and piping to allow venting.
- F. Pipe equipment drains and drip bases to nearest drain.
- G. Locate covered piping a sufficient distance from walls, other pipe, ductwork or other obstacles, to permit application of the full thickness of insulation specified; if necessary, use extra fittings and pipe.
- H. Install dielectric unions where dissimilar pipe materials are joined.
- I. Make piping connections to equipment in accordance with the manufacturer's instructions and in a manner which does not place strain on equipment.
- J. Arrange and install all pipes, valves, cleanouts, access openings and equipment so as to be accessible for service. Locate equipment to maintain clearances for tube, coil pulling, and periodic servicing.
- K. Make reductions in piping lines with reducing couplings.
- L. Do not install any water piping at locations subject to freezing.
- M. No piping, ducts or equipment foreign to the electrical equipment shall be permitted to be installed within six (6) inches of either side of, below or above any electrical panels or in elevator rooms or shafts.
- N. All exposed pipe locations shall be approved by the architect prior to rough-in. All exposed piping must be installed tight to structure and carefully coordinated with other work to achieve a neat and uniform appearance in the building.

3.02 REFRIGERANT PIPING SYSTEMS

- A. Refrigerant piping and equipment installation shall conform to the applicable requirements of the Safety Code for Mechanical Refrigeration (ANSI B9.12).
- B. Piping and specialties shall be sized to prevent excessive pressure drop and allow compressors and evaporators to operate together with balance points at or above the specified capacities.
- C. Piping and specialties shall be arranged to return oil at all loads and prevent liquid from

"slugging" the compressor or siphoning to the evaporator.

- D. Pitch horizontal refrigerant piping 1/2" per ten (10) feet in direction of flow.
- E. Piping shall be in full accordance with project-specific piping diagrams submitted by the equipment manufacturer after review by engineer. Submit piping shop drawings with equipment submittals for approval. Catalog pipe charts are not acceptable.
- F. Refrigerant piping systems shall be double evacuated with an oil vacuum pump to an absolute pressure of five (5) microns and shall maintain this pressure for a period of one (1) hour. Purge piping with refrigerant prior to and between evacuations. Break vacuum with refrigerant and charge system with proper mixture or refrigerant and oil per the manufacturer's recommendations.
- G. Isolate all refrigerant piping from structure and pipe hanging points. Uninsulated lines shall be isolated with Unistrut rubber sleeves at clamping points or 6" long, 1" thick fiberglass insulation, and insulation sleeve at each hanger. Insulated lines shall have insulation sleeve installed at each hanger point or between Unistrut clamp and insulation. No metal-metal contact is permitted for any refrigerant piping.

END OF SECTION

SECTION 200570

FIRE STOPPING

PART 1 GENERAL

1.01 REFERENCE

- A. Drawings and General Provisions of contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
- B. The requirements of this Section shall govern all Mechanical Division work for this project. Bidders are referred to in this section as "Mechanical Contractors" and all provisions apply to each contractor and their subcontractors.

1.02 DESCRIPTION OF WORK

- A. Work of this Section includes, but is not limited to:
 - 1) Requirements for furnishing and installing firestopping for fire-rated construction, in the following areas:
 - a. All openings in fire-rated floors and wall assemblies, both empty and those accommodating penetrating items such as cables, conduits, pipes, ducts, cable trays, bus ducts, etc.
- B. Related Work Specified Elsewhere includes, but is not limited to:
 - 1) Coordinate work of this section with the following sections for floors and walls where firestopping is applied:
 - Section 200010, General Provisions, All Mechanical Sections
 - Section 210010, Fire Protection
 - Section 260500, Basic Materials and Methods

1.03 QUALITY ASSURANCE

- A. General:
 - 1) Firestopping materials shall conform to Flame (F) and Temperature (T) ratings required by local building code and as tested by Underwriter's Laboratories per ASTM E-814 or UL 1479 fire tests in a configuration that is representative of field conditions. The F rating must be a minimum of one (1) hour but not less than the fire resistance of the assembly being penetrated.
 - 2) Firestopping materials shall be non-halogenated; refractory ceramic fiber and asbestos free and shall not incorporate nor require the use of hazardous solvents.
 - 3) Do not use firestop products that dissolve in water after curing.

- 4) This section supersedes all other specifications for building insulation. Provide firestopping for conditions specified whether or not firestopping is indicated and, if indicated, whether such material is designed as insulation, safing, or otherwise. Insulation types specified in contract documents shall not be installed in lieu of firestopping.
- 5) Manufacturer's engineering judgments will be accepted for non-standard applications or where no tested system exists. Drawings for engineering judgments must indicate the Underwriters Laboratories classified system or systems upon which the engineering judgment is based, in order to evaluate the engineering judgment against known performance.
- 6) Firestopping materials & systems must be capable of closing openings created by:
 - a. The burning away of combustible pipes, cable jacketing, or pipe insulation.
 - b. Deflection of sheet metal due to thermal expansion.
- 7) Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
- 8) Firestop systems for areas subject to movement from dynamic loading, thermal expansion, or building movement shall be tested per UL 2079 for 500 cycles at a minimum of 10 cycles per minute, and fire tested in a fully extended joint.

B. Manufacturer's Field Representative

- 1) The manufacturer of the work of this section shall provide a qualified field representative at the site. All technicians applying firestopping materials shall be trained and certified by the manufacturer.

C. Codes and Standards

ASTM E 84
ASTM E 119
ASTM E 814
UL 263
NFPA 101 6-2.2.5 & 6-2.2.8
UL 1479
Ohio Building Code
UL 2079

1.04 SUBMITTALS

A. All submittals shall conform completely to the requirements of the Contract Documents.

B. Product Data

- 1) For each type of material to be installed, literature shall indicate product characteristics, typical uses, performance, and test data.

C. Shop Drawings

- 1) Include U.L. rated system number and details for each type of penetration or configuration. Show typical installation details including: minimum and maximum allowable annular spacing; base material composition, firestop materials selected and applied thickness required to achieve the hourly rating.

D. Job Mock-up

- 1) Prior to installation, install one of each type of seal using the same materials that will be used on the project.
- 2) Obtain engineer's acceptance.
- 3) Approved mock-ups may be left in place as part of the finished project and will constitute the standard for remaining work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in original unopened packages fully identified with the manufacturer's name, trade name and UL label.

- 1) Materials shall be stored off the ground and protected from environmental conditions as required by Manufacturer.
- 2) All firestop materials shall be installed prior to expiration of shelf life.

1.06 PROJECT CONDITIONS

- A. Conform to manufacturer's printed instructions for installation and when applicable, curing in accordance with temperature requirements.

1.07 WARRANTY

- A. Contractor shall provide written certification that all firestopping was installed in accordance with manufacturer's written instructions for UL tested assemblies and that all firestop systems used meet firestopping requirements as herein specified.

1.08 SEQUENCING

- A. Coordinate this work as required with work of other trades.
- B. Firestopping shall precede the finishing of gypsum board.

1.09 PROTECTION

- A. Where firestopping is installed at locations which shall remain exposed in the completed work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other construction activities.

PART 2 PRODUCTS

2.01 GENERAL

- A. Firestopping materials shall meet the requirements specified herein.
- B. For applications where combustible penetrations are involved, i.e. insulated or plastic pipe, a suitable intumescent material must be used.

2.02 ACCEPTABLE MANUFACTURERS

- A. Specified Technologies, Inc. (STI)
- B. 3M, Construction Products Division
- C. Nelson Firestop Products
- D. Tremco, Inc.

2.03 MATERIALS

- A. Intumescent Firestop Sealants
- B. Elastomeric Firestop Sealants
- B. Firestop Putty
- C. Firestop Pillows
- D. Firestop Collars
- E. Wrap Strip
- F. Firestop Mortar

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions where firestop systems are to be installed and notify the engineer of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until the contractor in a manner acceptable to the engineer has corrected unsatisfactory conditions.

3.02 CONDITIONS REQUIRING FIRESTOPPING

- A. General
 - 1) Provide firestopping for conditions specified whether or not firestopping is indicated and, if indicated, whether such material is noted as insulation, safing, or otherwise.
 - 2) All firestopping will be installed in accordance to the U.L. tested system designed for

the application.

- 3) Insulation types specified in other sections shall not be installed in lieu of firestopping material specified herein.
- 4) Grout, mortar, or gypsum based products shall not be installed in lieu of firestopping material specified herein.

B. Interior Walls and Partitions - Provide Firestopping:

- 1) Whether or not there are any clips, angles, plates, or other members bridging or interconnecting the wall and floor systems.
- 2) Where the top edge of a fire-rated wall or partition abuts the bottom of all concrete floors or roof with or without fluted-type metal decking. The system selected shall be tested per UL 2079 for 500 cycles at a minimum of 10 cycles per minute and fire tested in a fully extended joint. Mineral wool safing may not be used alone but only as a component of a UL tested firestop system. There shall be no drywall tape or joint compound installed in the joint opening prior to the installation of the fire rated joint assembly.
- 3) Smoke barriers, smoke walls, and smoke partitions shall maintain a fire resistance rating of at least one hour and shall match or exceed the rating of the assembly.

C. Penetrations:

- 1) Provide firestopping at all locations where mechanical systems penetrate smoke barriers or fire-rated construction.
- 2) Requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. When sleeves are provided, the sleeve must also be firestopped.
- 3) Provide firestopping to fill miscellaneous voids and blank openings in fire-rated construction.

3.03 PREPARATION

- A. Surface to receive firestop shall be free of dirt, dust, grease, oil, oil from release agents or other matter that would impair the bond of the firestop material to the substrate or penetrating items.
- B. Substrate shall be frost free.

3.04 INSTALLATIONS

A. General

- 1) Installation of firestop shall be performed by applicators / installers qualified and trained by the manufacturer. Installation shall be performed in strict accordance with

the manufacturer's detailed installation procedures.

- 2) Apply firestopping in strict accordance with U.L. rated system designs, and manufacturer's recommendations.
- 3) Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire rated construction have been permanently installed prior to installation of firestop, schedule and sequence the work to assure that partitions and other construction which would conceal penetrations are not erected prior to the installation of firestop.
- 4) Unless specifically approved, all pipe and duct insulation must remain intact and undamaged and shall run continuously through walls and floors.
- 5) Gun grade sealants and putties shall be tooled into place to insure proper adhesion to penetrations and surrounding surfaces.

B. Dam Construction

- 1) Install dams when required to properly contain firestopping materials within openings and as required to achieve required fire resistance rating.
- 2) Placement of dams shall not interfere with functions of adjacent construction.

C. Field Quality Control

- 1) Install work in full accordance with rules, regulations, and safety requirements of Federal, State, County and City authorities having jurisdiction over premises. Do not construe this as relieving Contractor from compliance with any requirements of specifications that are in excess of Code requirements and not in conflict therewith.
- 2) Construction Manager or General Contractor shall employ, at their expense, a qualified testing agency, acceptable to the engineer, to inspect installed firestopping for compliance with the project requirements.
- 3) Inspecting agency will issue written reports to the construction manager and engineer.
- 4) Do not proceed to enclose firestopping with other construction until satisfactory examination reports are issued.
- 5) Correct unacceptable firestopping and provide additional inspection to verify compliance with this specification at no cost.
- 6) Finish surfaces of firestopping that is to remain exposed in the completed work to a uniform and level condition.

D. Cleaning

- 1) Leave finished work in neat, clean condition with no evidence of spill over or damage

to adjacent surfaces.

- 2) If visible in the finished work, remove temporary dams after initial cure.

END OF SECTION

SECTION 260000

ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 REFERENCE

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda, and Division 1 are a part of this specification. Contractors and Subcontractors shall examine same as well as other Divisions of the specifications which affect work under this Division.
- B. The requirements of this Section shall govern all Division 25, 26, 27 and 28 work for this project. Bidders are referred to in this section as "Electrical Contractors" and all provisions apply to each contractor and their subcontractors.
- C. The contractor shall be solely responsible for construction means, methods, sequences of construction and the safety of workmen.

1.02 DESCRIPTION OF WORK

- A. Mechanical, Architectural, Structural, Electrical and all other project drawings, as well as the Specifications for all the Divisions, are a part of the Contract Documents. Work of this section is shown on the electrical drawings.
- B. Drawings and Specifications are to be considered as supplementing each other. Work specified but not shown, or shown but not specified, shall be performed or furnished as though mentioned in both Specifications and Drawings. All systems shall be complete and fully operational upon completion of the project.
- C. Contractors shall not construe any correspondence or verbal communications with or by the engineer or his representative as authorization for "extra" construction payment. All requests for additions to this contract shall be submitted in writing by the contractor to the architect for consideration by the owner's representative. Work performed without written change order from the owner will be the contractor's sole responsibility without additional compensation.
- D. Contractor shall comply with and schedule work according to the schedule of construction specified in Division 1. All work shall be completed within these time constraints and the contractors for the work of this section shall provide all required temporary utilities and connections necessary to maintain the existing systems in full operation during the progress of this work. Sections of any systems may be taken out of service only when approved in writing by the owner.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - Project Phasing and Temporary Electrical and Telephone Service
- B. Division 3 - Poured-In-Place Concrete

- C. Division 9 - Finish Painting
- D. Division 22 - Plumbing
- E. Division 23 - HVAC
- F. Division 31 - Excavation and Backfill

1.04 QUALITY ASSURANCE

A. Codes and Permits:

- 1) Work shall be installed in full accordance with all applicable codes, rules and regulations of public authorities and/or utilities. Included shall be National Electrical Code, NEMA, U. L. Standards, OSHA, State and local Building Codes. All these Codes, Rules and Regulations are hereby incorporated into this specification.
- 2) Comply with specification requirements in excess of Code requirements where no conflicts exist.
- 3) Prior to starting any work, electrical contractors shall secure all necessary permits and inspection certificates required. All fees for permits, utility connection charges, inspections and certificates shall be paid for by electrical contractors.
- 4) Deliver official record of approval, by governing agencies, to architect for transmittal to owner, prior to starting work.

B. Standards:

- 1) Comply with applicable provisions of code approved editions of following National Standards:
 - NFPA 70E Electrical Safety in the Workplace
 - National Electrical Code
 - NFPA Life Safety Code and Standards under Appendix B of Life Safety Code
 - Underwriters Laboratory
 - NFPA
 - NEMA
 - National Electrical Safety Code
 - ANSI
 - Americans with Disability Act

1.05 SUBMITTALS

A. Shop Drawings:

- 1) Contractor shall submit shop drawings of fixtures, distribution equipment, electrical devices, and communication systems for review. Submittals shall be made in a timely fashion, keeping with the project schedule described in Division 1.

- 2) Contractor shall review and indicate his approval of each shop drawing prior to submittal for review. Do not start work until shop drawings have been reviewed by the Engineer and returned to the Contractor. Submittals not indicating contractor approval will be returned without review.
- 3) Submittals will be reviewed only for general compliance with the contract documents and not for dimensions, quantities, etc. The submittal review shall not relieve the contractor of responsibility for purchase of the item in full compliance with the contract documents and its complete and proper installation.
- 4) Where submittals vary from the contract requirements, the contractor shall clearly indicate on submittal or accompanying documents the nature and reason for variations.
- 5) Refer to various sections for listing of shop drawings required on this project which are not listed in A.1 above.
- 6) Each manufacturer or his representative must check the application of his equipment and certify at time of shop drawing submittal that equipment has been properly applied and can be installed, serviced and maintained where indicated on drawings. Advise engineer in writing with submittal drawings of any potential problems. The manufacturer shall be responsible for any changes that might be necessary because of physical characteristics of equipment that have not been called to the engineer's attention at the time of submittal.

B. Record Drawings:

- 1) Each contractor or subcontractor shall keep one (1) complete set of the contract working drawings on the job site on which he shall regularly record any deviations or changes from such contract drawings made during construction.
- 2) These drawings shall record the location of all electrical equipment, junction and pull boxes, conduit routing and all below-grade service. All underground services shall be dimensioned from readily identifiable and accessible building elements.
- 3) Record drawings shall be kept clean and undamaged and shall not be used for any purpose other than recording deviations from working drawings and exact locations of concealed work.
- 4) After the project is completed, these sets of drawings shall be delivered to the Architect in good condition, as a permanent record of the installation as actually constructed.
- 5) Provide record drawing of one-line power diagram and mount in electrical equipment room.

1.06 COORDINATION AND SUPERVISION

- A. Examine work of other trades which comes in contact with or is covered by the work. Do not

attach to, cover, or finish against any defective, or install work of this Division in a manner which will prevent other trades from properly installing their work. Consult all drawings, specifications and details of other Divisions of the work.

- B. Proper clearances for architectural design and equipment access and service shall be maintained for all items and components.
- C. Contractors shall report any interferences between their work and other work or construction as soon as discovered. If contractor proceeds without coordination, correction shall be the responsibility of the installing contractor without cost to the owner.
- D. Drawings are diagrammatic and show approximate location of conduit, devices, etc. Take all measurements and establish exact locations in the field. Adapt to construction and work of other trades as required for coordination of the work.
- E. Each contractor shall be responsible for layout and coordination of openings and chases required for these installations, which are provided by other trades. Provide dimensioned drawing and fully coordinate this work with the contractor providing the openings or chase.
- F. Each contractor shall provide adequate competent supervision on job during all working hours with authority and instructions to answer questions and carry out instructions of Architect or his representative.
- G. All light fixtures and ceiling mounted items shall be centered with regard to ceiling grid at locations shown on the architect's reflected ceiling plan. Failure to observe these requirements shall be cause for correction to be made at the contractor's expense.
- H. The owner and/or architect reserve the right to make reasonable changes in the location of electrical devices, furniture feed connection points, etc. up to the time of roughing-in, without additional cost.
- I. Provide necessary coordination elements, final dimensions, equipment, working clearances, major conduit runs above and below grade etc. to the Division 250000 HVAC contractor for integration into the coordination drawings.

1.07 DRAWINGS AND SPECIFICATIONS

- A. Drawings and specifications are supplemental to each other. It is intended that work covered by these specifications and drawings include everything requisite and necessary to make the various systems complete and operative, irrespective of whether or not every item is specifically provided for. Any omission of direct reference herein to any essential item shall not excuse contractor from complying with the above intent.
- B. In case of error or inconsistency, specifications shall take precedence over drawings. Figured dimensions supersede scaled ones. Contractor shall take no advantage of, and shall promptly call Architect's attention to any error, omission or inconsistency in specifications and drawings.
- C. Special attention is directed to requirements that equipment and materials stated in specifications and/or indicated on drawings shall be furnished, completely installed, adjusted

and left in safe and satisfactory operating condition. Accessories, appliances and connections necessary for proper operation of equipment shall be provided.

- D. Materials, apparatus or equipment specified or otherwise provided for on drawings, addenda, or change orders issued subsequent to award of contract, shall be same brand, type, quality and character originally specified, unless specifically approved by the architect.
- E. Layout of equipment, accessories, specialties and suspended, concealed or exposed piping systems are diagrammatic, unless dimensioned. In preparing shop drawings, contractor shall check project conditions before installing work. If there are any interferences or conflicts, they shall be called to the attention of Architect immediately for clarifications.
- F. The drawings indicate required size and points of termination of conduit and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets and it shall be the work of the installing contractor to make the installation in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear, without further instruction or cost to the owner.
- G. It is intended that the electrical items be located symmetrical with architectural elements, and shall be installed at exact height and locations as shown on the architectural drawings. Refer to architectural details in completing and correlating work. Confirm all locations with Architect prior to rough-in.

1.08 PROVISIONS FOR LATER INSTALLATION

- A. Become acquainted with nature and progress of construction against which this work attaches. Review structural drawings for coordination of openings. Cut no structural members or slabs without Architect's written approval.
- B. When this work cannot be installed concurrently with the building construction, arrange for inserts, sleeves, access panels, etc., as necessary for installation at a later date.

1.09 LOCAL CONDITIONS

- A. Visit site and become familiar with facilities and conditions affecting work. No additional payment will be made on claims that arise from lack of knowledge of existing condition.
- B. Exercise extra care when working in areas where underground services may exist. Any costs for repair of damage to such services become responsibility of Contractor causing damage.

1.10 PROTECTION

- A. When setting up equipment, protect area against staining, abrasion. Cost of correcting any such condition will be charged against the respective Contractor.
- B. Protect all equipment which has been installed from construction debris and the work of other trades.
- C. Protect finish floors from chips and cutting oil by use of chip receiving pan and oil proof cover.

- D. Protect equipment and finished surfaces from welding and cutting spatters with baffles and spatter blankets.
- E. Protect from paint droppings, insulation adhesive, by use of drop cloths.
- F. Contractors shall be responsible for including and maintaining adequate precautions and safeguards related to their work during all phases of construction. Include protection, warnings and safety devices and equipment for protection of personnel, equipment and materials. Comply with all requirements of governing authorities, including OSHA.

1.11 PRODUCT HANDLING

- A. Pay all costs for transportation of materials, equipment to job site.
- B. Provide all scaffolding, tackle, hoists, rigging necessary for placing electrical materials and equipment in their proper place. Remove temporary work when no longer required. Comply with applicable State, Federal and local regulations.
- C. Contractor shall keep materials clean and protected from weather and/or damage before and after installation until final acceptance by the owner. Protect all openings, bearings, controls, motors, etc., from dirt and moisture.

1.12 UTILITY TIE-INS

- A. Make all utility tie-ins for this project in accordance with requirements of authorities having jurisdiction.
- B. Fully coordinate service interruptions with all parties involved for shutdown and/or tie-ins with existing systems to minimize interruption of service. Fully coordinate and make connections to existing facilities as scheduled with the owner and governing authorities.
- C. Contractor shall confirm all utility requirements for tie-in prior to bid and include all facilities required by utility for fully coordinated and complete installation. Pay all charges, permit fees and assessments for utility connections.

1.13 SHUTDOWNS

- A. Give five (5) working days' notice to Architect or the Owner of anticipated shutdown requirements of an operating system. Tie-ins and modifications to existing facilities and services must be done with minimum interruption of facilities operation and during hours so affecting.

1.14 TEMPORARY SERVICES

- A. Temporary services shall be provided as stated in Special Conditions and Division 1. Provide all temporary services and connections as required to accommodate the phasing sequence of the project.
- B. Description of System: Furnish and install temporary electrical power service for construction

needs throughout construction period in accordance with the special conditions as follows:

- 1) Provide power for miscellaneous tools and equipment, for pumping, for temporary heating and ventilating and for temporary storage and construction buildings. See General Conditions for requirements of temporary service.
- 2) Provide temporary lighting of minimum 5 foot candles for safe and adequate working conditions throughout the project, for security and for temporary office and construction buildings.

C. Materials (General)

- 1) Comply with Electrical - Basic Materials and Methods.
- 2) Materials may be new or used, but must be adequate in capacity for required purposes, and must not create unsafe conditions or violate requirements of applicable codes.
- 3) At Contractor's option, patented specialty products may be used, if UL approved.
- 4) Provide required facilities, including transformers, conductors, poles, conduits, raceways, breakers, fuses, switches and lighting fixtures with lamps.
- 5) Provide appropriate enclosures for environment in which used, in compliance with NEMA standards.

D. Installation

- 1) Install work in neat and orderly manner.
- 2) Make structurally and electrically sound throughout.
- 3) Maintain to give continuous service and to provide safe working conditions.
- 4) Modify and extend service as work progress requires.
- 5) Locate so that power is available at any desired point with no more than 100' (30.00 m) extension, and with no more than 5% voltage drop at full load.
- 6) Provide circuit breaker protection for each outlet. Provide ground fault interrupting capacity for all circuits.
- 7) Provide equipment grounding continuity for entire system.
- 8) Removal: Completely remove temporary materials and equipment upon completion of construction. Repair damage caused by installation, and restore to specified or original condition.

1.15 OPERATING INSTRUCTIONS

- A. Owner's representative shall be instructed by contractor and manufacturer's representatives

on system maintenance and operation requirements. Instruction shall be complete, conducted by qualified service and maintenance specialists.

- B. The following systems shall include training sessions scheduled with the owner. Allow a minimum of **two (2) one-hour** sessions per system, scheduled one week apart. Include initial programming of all time-of-day set points for operation. Include video record of training sessions.

- 1) Generator system.

1.16 DAMAGE AND EMERGENCY REPAIRS

- A. Contractor shall be held responsible for damage to work caused by his work or through the negligence of his workmen. All patching and repairing of damaged work and the cost of same shall be paid by the contractor causing the damage. All existing facilities and installations shall be restored to their original condition when damaged by the work of this Division, using workmen skilled in each required trade.
- B. The owner reserves the right to make emergency repairs as required to keep equipment in operation, without voiding Contractor's warranty or relieving him of responsibility during warranty period.

1.17 WARRANTY

- A. Electrical Contractors shall warrant all material, equipment, fixtures and workmanship for a period of one (1) year from date of final acceptance.
- B. Any equipment piping, fixture or other component part of system which fails during warranty period and all resulting damage shall be replaced or repaired by contractor without cost to owner.
- C. Warranty on any repairs or replacements shall be extended from date of replacement or repair of that item for one (1) year.
- D. All equipment and fixtures shall be warranted by the manufacturer thru the contract warranty period. Any extended manufacturers warranties shall be extended to the owner.

1.18 REQUIREMENTS FOR FINAL INSPECTION

- A. All of the following items must be completed prior to final inspections. No exceptions will be made and no final payment will be made until all items are completed.
 - 1) Each contractor's foreman shall perform his own punch list and, upon completion, notify the architect that project is ready for final punch list.
 - 2) Thoroughly clean all parts of the apparatus and equipment. Exposed parts which are to be painted shall be thoroughly cleaned of cement, plaster and other materials and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out.

- 3) Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean.
- 4) All labeling of system components as required in this Section and Section 260500, the drawings and the owner shall be complete.
- 5) All system start ups shall be complete with written certifications submitted for all systems and major equipment.
- 6) Certification of test and start-up and training sessions for the systems listed in operating instructions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Provide material and labor which is neither drawn nor specified but which is obviously a component part of and necessary to complete work or comply with code, and which is customarily a part of work of similar character.
- B. Provide incidental concrete, trenching and backfilling, reinforcing steel, masonry, mortar, miscellaneous steel, painting and the like required to complete electrical installations; perform in manner specified in applicable Division of General Trades Specification by workmen skilled in that particular trade.
- C. All equipment and material shall be new, free from defects, U.L. listed where applicable and warranted by the manufacturer and the contractor.
- D. To the greatest extent possible, provide materials and products of the same kind from the same manufacturer for this project.

2.02 MATERIAL SUBSTITUTIONS

- A. All changes required by substitutions, such as revisions to foundations, bases, conduit, controls, wiring, openings and appurtenances shall be made by the substituting contractor at no additional cost to the project. Notify all other contractors affected by substitution and pay all costs related to the substitution incurred by other contractors.
 - 1) Refer to General Conditions and Division I for requirements related to material and equipment substitutions.
- B. Systems have been laid out around particular fixtures and equipment considered base items. Manufacturer **first** listed is base item. Other named manufacturers in these specifications or on the drawings who can provide equivalent equipment are acceptable and may be bid, provided performance, construction, components, quality and appearance, where applicable, are equivalent to base item and can be properly installed. Acceptable alternate makes of equipment are listed in specifications or equipment schedules; however, manufacturers other than base manufacturers are substitutions and shall comply with the following paragraphs. When distribution equipment is substituted, contractor shall submit equipment room shop drawings showing dimensions of equipment and required N.E.C. clearance. It is the

contractors sole responsibility that all substituted equipment fits in the allotted space and maintains all required clearances.

- C. Should the contractor propose to furnish materials or equipment other than those listed in the specification, a written request for substitution shall be submitted as an alternate to the base bid at the bid opening. Refer to General Conditions Division of this specification. It is the contractor's responsibility to fully evaluate substitutions and ascertain that the substitution is equivalent in all respects to the base specification prior to submittal.
- D. Substitutions are subject to approval of Architect and his decision shall be final. In submitting substitutions, include make and model number and complete literature and performance data for evaluation.
- E. Substitution of items not named in these specifications or drawings may be offered for consideration on the substitution sheet included in the Proposal Form of the contract, under the following conditions:
 - 1) The proposed substitution is proven, to the satisfaction of the Project Architect and Engineer, to be equal or superior to the specified item in all respects.
 - 2) Extended delivery schedules on specified items, which would delay timely completion of the job, will be cause for consideration of substitutions. The Contractor must show proof of delay in delivery from the manufacturer.
 - 3) Changes required by substitution, such as revisions to foundations, bases, conduit, controls, wiring, openings and appurtenances shall be made by the Contractor at no additional cost to the project and pay all costs related to the substitution incurred by other contractors.
 - 4) State the amount of credit to be given to the owner if the substitution is accepted prior to contract award on the proposal form substitution sheet or if after award of contract, submit a quotation stating cost reduction resulting from acceptance of a substitution if executed through a contract change order.
 - 5) Manufacturers of items not named in these specifications or drawings may submit a written request with supporting product information to the engineer ten (10) days prior to the project bid date for consideration at the sole determination of the engineer to become a named product. If approved, the product name will be added to the list of substitute manufacturers in a written addendum issued by the architect to bidders.

PART 3 EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. Location of conduit, equipment, devices, etc., on the drawings are diagrammatic; indicated positions shall be followed as closely as possible, exact locations shall be subject to building construction and interferences with other work. Difficulties preventing the installation of any part of work as indicated shall be called to the attention of the Architect. Architect shall determine locations and changes, Contractor shall install the work accordingly. Architect reserves right to make minor changes in location of any part of the work up to the time of

roughing-in without additional cost.

- B. All materials and equipment shall be installed in a neat and workmanlike manner by competent specialists for each subtrade. The installation of any materials and equipment not meeting these standards may require removal and reinstallation at no additional cost to the Owner.
- C. Install, connect equipment, services, materials in accordance with best engineering practice and in conformity with manufacturer's printed instructions and U.L. Listing.
- D. Take all measurements and determine all elevations at the building prior to fabrication or rough-in.

3.02 CUTTING AND PATCHING

- A. Perform all cutting, framing and patching in completed construction as necessary for installation of this work. Do not cut any structural member or structural floor slab without written permission from the Architect. Have cutting done by skilled mechanics as carefully as possible, and with as little damage as possible. Have patching done by first-class mechanics, skilled in the several trades.
- B. In new construction, lay out location and size of all openings to be provided by other trades in advance of their work. Set sleeves, lintels, etc., for openings and provide layout dimensioned drawings as required for coordination with other contractors. If openings information and sleeves are not provided to other trades in advance of their work, this contractor shall provide all required openings as required for existing construction.
- C. In existing construction, contractor shall perform all cutting, patching and framing of chases and openings required by this work. Properly sized structural lintels shall be provided above masonry wall openings and steel angle frames around panel walls, floor or roof openings. Size lintels and frames per schedule on architectural or structural plans.
- D. Perform all excavation and backfill required for installation of below-grade conduits. Excavate to depth required to install conduits at required level and pitch. All backfill shall be compacted in maximum twelve (12) inch layers and conform to all bearing requirements of site and/or structure above. Trenches for utility services shall comply with the specifications and details of the utility company.
- E. All conduits for below-grade entry of the building shall be pitched away from the building floor elevation and sealed to prevent water entry.
- F. All openings shall be cut with lintels and frames installed by workmen skilled in the particular trade.
 - 1) All patching shall be by a skilled general trades contractor and shall be performed in accordance with requirements of Division 9.
 - 2) All roof cutting and patching installed under this contract shall be performed by the project roofing contractor at this contractor's expense.

- G. Core drill round openings and neatly saw cut rectangular openings in floors or walls. Sleeves shall be grouted or patched to match existing wall or floor construction.
- H. Sleeves for floor or wall penetrations shall extend 2" past opening and be grouted in place and sealed watertight with silicone caulk.

3.03 FIRE STOPPING

- A. Where steel conduits pass through fire rated walls, set sleeve in wall, install non-shrinking grout between conduit and sleeve. Fire seal around wall sleeve with fire rated sealant. All penetrations shall be protected or rated construction in accordance with an approved method listed in the U.L. fire resistance directory.
- B. Where conduits pass through floors, set steel sleeve in floor slab. Top of sleeve shall be 2" above finish floor and shall be grouted in place and sealed watertight to floor. Fire seal between sleeve and conduit.
- C. Penetrations of fire rated walls and ceilings by exposed cabling system shall be made with steel conduit sleeves, fire stopped with U.L. listed sealant per U.L. assembly drawings.
- D. Fire rated sealant shall be U.L. listed and applied in accordance with the U.L. assembly requirements and the manufacturer's recommendations to match the rating of the penetrated structure. Sealants shall be as manufactured by Hilti, International Protective Coatings (IPC), Specified Technologies, Inc. (STI), or 3M.

3.04 ACCESS DOORS

- A. Proper access for service and maintenance shall be ascertained before installation of any item. The electrical contractor shall furnish access doors adequately sized for servicing concealed items furnished under this contract. Doors shall be fire rated where installed in rated construction and shall have concealed hinge door, screw drive latch and primed painted finish. Frames shall match the construction of adjoining surfaces.
- B. Doors in new construction shall be furnished to general trades contractor for installation. In existing construction, doors shall be installed by the electrical contractor with surrounding surfaces patched and painted to match existing.
- C. Access doors shall be as manufactured by Milcor or approved equivalent.

3.05 PAINTING

- A. Finish painting is included under Division 9 - Finishes, except where specifically called for under this Division.
- B. Certain painting specified as part of the electrical Trades Work is included herein and shall comply with Division 9.
- C. Materials and equipment installed under this Division shall be left free from dirt, grease and foreign matter, ready for painting.

- D. No equipment or piping shall be painted before being tested.
- E. Damaged surfaces of prefinished materials and equipment shall be touch-up painted to match existing finish by the contractor.
- F. All items to be painted shall be primed and painted with two (2) coats of rust inhibitive paint on exterior and enamel paint on interior in accordance with the paint manufacturer's instructions. Engineer shall select a custom color.

3.06 EQUIPMENT IDENTIFICATION

A. Equipment:

Push buttons, selector switches, safety switches, motor starters, time switches, contactors, panelboards, pull boxes, cabinets, special outlets, etc., shall be identified as to function with a phenolic engraved nameplate securely attached. Identify voltage, phase, origin and load served.

B. Panelboards:

Provide typed directories for distribution and circuit breaker panels describing load fed and location. Typed directories shall include specific load location information with final room names and numbers (i.e., Receptacles - Office 120).

- C. Nameplates shall be laminated phenolic with a black surface and white core and shall be mechanically fastened with screws to each item. Use 1/16" thick material for plates up to 2"x4". For larger sizes, use 1/8" thick material. Lettering shall be minimum 1/4" height, spaced at four (4) per inch. Safety switches, motor starters, and panelboard nameplates shall include system voltage, phase and wire count, i.e. Panel "A" - 208Y/120, circuit origin and load served.

D. Wiring:

- 1) Color code all wiring in accordance with NEC Standards. All system and control wiring shall be labeled at each termination and splice, and continuously color coded.
- 2) Color coding is to be plainly labeled on all wiring diagrams submitted for approval and wire installed by this contractor shall comply with manufacturer's wiring diagram requirements.

- E. Label all conduits leaving main panelboards where exposed with stick-on labels indicating circuit contained.

- F. Label all junction boxes with circuits contained with indelible marker. Color code emergency and fire alarm system box covers as directed with permanent paint markings. Mark conduit at 48" intervals where visible, or use pre-finished color coded conduit, exposed or above accessible ceilings.

- G. Label inside of device plates with panel and circuit number.

3.07 OPERATING AND MAINTENANCE MANUAL

- A. Prepare one (1) complete operating and maintenance manual in hardback binder describing operation of the systems and recommended maintenance schedule. Turn all equipment warranties over to the Owner. Quantity of manuals shall be confirmed with the owner.
- B. Manuals shall be indexed, arranged in the CSI format, and include:
 - 1) Job name and names of contractor with address and telephone number for service. Include all major emergency service numbers for equipment and generator set particularly.
 - 2) Manual index.
 - 3) Identification, name, mark, number as indicated on design drawings.
 - 4) Normal equipment operating characteristics.
 - 5) Performance data and ratings.
 - 6) Wiring diagrams.
 - 7) Manufacturer's descriptive literature.
 - 8) Manufacturer's maintenance and service manuals. Include signed copies of attendance sheets for each owner instruction session.
 - 9) Spare parts and replacement parts list for each piece of equipment.
 - 10) Name of service agency and installer.
 - 11) Final accepted shop drawings.
- C. Include entire manual in digital format and storage device, as required by the owner.

3.08 CLEANING UP

- A. From time to time during the operations and at completion thereof, electrical contractor shall remove from the premises all debris and excess material caused by their work. Area of operation shall be left broom clean.
- B. Construction materials shall be neatly stored in project areas and locations designated by the owner and architect. Construction materials must not be left scattered about construction area.
- C. All electrical equipment to be painted by others shall be thoroughly cleaned by electrical contractors of grease, rust, shipping tags and construction dirt.

3.09 TEST, CHECK, START AND BALANCE

- A. The electrical contractor shall test, check and start up all systems installed under this contract and place them in operating condition. Testing may be done by qualified employees of the contractor except where independent testing company is specified (see paragraph F. below).
- B. All light fixtures, panels and electrical equipment shall be cleaned and labeled.
- C. Circuits shall be phased out and connected to the panel or main switch in proper manner. Loads shall be distributed within 5% between phases when all loads are energized. All wires shall be entirely free from grounds and short circuits.
- D. Distribution voltages shall be checked by this contractor who shall advise the engineer in writing in the event that incoming voltages are not within a tolerance of plus or minus 5% of nominal value. Adjust taps on transformer if required to correct voltage variations or coordinate with serving utility to adjust incoming service voltage.
- E. Upon completion of the work, deliver to owner all special tools, keys, fuses and other detachable portions of the electrical system. Obtain written receipt from owner's representative and submit to architect with request for final payment.

END OF SECTION

SECTION 260500

BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 REFERENCE

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to work of this section.
- B. Division 26, Section 260000, Electrical General Provisions, apply to work of this section.
- C. Division 22 - Plumbing.
- D. Division 23 - HVAC.

1.02 CONTENTS

- A. Specified Herein: Requirements for basic electrical materials, equipment and wiring methods.
- B. Described herein are the following:

- Scope
- Safety Switches
- Wiring Devices
- Wall Plates
- Connectors, Lugs, Taps and Splices
- Junction and Pull Boxes
- Outlet and Switch Boxes
- Conductors
- Conduit

1.03 SCOPE

- A. The work under this section shall comprise, but is not necessarily limited to the following:
 - 1) Provide all labor and material required to install a 277/480 volt and a 120/208 volt interior wiring system, utilization outlets, motor starters, disconnect switches and fuses.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Storage Conditions: It is recognized that space at the project for storage of materials and products may be limited. Coordinate the deliveries of electrical materials and products with the scheduling and sequencing of the work so that storage requirements at the project are minimized. In general, do not deliver individual items of electrical equipment to the project substantially ahead of the time of installation. Limit each shipment of bulk and multiple use materials to the quantities needed for installations within three (3) weeks of receipt.

- B. Handle all electrical material carefully to prevent damage, dents or marring of the finish.
- C. Protection and Identification: Deliver products to project properly identified with names, model numbers, types, grades, compliance labels and similar information needed for distinct identification; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior storage.
- D. Do not install damaged material. Remove from the project site.

PART 2 PRODUCTS

2.01 SWITCHES, SAFETY

- A. Safety switches shall be heavy duty, sheet steel enclosed, of the type, size and electrical characteristics indicated, surface mounted, fusible rated at 250 volts on the 208 volt system and 600 volts on the 480 volt system, ampere ratings as required for the application or as noted on the drawings, 60 Hertz, 3 blades, incorporating quick-make, quick-break type switches, constructed so switch blades are visible in "OFF" position with door open; equipped with operating handle which is easily recognizable, and is padlockable in the "OFF" position; with current carrying parts constructed of high-conductivity copper and silver-tungsten type switch contact; with positive pressure type reinforced fuse clips. All switches shall be of the same manufacturer. Handle shall be interlocked so switch cannot be opened in the "ON" position.
- B. Fuses: Unless indicated on the drawings as non-fused type, provide fuses for safety switches, as recommended by the switch manufacturer of class, type and rating needed to meet electrical requirements.
- C. Disconnects for 120 volt, single phase equipment shall be heavy duty type suitable for the service intended. Include thermal overload protection integral with disconnect for motors or where required by code. Thermal protection in the disconnect may be deleted where motors have integral thermal protection.
- D. Switches installed in outdoor locations shall be weatherproof NEMA 3R.
- E. All disconnects shall have provisions for padlocking in the off position to comply with owner's lock-out tag-out procedures.
- F. Switches manufactured by the following will be acceptable:
 - Square "D" - Type Heavy Duty
 - Siemens - Type HD
 - Eaton - Series "K"
 - ABB - Type THSubmit complete shop drawings.

2.02 WIRING DEVICES

A. General: Provide factory-fabricated wiring devices, in type, color and electrical rating for the service indicated. Type and grade shall be as described in the following paragraphs and in the symbol legend on the drawings.

B. Receptacles: Comply with NEMA Standards Publication No. WD1 and Federal Specification WC 596-F, and as follows:

Heavy Duty Duplex: Provide duplex heavy-duty type receptacles, 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, ground terminals and poles internally connected to mounting yoke, 20-ampere, 125 volts, with metal plaster ears, back and side wired, with side screws providing clamping action of the back wiring slots, NEMA configuration 5-20R, unless otherwise indicated.

GFCI: Provide heavy-duty, duplex, ground fault circuit interrupter receptacles, feed-through type, capable of protecting connected downstream receptacles on single circuit, grounding type, UL rated Class A, Group 1, 20 ampere rating, 125 volts, 60 Hertz; with solid state ground fault sensing and signaling; with five (5) milliampere ground fault trip lever; equipped with 20-ampere plug configuration, NEMA 5-20R. When GFCI becomes inoperable, unit shall fail in the safe position (off) and interrupt power. Units that use lights or sounds are not acceptable.

C. Switches: Comply with NEMA Standards Publication No. WD1 and Federal Specification Test WS-896E, and as follows:

Snap: Provide heavy-duty flush single-pole toggle switches, 20 ampere, 120/277 volts AC, with mounting yoke insulated from mechanism, equipped with plaster ears and side-wired screw terminals.

D. In general, all wiring device colors shall be verified with architect and have smooth finish stainless steel plates with openings to match devices. Contractor shall provide custom color receptacles and any plate material selected by architect and furnish at no additional cost to the contract.

E. Wiring devices and plates shall be as manufactured by Hubbell, P & S or Leviton

F. The contractor shall submit a device schedule for selection of colors with shop drawings, along with a sample of the manufacturer's standard device colors. Schedule shall include each room of the project and read as follows:

<u>Room No.</u>	<u>Room Name</u>	<u>Device Color</u> (by architect)
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G. Devices with proprietary quick connect back-wiring pigtails are not permissible.

2.03 CONNECTORS, LUGS, TAPS AND SPLICES

A. Joints in #10 AWG and smaller wire shall be made with Minnesota Mining and Manufacturing Company insulated "Scotch Locks", Ideal Company "Wing Nut", or T & B Company "Piggy Connector".

- B. Joints in #8 AWG and larger shall be made with pressure type mechanical connectors and insulated with electrical tape or manufacturer's insulation kit to 200% of the insulating value of the conductor insulation.
- C. Straight taps to be ILSCO SPA Series or equal. Taps of multiple and parallel conductors are to be made with mechanical connectors listed for the quantity and size of conductors, ILSCO Type PTA or IPC or equal.
- D. Splices may be made with long barrel compression sleeve connectors insulated to 200% of cable rating. Compression connectors to be long barrel type, ILSCO Type CTL or equal.
- E. Lugs to be mechanical type connectors of size and ampacity to match service used. Provide compression lugs where required by equipment installed. Compression lugs to be long barrel, heavy duty type.
- F. All materials for copper wiring shall be copper.

2.04 JUNCTION AND PULL BOXES

- A. Furnish and install junction and pull boxes wherever required or otherwise necessary to facilitate installation of other equipment. Junction boxes shall be galvanized finished sheet steel of code thickness, of ample size to properly enclose the conductors terminating in or passing through them, sized in accordance with NEC 370 or as noted. Junction boxes shall not be placed in locations made inaccessible by piping, ducts or other equipment and locations shall be as approved by the A/E.

2.05 OUTLET AND SWITCH BOXES

- A. Furnish and install outlet boxes of proper type and size as required at outlets where required, secured firmly in place and set true and square and flush with the finished surfaces. Boxes shall be rigidly supported from the building structure independent of the conduit system. Boxes cast into masonry or concrete are considered to be rigidly supported.
- B. All boxes for lighting outlets shall be provided with fixture studs of a size suitable for the weight of the fixture to be supported. The stud shall be of integral construction with the box, or of the type which is inserted from the back of the box. In no case shall the weight of the fixture be dependent upon bolts holding the stud to the box.
- C. Outlet boxes for exterior work shall be of cast, rust resistant metal. Gasketed covers shall be provided where outlet is exposed to weather or moisture.
- D. Wiring device boxes for surface conduit work shall be FS Series cast type.
- E. Outlet and switch boxes shall be four (4) inch square minimum with plaster ring as required. All communications outlets shall be 2-1/8" deep minimum.

2.06 CONDUCTORS

- A. All wire shall be in strict accordance with the applicable standards and shall be delivered on

site with original factory tags attached and shall be less than one (1) year old when installed.

- B. Except as specifically designated otherwise, no wire smaller than No. 12 AWG copper shall be used. Generally, all wire and cable sizes are shown, either directly or by implication that no marking designates No. 12 size. In the event that size is not indicated for a feeder or motor run, which obviously could not be interpreted as No. 12, the wire size shall conform to the sizing for the rating of the service protective device.
- C. Single conductor 600 volt wire shall be copper and be equal to or better than THW, THWN/THHN or XHHW specifications. Wire shall be rated for 75 degrees C. maximum temperature in dry locations and 90 degrees C. in wet locations and below grade. Wire shall be listed by UL and conductor identification shall include size, voltage manufacturer's name and number, UL listing and wire type.
- D. Wire sizes up to No. 10 AWG shall be solid or stranded, No. 8 AWG and larger, stranded.
 - 1) Use stranded conductors for motors and other connections subjected to vibration.
 - 2) 90 degree C. wire shall be used from outlet boxes to light fixtures.
 - 3) Color code wiring in accordance with N.E.C. standards. In existing facilities, match facility standards.
 - a. Phase conductors on the 120/208 volt system shall be black, red, blue for Phase A, B, C respectively. Ground conductor shall be green and neutral shall be white.
 - b. Phase conductors on the 277/480 volt system shall be brown, orange, yellow for Phase A, B, and C respectively. Ground conductors shall be green with yellow stripe and neutral conductor shall be gray.
- E. Conductors smaller than #12 AWG shall be allowed for use on fire alarm system and other control systems only. In general, #18 AWG shall be used for initiating devices and #14 AWG for indicating circuits.
 - 1) Wire shall be 600 V copper Type TF or TFN solid or seven (7) strands maximum for #18 and #16 and nineteen (19) strands maximum for #14 AWG.
 - 2) All wire types shall conform to the U.L. listing requirements of equipment connected and shall be coordinated with equipment installed.
 - 3) All wire shall be continuously color coded for entire length of circuit. Conductor color coding shall be clearly noted on all wiring diagrams and instruction manuals. Match facility standards where applicable.
- F. All ground conductors shall be green on the 120/208 volt system and green with a continuous yellow stripe on the 277/480 volt system. All neutral conductors shall be white on the 120/208 volt system and gray on the 277 volt system. Where neutrals of different voltage systems share the same conduit, they shall be of different colors (as allowed by the NEC) and labeled at all junction and outlet boxes.

- G. Wire shall be as manufactured by Southwire, General Cable, Pirelli, Essex, Continental or other approved manufacturer.

2.07 POWER AND CONTROL WIRING - BUILDING FACILITIES

- A. Electrical Contractor shall provide all single phase and three (3) phase (unless noted) power wiring in conduit to all motors and equipment. In general, all motors 1/2 hp and larger will be rated three (3) phase, while smaller motors will be rated single phase unless otherwise noted on drawings.
- B. Provide each motor with a disconnecting means as required by the National Electrical Code, unless furnished with equipment. All devices on building exterior shall be weatherproof type and conduit and supports shall be rigid aluminum. Where disconnect switches are furnished with mechanical equipment, the electrical contractor shall mount and wire those devices.
- C. Provide all power and interlock wiring for mechanical equipment, along with conduit and wires for control system where specifically shown on electrical drawings. Mount all control devices furnished by mechanical contractor and wire per manufacturer's wiring diagrams.
- D. This contractor shall review mechanical shop drawings and indicate his approval of all mechanical equipment voltages and horsepower prior to any equipment being released. Failure to do so shall require any revisions to wiring systems, etc., to be revised at the contractor's expense.
- E. The wire size and number of conductors for all control wiring shown on plans shall be as required by the manufacturer's shop drawings. No wire shall be pulled based on fill shown on plans.
- F. Wire all motorized dampers at associated fans.
- G. Coordinate conductor sizes shown on drawings with the required terminations on mechanical equipment. Advise mechanical contractor of required terminations. Provide lug kits to terminate conductors shown on drawings where required.

2.08 CONDUIT

- A. General: All medium and low voltage wiring to be installed in metal conduit or tubing with fittings of type, grade, size and weight (wall thickness) indicated for each service. Where conduit type and grade are not indicated below, conduit shall be rigid galvanized steel and comply with National Electrical Code for electrical raceways. Minimum size conduit shall be 3/4" unless otherwise noted. No conduit shall be run in or through ductwork. All conduit shall bear the U.L. label.
- B. Intermediate Metal Conduit: Conduit shall be hot dipped galvanized intermediate metal conduit conforming to Federal Specification WW-C-581 and ANSI C80.1.

Location: Exposed interior subject to damage.
- C. Electrical Metallic Tubing (EMT): Conduit shall be zinc coated steel electrical metallic tubing

conforming to Federal Specification WW-C-563 and ANSI C80.3. All EMT conduit stubs for communications wiring shall have a plastic bushing at both ends.

Location: In stud walls or above ceilings. Exposed interior not subject to damage.

- D. Flexible Metal Conduit: Conduit shall be manufactured of heavily zinc coated sheet metal strips interlocked to form a flexible, smooth wiring channel. Federal specification WW-C-566

Location: Motor connections subject to vibration, light fixtures (six feet in length), and transformer connections.

- E. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit comprised of single strip, continuous, flexible, interlocked, double-wrapped steel, galvanized inside and outside; forming smooth internal wiring channel; with liquid-tight jacket of flexible polyvinyl chloride (PVC) (maximum length 5'-0") conforming to U.L. 360. Conduit shall be Anaconda "Sealtite" or "Electri-Flex."

Location: Motor connections subject to vibration in wet areas and all connections to all outdoor equipment.

- F. Underground Conduit: Schedule 40 direct burial Type PVC conforming to UL 651, NEMA TC2-1978 and Federal Specification WC-1094A. and shall include a green ground wire with the circuit conductors. Conduit to be Carlon Plus 40 or approved.

Location: Direct buried conduits.

- G. Underground Conduit: Concrete encased conduit to conform to UL-651-A, NEMA TC-6 and ASTM F-512. Conduit to be Carlon Type EB or approved.

- H. Rigid Aluminum Conduit: Rigid aluminum conduit conforming to Federal Specification WW-C-540c and U.L. UL-6.

Location: Exterior or conduit exposed in wet or damp atmosphere.

- I. Type MC Cable: Not permitted for use on this project.

2.09 CONDUIT FITTINGS

- A. Conduit fittings for exposed work shall be rust resistant. Castings shall provide ample wiring space, shall have smooth round edges and full-threaded hubs.

- B. Fittings shall be as manufactured by Crouse Hinds Appleton, Killark, or approved manufacturer.

- C. EMT and IMC conduit fittings, connectors and couplings shall be steel set screw or compression type (no pot metal or zinc) as manufactured by OZ/Gedney, T & B or equal.

- D. Rigid aluminum fittings to be threaded aluminum.

- E. All conduit fittings shall be U.L. listed for conduit material, in particular, for transition from one

material to another.

PART 3 EXECUTION

3.01 INSPECTION

- A. Installer must examine the areas and conditions under which electrical work is to be installed and notify the contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 ELECTRICAL INSTALLATIONS

- A. General: Install electrical equipment for this project as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended functions.

3.03 SAFETY SWITCHES

- A. Install disconnect switches used with motor-driven appliances and motors and controllers within sight of the controller position unless otherwise indicated.
- B. Do not install switches on equipment to obstruct unit nameplates or access panels. Exact locations are to be coordinated in field.
- C. Install disconnect switches furnished as accessories to mechanical equipment. Where equipment is served by a variable frequency drive, provide label on switch: "Do not open when equipment is energized variable frequency drive."

3.04 PULL, JUNCTION, OUTLET AND SWITCH BOXES

- A. Install electrical boxes as indicated, or in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that the boxes and fittings serve the intended purposes.
- B. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture exposure. Boxes shall be rigid aluminum.
- C. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- D. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.
- E. Avoid using round boxes where conduit must enter box through side of box, which would result in a difficult and insecure connection with a lock nut or bushing on the rounded surfaces.
- F. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.

- G. Pull boxes shall be sized per code and located at maximum 100 foot centers on long runs where accessible. All wire splices shall be made in outlet or pull boxes.
- H. Conduit crossings of building expansion joints shall have expansion fitting with grounding continuity.
- I. Grade accessible pull boxes shall be installed flush with finished grades or paving. Boxes shall have open bottom and be installed on an 8" gravel sub-drain as detailed. All conduit penetrations of boxes shall be made with bell ends on conduits and be with an expanding mortar such as "Water Plug". The entire installation shall comply with the manufacturer's recommendations.
- J. Where multiple switches are installed adjacent to one another, multiple gang boxes shall be used with single cover and barriers between 277 volt and 120 volt circuits, where required.
- K. All spaces around boxes not covered by cover plate shall be filled to match surrounding finish work. Provide oversized covers on all flush devices in masonry walls.
- L. Coordinate all outlet and switch locations with finish millwork so as not to cut or damage trim, as directed by architect.

3.05 WIRING DEVICES AND PLATES

- A. All mounting heights shall be subject to checking with the details shown on the architectural drawings and with the A/E and locations shall be verified through the A/E before installing wiring, apparatus, etc.
- B. Delay installation of devices until wiring is completed.
- C. Install receptacles and switches only in electrical boxes which are clean; free from excess building materials, debris, etc.
- D. Install plates after wall finish work is complete.
- E. Prior to project completion, replace those items which have been damaged during construction.
- F. Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements.

3.06 CONDUCTORS AND CONDUIT

- A. General: Except as indicated hereinafter or on the drawings, all wiring above ceilings and in stud walls shall be done with insulated conductors in electrical metallic tubing (EMT). Wiring exposed on walls and in areas subject to damage shall be insulated conductors in intermediate metal conduit (IMC) and wiring for feeders buried in earth shall be insulated conductors in rigid Schedule 40 PVC, 24" below finished grade (minimum).
- B. Conduit Installation: Conduit sizes, type and length shall be furnished and installed as required by the drawings and as specified in these specifications.

The drawings indicate generally the size and location of the conduits. Conduits not shown but obviously required shall be run where directed, of sizes as approved by the A/E. The conduit system shall connect all outlet boxes, junction boxes, panelboards, cabinets, push button stations, motors, etc.

- C. Field bends and offsets shall be uniform and symmetrical, without conduit flattening or finish scarring. Minimum bend radii shall be as required by the NEC, but in no case less than six (6) times conduit diameter.
- D. Conduit found unacceptable while on the job before installation shall be removed from the premises upon notice.
- E. Approved pipe plugs or caps shall be installed in conduit before pouring of concrete. Conduit shall also be kept dry and free of water and debris by means of plugs or caps.
- F. Where conduit enters through exterior concrete walls or below grade footings, the entrance shall be made watertight. Pipe sleeves shall be provided in the concrete with 1/2" minimum clearance around the conduit for an entrance seal similar to O.Z. Type FSK or Link Seal mechanical seal fittings. Conduits shall be sloped away from building and sealed inside the conduit after conductor installation to eliminate water and condensation infiltration. Contractor shall use Polywater FST or Raychem "RDSS" duct sealing system or Polywater FST series sealant.
- G. At all entrances to panelboards, pull boxes or outlet boxes, conduit runs shall be secured in place with galvanized lock nuts and bushings; one lock nut inside and one lock nut outside the box with the bushing on the inside. Bushings shall be of the insulating throat type. Where conduit fittings are used, a single locknut with insulated throat fitting is acceptable.
- H. Field bends shall be made with standard tools and equipment manufactured specifically for conduit bending. Use factory elbows for bends in conduit larger than 2" trade size. Use conduit bodies to make sharp changes in direction.
- I. Complete the installation of electrical raceways before starting installation of cables within raceways.
- J. Provide flexible conduit for motor connections transformer connections and for other electrical equipment connections where subjected to movement and vibration.
- K. Provide liquid-tight flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration, and also where subjected to one or more of the following conditions:
 - 1) Exterior location.
 - 2) Moist or humid atmosphere where condensate can be expected to accumulate.
- L. Where possible, install horizontal raceway runs above water piping.
- M. All conduit to be concealed in walls, ceiling or floor, except in the mechanical and electrical rooms where exposed conduit is permitted or where approved by architect.

- N. Exposed conduit shall run parallel or perpendicular to members of the building structure, rigidly maintained and clamped with one-hole malleable iron conduit clamps or conduit supports similar to those of Steel City Electric Company or Unistrut Corporation.
- O. All conduit shall be rigidly and independently supported from the structure at 7'-0" maximum spacing. No conduit shall rest on or be supported from acoustic tile ceiling support wires, ductwork or piping. Support outlet boxes directly from the structure or where not possible, within one (1) foot of box. Provide all miscellaneous steel and support framing for electrical installation.
- P. Locate conduit runs to avoid equipment and items requiring service. Maintain clearance of six (6) inches minimum from water piping and twelve (12) inches minimum from heating system piping.
- Q. All PVC conduits shall have bell ends. Provide expansion fittings at spacing recommended by the manufacturer.
- R. All communications conduits shall have nylon bushings at both ends and pull strings.
- S. All communications conduits shall have wide sweep 90° elbows and pull boxes after two (2) bends.
- T. Penetrations of floor slabs shall be made with rigid galvanized steel conduit. All conduit below floor slabs shall be run in sub-floor below floor, not in floor pour. Provide expansion fitting prior to entry into first box, enclosure or conduit section.
- U. Maintain 12" clearance minimum for all conduits from heat producing equipment, such as flues, heat exchangers.
- V. Conductor Installation: Conductor sizes, type and quantity shall be furnished and installed as required by the drawings and as specified in these specifications.
 - 1) All wiring shall be installed in accordance with the applicable provision of the National Electrical Code and as specified herein and shown on the drawings.
 - 2) All branch circuit wiring involving a total length over 75' shall use the next largest wire size for the home run and/or the portion exceeding 75'.
 - 3) Pull conductors together where more than one is being installed in a raceway.
 - 4) Use pulling compound or lubricant, when necessary; compound must not deteriorate conductor and insulation.
 - 5) Keep conductor splices to a minimum.
 - 6) Wire shall be installed only after all work that may cause injury is completed, such as the pouring of concrete.
 - 7) Install splices and taps which have equivalent or better mechanical strength and

insulation as the conductor.

8) Use splice and tap connectors which are compatible with the conductor material.

W. Provide seals when conduit is passing from cold to warm environments. Use silicone sealant around boxes and exterior of raceways and sealing system within raceways, Polywater FST or Raychem RDSS Bags.

END OF SECTION

SECTION 262400

SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.01 REFERENCE

- A. Drawings and general provisions of contract including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
- B. Division 26, Section 260000, Electrical General Provisions and Section 260500, Basic Materials and Methods, apply to work of this section.

1.02 CONTENTS

- A. Specified herein: Requirements for electrical service and distribution.
- B. Described herein are the following:
 - Scope.
 - Power and Telephone Service Work and Coordination.
 - Grounding.

1.03 SCOPE

- A. The extent of electrical service and distribution work is indicated by drawings and in schedules, in other Division 23 and 26 requirements of this division, and is hereby defined to include, not necessarily limited to:
 - 1) Conduit, trenching and backfilling for incoming utilities.
 - 2) Underground service conduits from utility pole to a pad-mounted transformer and to service entrance equipment.
 - i. Grounding.
 - 3) Metering equipment installation.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS, GROUNDING

- A. The entire light and power system shall be permanently and effectively grounded in accordance with the latest issue of the National Electrical Code, including panels, motor frames and other exposed non-current carrying electrical parts of the electrical equipment and conductive components of the building structure and mechanical systems (i.e., piping, ductwork, etc.).
- B. Article 250 of the National Electrical Code shall be complied with in its entirety with regard to this installation. Particular attention shall be paid to Article 250-45 in reference to appliance and portable equipment grounding.

- C. Metallic conduit system shall be electrically continuous throughout and be grounded at the service entrance. All conduits and cable assemblies for feeders and branch circuits shall include a green ground wire. Install grounding jumper across all flexible conduit.
- D. A green pigtail shall be installed from grounding slots of all grounding outlets to outlet box in each instance where the receptacle attachment bar is not in direct contact with the outlet box or outlet box plaster plate.
- E. Ground mats shall be installed at utility transformer location to comply with utility company details.
- F. The ground system shall be extended and connected to the incoming cold water line within the building ahead of main shut-off valve.
- G. Connect to building steel with ground loop as shown on drawings. Provide "UFER" ground in building footing at service entrance.

PART 3 EXECUTION

3.01 INSPECTION

- A. Installer must examine areas and conditions under which electrical work is to be installed and notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.02 ELECTRICAL INSTALLATIONS

- A. General: Install electrical equipment for this project as indicated, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation" and in accordance with recognized industry functions.
- B. Direct all other contractors to maintain required clearances from electrical equipment to piping and ductwork during construction progress.
- C. All panelboards, switchboards, motor control centers and control panels shall be labeled to warn qualified persons of electric ARC flash hazards per NEC.
- D. Provide 4" minimum height concrete housekeeping pads for all floor mounted electrical distribution equipment including (but not limited to) switchboards, switchgear, distribution panelboards, motor control centers and transformers.
- E. Provide performance testing of service ground fault protection system on site by equipment manufacturer per the NEC.

3.03 ELECTRICAL SERVICE

- A. Service consists of an underground primary feed in PVC conduit to a power company pad-mounted transformer as indicated on the drawings.
- B. Secondary underground service from the power company transformer to the main disconnect inside the equipment room.
- C. Electrical Contractor shall provide complete installation for power company transformer per their requirements. Installation to include reinforced concrete pad for utility transformer, conduits for primary and secondary services, facilities for utility company metering, and other installation requirements of the serving utility.
- D. All trenching and backfilling for the primary and secondary underground service to be by this contractor.
- E. Any installation costs assessed by utility company for service installation shall be included in bid and paid for by the electrical contractor.

3.04 TELEPHONE SERVICE

- A. Service consists of an underground PVC conduit system for incoming service as indicated on drawings. This contractor shall fully coordinate with and provide trenching, backfilling and other facilities required by the telephone utility company for the service installation.
- B. Provide 3/4" plywood backboards where indicated on drawings for use by telephone system. Backboards shall be painted both sides with two (2) coats of flame retardant gray enamel paint. Provide 120 volt duplex receptacle at each backboard location.
- C. Provide empty conduit system with pull wires from main service backboard to each remote backboard and from individual telephone backboards to each outlet location. Conduit sizes on drawings are approximate and shall be confirmed with utility prior to installation.
- D. From each telephone outlet location, conduit to be stubbed into ceiling space from junction box. Size as shown on drawing.
- E. Any installation costs assessed by utility company for incoming service installation shall be included in bid and paid for by the Electrical Contractor.

3.05 INSTALLATION OF ELECTRICAL GROUNDING

- A. General: Install electrical grounding systems (including ground rods and water line tap) where shown, in accordance with applicable portions of National Electrical Code, with National Electrical Contractors Association's "Standard of Installation" and in accordance with recognized industry practices to ensure that electrical grounding complies with requirements and serves intended purposes.
- B. Coordinate with other electrical work, as necessary to interface installation of electrical grounding system with other work.
- C. Install braided type bonding jumpers with ground clamps on water meter piping to electrically

bypass water meter.

- D. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- E. A green pigtail shall be installed from grounding outlets to outlet box in each instance where the receptacle attachment bar is not in direct contact with the outlet box or outlet box plaster plate.
- F. Green bonding jumper shall be installed in all flexible metallic conduit.
- G. All metal piping systems, ductwork, and steel frames shall be bonded to the electrical system in compliance with the NEC.

END OF SECTION

SECTION 262419

MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: This section includes, but shall not be limited to, requirements for a motor control center (MCC) and required control devices as shown on the Drawings and specified to be part of the MCC equipment. The MCC shall be 480 volt, 3-phase, 3-wire, 60 hertz unless otherwise indicated.

1.02 REFERENCES

- A. General: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.
- B. American National Standards Institute (ANSI):
- 1) ANSI Z55.1, "Gray Finishes for Industrial Apparatus and Equipment."
- C. ASTM International (ASTM):
- 1) ASTM B117, "Standard Practice for Operating Salt Spray (Fog) Apparatus."
- D. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
- 1) IEEE 519, "Guide for Harmonic Control and Reactive Compensation of Static Power Converters."
- E. International Electrotechnical Commission (IEC):
- 1) IEC 60947, "Low Voltage Switchgear and Control Gear - Part 2: Circuit Breakers."
- F. National Electrical Manufacturers Association (NEMA):
- 1) NEMA ICS 18, "Motor Control Centers."
- G. National Fire Protection Association (NFPA):
- 1) NFPA 70, "National Electrical Code," hereinafter referred to as NEC.
- H. Underwriters Laboratories, Inc. (UL):
- 1) UL 50, "Enclosures for Electrical Equipment, Non-Environmental Considerations."
 - 2) UL 498, "Standard for Attachment Plugs and Receptacles."

- 3) UL 508, "Standard for Industrial Control Equipment."
- 4) UL 845, "Motor Control Centers."

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 01 - General Requirements.
- B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications.
- C. Shop Drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data.
- D. Wiring Diagrams: Submit wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring, and between components provided by the manufacturer and those provided by others.
- E. Operation and Maintenance Manuals: Submit with the delivery of the MCC an operation and maintenance manual and one copy of the manufacturer's drawings per shipping block.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1) Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of low voltage industrial MCCs of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years.
 - 2) Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing low voltage industrial MCCs similar in type and scope to that required for this Project and shall be approved by the manufacturer.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.
 - 1) The MCC shall conform to UL 845, current revision, NEMA ICS 18 and the NEC. The MCC shall be manufactured in an ISO 9001 certified facility.
- C. Single Source Responsibility: Obtain MCCs and required accessories from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work. Any materials which are not produced by the manufacturer shall be acceptable to and approved by the manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

- A. The MCC shall be separated into shipping blocks no more than three vertical sections each. Shipping blocks shall be shipped on their sides to permit easier handling at the job site. Each shipping block shall include, but shall not be limited to, a removable lifting angle, which shall allow an easy means of attaching an overhead crane or other suitable lifting equipment.
- B. If the MCC cannot be placed into service reasonably soon after its receipt, store it in a clean, dry, and ventilated building free from temperature extremes. Acceptable storage temperatures are from 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C).

1.06 WARRANTY

- A. The MCC shall be warranted to be free from defects in materials and workmanship for a period of 18 months from date of invoice from manufacturer or authorized sales channel.
- B. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Shall be Rockwell Automation, Square D®, ABB, Eaton, Siemens or equal.
- B. Additions to existing MCCs shall be the same as the original manufacturer.

2.02 MATERIALS

- A. Steel material shall comply with UL 845 requirements.
- B. Each MCC shall consist of one or more vertical sections of heavy gage steel bolted together to form a rigid, freestanding assembly. A removable 7 gage structural steel lifting angle shall be mounted full width of the MCC shipping block at the top. Removable 7 gage bottom channel sills shall be mounted underneath front and rear of the vertical sections extending the full width of the shipping block. Vertical sections shall be made of welded side-frame assembly formed from a minimum of 12 gage steel. Internal reinforcement structural parts shall be of 12 gage and 14 gage steel to provide a strong, rigid assembly. The entire assembly shall be constructed and packaged to withstand normal stresses included in transit and during installation.

2.03 STRUCTURES

- A. Structures shall be totally enclosed, deadfront, freestanding assemblies. Structures shall be capable of being bolted together to form a single assembly.
- B. Structures shall be as shown on plans.
- C. Each 20 inch (508 mm) wide standard section shall have all the necessary hardware and bussing for modular plug-on units to be added and moved around. Unused space shall be

covered by hinged blank doors or appropriate cover plate and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters.

- D. Each section shall include, but shall not be limited to, a top plate (single piece or two-piece). NEMA Type 12 shall also include a bottom plate. Top and bottom plates shall be removable for ease in cutting conduit entry openings.

2.04 BUSSING

- A. Bussing and connectors shall be silver plated copper.
- B. The main horizontal bus shall be rated at 600 amperes continuous and shall extend the full length of the MCC. Bus ratings shall be based on 149 degree F (65 degree C) maximum temperature rise in a 104 degree F (40 degree C) ambient. Provisions shall be provided for splicing additional sections onto either end of the MCC.
- C. The horizontal bus splice bars shall be pre-assembled into a captive bus stack. This bus stack shall be installed into the end of the MCC power bus to allow the installation of additional sections. The main bus splice shall utilize four bolts, two on each side of the bus split, for each phase. Additional bolts shall not be required when splicing higher amperage bus. The splice bolts shall secure to self-clenching nuts installed in the bus assembly. It shall be possible to maintain any bus connection with a single tool.
- D. Each section that accepts plug-in units shall be provided with a vertical bus for distributing power from the main bus to the individual plug-in starter units. This bus shall be of the same material and plating as the main bus.
- E. The system shall be rated for an available short circuit capacity of 65,000 amperes rms.

2.05 TYPICAL UNIT CONSTRUCTION

- A. Units with circuit breaker disconnects through 400 ampere frame, and fusible switch disconnects through 400 amperes, shall connect to the vertical bus through a spring reinforced stab-on connector. Units with larger disconnects shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus. Circuit breakers with frame sizes 1,200 amps and greater shall be installed with energy reducing maintenance switch and status indicator.
- B. Conducting parts on the line side of the unit disconnect shall be shrouded by a suitable insulating material to prevent accidental contact with those parts.
- C. Unit mounting shelves shall include, but shall not be limited to, hanger brackets to support the unit weight during installation and removal. Plug-on units shall use a twin-handle camming lever located at the top of the bucket to rack in and out the plug-on unit. The cam lever shall work in conjunction with the hanger brackets to ensure positive stab alignment.
- D. A lever handle operator shall be provided on each disconnect. With the unit stabs engaged onto the vertical phase bus and the unit door closed, the handle mechanism shall allow complete on/off control of the unit. Circuit breaker operators shall include, but shall not be limited, a separate tripped position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door. Clear

indication of disconnect status shall be provided, by adhering to the following operator handle positions:

- 1) Handle on position shall be up or to the left and within 45 degrees of being parallel to the face of the equipment.
 - 2) Handle off position shall be down or to the right and within 45 degrees of being parallel to the face of the equipment.
 - 3) The minimum separation between the on and off positions shall be 90 degrees.
 - 4) On circuit breaker disconnects, the handle tripped position shall be perpendicular to the face of the equipment ± 30 degrees. Minimum separation between on and tripped shall be 30 degrees. Minimum separation between tripped and off shall be 45 degrees.
- E. A mechanical interlock shall prevent the operator from opening the unit door when the disconnect is in the on position. Another mechanical interlock shall prevent the operator from placing the disconnect in the on position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.
- F. A non-defeatable interlock shall be provided to prevent installing or removing a plug-on unit unless the disconnect is in the off position.
- G. The plug-in unit shall have a grounded stab-on connector which shall engage the vertical ground bus prior to, and shall release after, the power bus stab-on connectors.
- H. Provisions shall be provided for locking disconnects in the off position with up to three padlocks.
- I. Handle mechanisms shall be located on the left side to encourage operators to stand to the left of the unit being switched.
- J. Unit construction shall combine with the vertical wireway isolation barrier to provide a fully compartmentalized design.

2.06 COMPONENTS FOR TYPICAL UNITS

- A. Combination Starters:
- 1) Combination starters shall use a unit disconnect as described in Typical Unit Construction Article above. Magnetic starters shall be furnished in combination starter units. Starters shall utilize NEMA rated contactors. Starters shall be provided with a three-pole, external manual reset, overload relay for ambient compensated bimetallic thermal overload units.
 - 2) When provided, control circuit transformers shall include, but shall not be limited to, two primary protection fuses and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and connected control circuit loads plus an additional spare 100VA.

The transformer rating shall be fully visible from the front when the unit door is opened.

- 3) When a unit control circuit transformer is not provided, the disconnect shall include, but shall not be limited to, an electrical interlock for disconnection of externally powered control circuits.
- 4) Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.
- 5) NEMA Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.

B. Terminal Blocks:

- 1) When Type B wiring is specified, starter units shall be provided with unit control terminal blocks.
- 2) Terminal blocks shall be the pull-apart type with a minimum rating of 250 volts and 10 amperes. Current carrying parts shall be tin-plated. Terminals shall be accessible from inside the unit when the unit door is opened. Terminal blocks shall be DIN rail-mounted with the stationary portion of the block secured to the unit bottom plate. The stationary portion shall be used for factory connections, and shall remain attached to the unit when removed. The terminals used for field connections shall face forward so they can be wired without removing the unit or any of its components.
- 3) When Type C wiring is specified, starter units shall be provided with unit control terminal blocks as described for Type B wiring along with power terminal blocks for Size 1-3 units. An additional set of terminal blocks shall be provided in a terminal compartment located in each section. These terminal blocks shall be pre-wired to the unit terminals so that field control connections can be made at the terminal compartments.

C. Nameplates: Provide engraved phenolic nameplates for each MCC and unit compartment. Provide black background with white letters, measuring a minimum of 1.5 inches (38 mm) high by 6.25 inches (159 mm) wide total outside dimensions.

D. Pilot Device Panel: Each combination starter unit shall be provided with a hinged/removable control station plate, which can accommodate up to five 0.87 inch (22 mm) pilot devices or three 1.18 inch (30 mm) pilot devices. [The control station plate can be deleted if no local unit pilot devices are required.]

E. Starters for motors greater than 10HP shall be provided with single phase protection relay.

2.07 PANELBOARDS

- A. General: Except as otherwise indicated, provide panelboards, enclosures and components of types, sizes and ratings indicated, which comply with manufacturer's standard materials, design and construction, in accordance with published product information; equip with number of unit panelboard devices as indicated for a complete installation. Where more than one type of component meets indicated requirements, selection is installer's option. Where types, sizes or ratings are not otherwise indicated, comply with NEC, UL and established industry standards for applications indicated. Panelboard ratings, current and voltage, fused switch or circuit breaker complement, interrupting ratings and mounting are indicated on the drawings. Where not noted, the minimum interrupting rating on the 480 volt system shall be 14 KAIC and 10 KAIC on the 120 volt system.
- B. Provide dead-front safety type lighting and power panelboards as indicated, with switching and protective devices in quantities, ratings, types and arrangement shown; with anti-turn solderless pressure type lug connectors approved for copper conductors; construct unit for connecting feeders at top or bottom of panel to suit field conditions; equipped with copper bus bars, full-sized neutral bar, with bolt-in type molded case branch circuit breakers for each circuit, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide a bare uninsulated copper grounding bar suitable for bolting to enclosure.
- C. Panelboard Fronts: Provide panelboard fronts with door-in-door feature with one door over the interior and the other hinged to give access to the wiring gutter. The inner door over the interior shall have flush lock keyed to match other panels.
- D. All panelboard fronts shall be equipped with interior circuit-directory frame and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor. Design enclosure for surface or flush mounting, as indicated on the drawings. Provide enclosures fabricated by same manufacturer as panelboards and which fit properly with panelboards to be enclosed.

Panelboard Accessories: Provide panelboard accessories and devices, including but not necessarily limited to, circuit breakers, ground-fault protection breakers, arc fault protection breakers, H.I.D., SWD and HACR rated circuit breakers etc., as recommended by panelboard manufacturer or required by code for ratings and applications indicated.
- E. Panelboards shall be of the same manufacturer as the MCC.

2.08 DISTRIBUTION TRANSFORMERS

- A. Dry type transformers shall be of the same manufacturer as the MCC.
- B. Three (3) phase transformers shall be 480 volt delta primary and 120/208 volt wye secondary, sized as noted with a minimum of four (4) 2-1/2% full capacity primary taps with copper windings.
- C. Transformers shall be 115 degrees C. temperature rise above 40 degrees C. ambient. All insulating materials to be in accordance with NEMA ST-20 standards for 180 degree C. UL component recognized insulation system. Efficiency rating shall meet or exceed the current Department of Energy Standards.
- D. Sound levels shall be guaranteed by the manufacturer not to exceed the following when tested per NEMA and ANSI Standards.

10 to 50 KVA - 45 DB
51 to 150 KVA - 50 DB

- E. Mount transformers using vibration isolation.

2.09 GENERAL COMMUNICATION CABLING

- A. The MCC shall employ a pre-engineered communication cabling system to interconnect units within the MCC.
- B. Network cabling shall be routed through the lower horizontal wireway to isolate the network from the horizontal bussing routed through the top.
- C. The full-depth vertical wireway shall serve to separate communications from power cabling to prevent noise interference on the network cable.
- D. The communication cabling installation shall meet Class 2 wiring practices under the provisions of NEC Articles 725 and 800.
- E. Provisions for appropriate terminators and grounding shall be provided.
- F. Addition, removal, or rearrangement of units shall not interrupt the trunk line and shall not affect the cabling of other units attached to the trunk line.
- G. Cable assemblies shall use 5-pole micro-style connectors with a single keyway and shall comply with SAE H1738-2 specifications.
- H. Connectors shall be epoxy-coated for a 500-hour salt-spray test per MIL-STD-202.
- I. Cable coupler design shall include, but shall not be limited to, a vibration-resistant ratchet to prevent loosening.
- J. The system shall be constructed of molded PVC material.

2.10 QUALITY CONTROL

- A. The entire MCC shall go through a quality inspection before shipment. This inspection shall include, but shall not be limited to, the following:
 - 1) Physical Inspection of the following:
 - a. Structure.
 - b. Electrical conductors, including, but not limited to, the following:
 - 1. Bussing.
 - 2. General wiring.
 - 3. Units.

- 2) Electrical Tests:
 - a. General electrical tests shall include, but shall not be limited to, the following:
 1. Power circuit phasing.
 2. Control circuit wiring.
 3. Instrument transformers.
 4. Meters.
 5. Ground fault system.
 6. Device electrical operation.
 - b. AC dielectric tests shall be performed on the power circuit.
- 3) Markings/labels include, but shall not be limited to, the following:
 - a. Instructional type.
 - b. UL/CSA.
 - c. Inspector's stamps.
- 4) Each device shall be configured and addressed to correspond with software settings.
- 5) A read/write test shall be performed prior to shipment on network devices, including, but not limited to, overloads, drives, and soft starters.
- 6) Testing shall be designed to verify system operation and shall include, but shall not be limited to, these verifications as a minimum:
 - a. Drawings and bill of materials.
 - b. I/O addressing.
 - c. Correct device operation by I/O address.
 - d. Host communications.
 - e. Control network interface.
- 7) The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the MCC meets operating specifications.

350,000 Amp Class (Service Entrance)

- A. Surge suppression system shall be provided as an integral component of the MCC.
- B. Standards. The specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:
 - ANSI/IEEE C62.41-1991 and C62.45-1987;
 - ANSI/IEEE C62.1 and C62.11;
 - Canadian Standards Association (CSA);
 - Federal Information Processing Standards Publication 94 (FIPS PUB 94);
 - National Electrical Manufacturer's Association (NEMA LS1-1992 Guideline);
 - National Fire Protection (NFPA 70 [NEC], 75 and 78);
 - Underwriters Laboratories (UL 1449 and 1283);
 - Underwriters Laboratories (UL 489 and 198)
- C. The unit shall be UL 1449 listed and CSA approved as a transient voltage surge suppressor and UL 1283 listed as an electromagnetic interference filter.
- D. High Performance Suppression System. The unit shall include an engineered, solid-state, high performance suppression system utilizing predetermined arrays of non-linear voltage dependent metal oxide varistors with similar operating characteristics.
- E. Internal Connections. All internal wiring associated with the suppression filter system and subject to surge currents shall utilize low-impedance copper bus bar and/or #2 AWG copper conductor or larger. All internal connections associated with the suppression filter system and subject to surge currents shall be made with compression solderless type lugs and shall be bolted to the bus bars in order to reduce overall system impedance. No plug-in components modules, quick disconnect terminals, non-field replaceable fusing or printed circuit boards shall be used in surge current carrying paths.
- F. Unit Status Indicators. The unit shall include long life, solid state, externally visible LED visual status indicators that monitor the on-line status of each phase of the unit.
- G. Integral Test Point. The unit shall incorporate an integral test point allowing easy off-line diagnostic testing verifying the operational integrity of the unit's suppression filter system. Field testing shall permit proactive testing to ensure performance and long term reliability. Testing shall include performance and long term reliability. Testing shall include injection of an impulse into the off-line suppression filter system to verify the suppression performance values established at final factory testing and recorded on the diagnostic signature card. Indicator lights monitoring fuse condition or power available which inform the user of failure after the fact are not acceptable to meet the intent of this specification.
- H. Remote Status Monitor Contacts. In order to monitor on-line status, the unit shall include form C dry contacts (N.O. or N.C.) to facilitate connection to a building management system. The contacts shall be normally open or normally closed and shall change state upon degradation of failure or the suppression system and/or fuse. The contacts shall also change upon phase reversal, power failure of any combination of all three phases or total power failure.

2.12 METERING DEVICES

- A. Manufacturer shall provide an electronic power meter where indicated on the drawings. Three phase metering and power quality analysis shall be provided by a power quality meter provided by the MCC manufacturer.
- B. Metering shall include A, V, W, Wh, Wcost, var, varh, VA, VAh, Hz, and PF in True RMS or displacement (fundamental) quantities.
- C. Power analysis features shall include an event recorder, waveform capture, trace memory, harmonic spectrum display through the 63rd harmonic with total harmonic distortion and a data logger function. All analysis data shall be non-volatile.
- D. Four switch inputs shall be provided which can be programmed for relay activation, counters, logic, demand sync, reset and alarms. Four output relays shall be provided which can be programmed to activate on alarms, setpoints, switch inputs, kWh pulse, trace memory triggers or communications control. These output relays shall also be able to use demand metering values of A, VAR, W and VA to control load shedding. Provide Ethernet TCP/IP interface compatible with owner's SCADA System.
- E. Local user interface shall include a keypad and display for entering all setpoints and reading all measured values, and LED indicators for output relays, communication status and alarm status.
- F. Instrument Transformers
 - 1) Current transformers with shorting terminal block shall be provided. Current ratings shall be as indicated on drawings.
 - 2) Manufacturer shall provide potential transformers with fused primary, stationary mounted, rated and configured as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
 - 1) Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.02 INSTALLATION

- A. Install MCCs in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.
- B. MCCs shall not be placed in hazardous locations. The area chosen shall be well ventilated and totally free from humidity, dust, and dirt. The temperature of the area shall be no less

than 32 degrees F (0 degrees C) and no greater than 104 degrees F (40 degrees C). For indoor locations, protection shall be provided to prevent moisture entering the enclosure.

- C. The MCCs shall be assembled in the factory on a smooth level surface so that sections are properly aligned. A similar smooth and level surface shall be provided for installation. An uneven foundation will cause misalignment of shipping blocks, units, and doors. The surface under a MCC shall be of a non-combustible material unless bottom plates are installed in each vertical section.

3.03 DEMONSTRATION

- A. Provide the services of a factory-authorized service representative of the manufacturer to provide start-up service and to demonstrate and train the Owner's personnel.
 - 1) Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
 - 2) Train the Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.
 - 3) Review data in operation and maintenance manuals with the Owner's personnel.
 - 4) Schedule training with the Owner, through the Architect, with at least seven day's advanced notice.

3.04 PROTECTION

- A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the low voltage industrial MCCs shall be without damage at time of Substantial Completion.

END OF SECTION

SECTION 262923 - VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, services, and incidentals as shown, specified, and required to furnish and install variable frequency drives, complete and operational.
2. Variable frequency drives required under this Section are low-voltage, voltage source inverter, pulse width modulated. Variable frequency drives shall be customized.

B. Where variable frequency drives are being provided by the vendor of the associated driven equipment, costs for variable frequency drives shall be included in the lump sum price for said equipment. Where variable frequency drives are not being provided by the vendor of the associated driven equipment, costs for variable frequency drives shall be included in the general contract price.

C. Related Sections:

1. Section 260553, Electrical Identification.
2. Section 260520, Shielded Cable.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. NEMA AB 1, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.
2. NEMA ICS 2, Industrial Control and Systems, Controllers, Contactors and Overload Relays Rated 600 Volts.
3. NEMA ICS 7, Industrial Control and Systems Adjustable Speed Drives.
4. NEMA MG 1, Motor and Generator Standard.
5. UL 508, Industrial Control Equipment.
6. ISO 9000, Quality Management Systems, Fundamentals and Vocabulary.
7. ISO 9001, Quality Management Systems, Requirements.
8. ISO 9002, Quality Systems, Model for Quality Assurance in Production, Installation and Servicing.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:

- a. Variable frequency drive manufacturer shall have at least five years of experience designing and regularly manufacturing and servicing substantially similar equipment to that specified, and shall submit documentation upon request of at least five installations in satisfactory operation for at least five years.
- b. Manufacturer shall be certified under ISO 9000, ISO 9001, or ISO 9002 for materials and equipment specified.
- c. For all required factory tests, variable frequency drive manufacturer shall use a factory test facility that has calibrated its testing apparatus in the previous twelve months, and is staffed by qualified, experienced technicians.

B. Component Supply and Compatibility:

1. Drives specified under this Section shall employ a low switching frequency or pattern to minimize instantaneous rate of voltage change over time (dv/dt), and the adverse effects of potential bearing currents. Where alternate manufacturers are proposed, obtain manufacturer recommendations regarding bearing currents and provide equipment required at no additional cost to OWNER.
2. Each variable frequency drive shall be totally compatible with associated driven equipment and motors. Variable frequency drives shall be matched to specific load requirements for each system. Operation of variable frequency drive shall not overstress motor insulation.
3. Similar components of drives associated with each system shall be products of a single manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
 - a. Dimensional information and construction details of enclosures. Enclosure details shall consist of exterior and interior front door with nameplate legends, interior door front and rear views, and terminal block layout.
 - b. Three-line power and control schematic diagrams.
 - c. Wiring diagrams showing the interconnection of conductors to all devices with terminal assignments for remote devices.
 - d. Functional description of system operation.
 - e. VFD heat dissipation at full load, including heat rejection/cooling system.
 - f. Preliminary Harmonic analysis shall utilize:
 - 1) I_L shall be 80% of the connected load.
 - 2) The point of common coupling (PCC) shall be the first main breaker of the motor control center which the VFD is powered from.
2. Product Data:
 - a. Technical specifications.
 - b. Catalog cuts and product literature.

3. Testing Plans:

- a. At least thirty days prior to source quality control testing, submit descriptions of proposed shop testing methods, procedures, and apparatus.
- b. At least thirty days prior to field quality control testing, submit descriptions of proposed field testing methods, procedures, and apparatus.

B. Informational Submittals: Submit the following:

1. Certificates:

- a. Certification letters from variable frequency drive manufacturer and motor manufacturer that the approved driven equipment has been reviewed and that variable frequency drive units and motors are compatible, and shall be provided in accordance with the Contract Documents and requirements of the driven equipment.

2. Source Quality Control Submittals:

- a. Within 14 days of completing source quality control tests and inspections, submit test results with indication of whether all criteria of the Contract Documents for the specified equipment were met.

3. Field Quality Control Submittals:

- a. Within 14 days of completing field quality control tests and inspections, submit test results with indication of whether all criteria of the Contract Documents for the specified equipment were met.

4. Manufacturer Reports:

- a. Preliminary and final harmonic analysis.
- b. Within 14 days of each visit to the Site by manufacturer's representative, submit written report of reason for visit, problems encountered, solutions implemented, and remaining work.

5. Qualifications Statements:

- a. Manufacturer.

C. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data:

- a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation, list of recommended spare parts, and spare parts ordering information.

- b. Manuals shall include record drawings of control schematics, including point-to-point wiring diagrams.
- c. Comply with Section: Operation and Maintenance Data.
- d. Field report of final harmonic testing.

D. Maintenance Materials Submittals: Submit the following:

1. Spare Parts and Extra Stock Materials:

- a. Furnish, tag, and box for shipment and long term storage, spare parts and special tools for variable frequency drives. Each spare part set shall include manufacturer's recommended spare parts inventory for one year and include, at minimum, the following:

Item	Quantity per Four VFDs per HP Rating
1) Transistor and diode modules with accessories	One set
2) Power supply module	One
3) Fans	One set
4) Power fuses	One set of each size and type used
5) Control power fuses	Two sets of each size and type used
6) Pilot lights	Two per ten of each type used

- 2. Furnish a list of recommended spare parts for an operating period of one year. Describe each part, the quantity recommended, and current unit price.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

- 1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
- 2. Shipping containers shall be designed to be shipped by truck, rail, or ship. Indoor containers shall be bolted to skids.
- 3. Inspect variable frequency drive equipment for shipping damage or loose parts upon delivery. Check for evidence of water that may have entered equipment during transit.

B. Handling:

- 1. Lift, roll or jack variable frequency drive equipment into locations shown.
- 2. Variable frequency drives shall be equipped for handling required for installation. Handle equipment in accordance with manufacturer's requirements.

C. Storage:

- 1. Store variable frequency drive equipment in a clean, dry location with controlled, uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. System Performance:

1. Driven equipment to be controlled by a variable frequency drive shall be provided with a customized variable frequency drive. Each drive unit shall include an adjustable frequency controller with associated controls for continuous speed adjustment and protection of the driven equipment. Output speed control of motor shall be continuous throughout speed range of two to 60 Hertz under variable torque load or constant torque as specified for the driven equipment.
2. Variable frequency drives associated with each set of driven equipment shall be similar to each other.
3. Variable frequency drives shall be UL-listed or ETL-listed and designed, built, and tested in accordance with NEMA AB 1, NEMA ICS 2, NEMA ICS 7, and UL 508.
4. The point of common coupling for all VFDs to be tested. Harmonic limits will be considered at the first point of connection to the electrical system, such as the motor control center that the VFD power is being supplied from and not the utility connection point.

2.2 MANUFACTURERS

A. Provide variable frequency drives by one of the following:

1. ABB
2. Schneider Electric
3. Allen-Bradley
4. Eaton
5. Toshiba
6. Danfoss
7. Or equal.

2.3 APPROVED EQUAL: OTHER MANUFACTURERS MUST BE PRE-QUALIFIED BEFORE ONE (1) WEEK PRIOR TO BID OPENING. PREQUALIFICATION SHALL CONSIST OF SUBMITTING INFORMATION LISTED IN PARAGRAPHS 1.3 AND 1.4 ABOVE TO THE ENGINEER A MINIMUM OF TWO (2) WEEKS PRIOR TO THE BID OPENING DATE. APPROVAL OF EQUAL MANUFACTURERS (IF ANY) WILL BE MADE BY ADDENDUM PRIOR TO THE BID OPENING.

- A. Provide each variable frequency drive with freestanding, front-access, stainless steel, filtered and gasketed enclosure, suitable for outdoor installation in direct sunlight. Enclosure shall house all components required for the associated variable frequency drive.
- B. Enclosure shall provide adequate cooling for components within and include positive ventilation.

- C. Enclosure shall include circuit breaker disconnect switch. Circuit breakers shall be in accordance with NEMA AB 1. Switch handle shall be suitable for padlocking and be through-the-door type with handle height not exceeding six feet. Operation of switch shall remove the service supply from all internal components. Power devices shall be suitable for interrupting capacity matching that of the upstream Power source in symmetrical amperes. Include current limiting semi-conductor fuses where required for protection of solid state components.
- D. Enclosure door shall include an operator interface for access to controller's digital keypad and display.
- E. Equip enclosure front with nameplates for identification of equipment and operating functions. Nameplates shall be in accordance with Section 16075, Electrical Identification.
- F. Equip enclosure with phenolic type terminal blocks suitably labeled for all internal and remote wiring requirements, plus twenty percent spare.
- G. Data shall be formatted as required to communicate with the plant SCADA system. The VFD's shall communicate via-ethernet TCP/IP. The manufacturer shall coordinate with the plant integrator to map data for SCADA interface.

2.4 ADJUSTABLE FREQUENCY CONTROLLER

A. General:

1. Adjustable frequency controller shall be microprocessor-based, pulse width modulated design, suitable for operation on a 480-volt, three-phase supply. Controller shall produce an adjustable AC voltage/frequency output to vary speed of driven equipment. Controller shall consist of the following sections:
 - a. The drive shall be a PWM (Pulse Width Modulated) inverter using IGBT transistors.
2. Controller switching frequency shall be adjustable and allow operation at 5,000 Hertz or less. Controller technology shall include a switching scheme that reduces the dv/dt of output supply.
3. Equip controller with a DC bus reactor or input line reactor as required to keep equipment line harmonics to a minimum.
4. Variable frequency drive control shall include status indicators, controller, and system fault condition displays and operating controls. Provide status indicators and operating controls associated with drive control on sub-panel behind hinged, gasketed door with a twist latch.
5. Overload rating of 110 percent variable torque, 150 percent constant torque for one minute.
6. RMS harmonic content of output current shall be less than five percent of fundamental current.
7. Able to withstand output terminal line-to-line short circuits without component failure.

B. Operating Criteria:

1. Operating criteria shall be in accordance with the following:
 - a. Ambient temperature range of zero to 40 degrees C.
 - b. Operational humidity of up to 90 percent non-condensing.
 - c. Altitude up to 3,300 feet above sea level.
 - d. Nominal voltage of 480-volts plus or minus ten percent, three-phase, three-wire. Include an under-voltage feature to allow trip-free operation down to 35 percent undervoltage.
 - e. Nominal frequency of 60 Hertz plus or minus three Hertz.
 - f. Input power factor of 95 percent displacement power factor at all operating speeds.
 - g. Efficiency of 96 percent at full speed and full load.

C. Features:

1. Controller shall have the following features:
 - a. Digital keypad and display module shall provide parameter setting, adjustments, and monitoring of control functions and faults. Display messages shall be in English.
 - b. Serial communication port shall allow connecting to programmable controller interface using manufacturer standard protocol.
 - c. Independent acceleration/deceleration rates shall provide two to 600 seconds minimum. When called to stop, motor shall decelerate to minimum speed before stopping.
 - d. Power loss feature shall allow five cycle ride through capability for input supply interruptions.
 - e. Time delay automatic restart shall allow restart after controller fault conditions have been cleared with programmable attempts.
 - f. Coasting motor restart shall allow controller to restart into a coasting motor without damage or tripping. Coasting motor restart feature shall allow switching from bypass mode to variable frequency drive mode while operating, without shutdown.
 - g. Isolated control inputs and outputs.

D. Protection:

1. Controller shall have protective functions as follows:
 - a. Input line metal oxide varistor transient protection.
 - b. Electronic over-current trip, instantaneous and inverse time overload protection with thermal memory retention.
 - c. Over-temperature trip temperature protection.
 - d. Current limit trip protection.
 - e. Input line over- and under-voltage trip protection.
 - f. Ground fault trip protection.

2. Power Line Considerations:

- a. Each VFD or multiple sets of VFD's shall be designed and installed such that: the total voltage harmonic distortion reflected back to the power source is a maximum of 5%.
- b. When required line reactors and harmonic filters are required, they shall be provided by VFD supplier and shall be rated for, and compatible with, each VFD. They shall function as a complete system. Additional harmonic filters beyond those shown on drawings may be required in order to comply with the above parameters. The line reactors and harmonic traps shall be mounted inside the respective VFD enclosures. Traps shall be fuse-protected as a minimum and shall protect internal wiring and components on each phase and shall be current limiting. Data on these items shall be included with VFD shop drawings.
- c. The VFD supplier shall perform a computer simulated power system study to verify compliance with the parameters as stated herein. The results of this study shall be submitted to the engineer. At a minimum the submitted results of this study shall include:
 - 1) A results summary sheet which briefly describes the power system configuration analyzed and which states the calculated values of total harmonic distortion.
 - 2) Detailed list of the amplitude of harmonic currents and voltages to the 50th harmonic.
- d. The contractor shall supply the VFD supplier with all power system data required to perform the above described study. These data may include but are not limited to:
 - 1) A complete one line diagram of the subject electrical distribution system.
 - 2) Complete electrical data on all equipment shown on the one line diagram is required. At a minimum this data shall consist of:
 - a) Transformers - kVA, Primary voltage, Secondary voltage, Short circuit capacity or impedance.
 - b) Motors - Horsepower, Base speed, Full load RMS current (FLA).
 - c) Generators - Short circuit capacity or Subtransient reactances (Xd), Power factor, kW, X/R Ratio.
 - 3) If the distribution system can function in more than one configuration, the configuration(s) to be analyzed shall be clearly defined. Any other information which may affect the behavior of the distribution system shall also be provided.

2.5 OUTPUT FILTER

A. General:

1. Provide output filter to prevent overstressing motor insulation system. Provide output filter with each variable frequency drive, when cable length between motor and variable frequency drive exceeds the following based on noted switching frequencies.
 - a. One KHZ switching frequency, 200 feet cable length.
 - b. Three KHZ switching frequency, 175 feet cable length.

2. Provide output filters in all other cases, based on recommendations of variable frequency drive and motor manufacturers, when actual voltage peaks at motor terminals exceed NEMA MG 1 limits.

B. Features and Criteria:

1. Filter shall be three-phase, 600-volt class motor-protecting type consisting of suitable values of inductance, capacitance and resistance to form a damped, low pass filter.
2. Filter shall be low-loss type specifically designed to reduce voltage wave form dv/dt. Filter shall allow cable lengths at minimum exceeding actual application distances with waveform resulting in voltage spikes at motor terminal that are within NEMA MG 1 Part 31 voltage stress levels.
3. Filter shall be suitable for mounting within variable frequency drive enclosure.

2.6 CONTROLS

A. General:

1. Equip each variable frequency drive control system with relays, switches, fuses, indicating lights, and components required for a complete, functional system.
2. Variable frequency drive control shall be powered from a suitably sized and protected control power transformer.
3. Variable frequency drive control shall include status indicators, controller, and system fault condition displays and operating controls. Provide status indicators and operating controls associated with drive control on front door of enclosure.
4. Variable frequency drive control shall include status indicators, controller, and system fault condition displays and operating controls. Provide status indicators and operating controls associated with drive control on sub-panel behind hinged, gasketed door with a twist latch.

B. Control and Pilot Devices:

1. Relays shall be standard, latching type, and pneumatic or solid state time delay type. Provide relays with contacts rated ten amps, quantity as required.
2. Pilot devices shall be heavy duty type, rated 10 amps continuous. Indicating lights shall be push-to-test transformer type with 12-volt secondaries.

C. Operation:

1. Controls for each variable frequency drive shall consist of all devices necessary for the following:
 - a. Stop/Start and Speed Control: Stop/start and speed control shall respond to drive-mounted selector switch. With switch in "REMOTE" position, stop/start and speed control shall be based on a stop/start contact and four- to 20-mADC speed signal from remote process control panel. With switch in "LOCAL" position, stop/start control shall be based on remote stop/start pushbuttons located adjacent to driven equipment, and speed control shall be based on drive-mounted speed potentiometer.

- b. Emergency Stop Control: Emergency stop control shall respond to remote stop pushbutton located adjacent to driven equipment. When activated, driven equipment shall stop immediately in all operating modes.
- c. Motor Over-temperature Shutdown: Motor over-temperature control shall respond to remote contact that activates on motor over-temperature. When over-temperature is detected, driven equipment shall stop. Include provisions to remotely supply 120-volt power to thermistor control module located at motor.
- d. Seal water control (required for pumps and other equipment that require seal water): Seal water control shall include provisions to supply 120-volt power to remote seal water solenoid. Seal water solenoid shall energize when equipment requiring seal water is enabled. Equipment requiring seal water start shall be delayed until remote-located pressure switch verifies seal water flow. Upon loss of seal water, after an adjustable period of time, an alarm shall be initiated but equipment requiring seal water shall not shut down. When equipment requiring seal water is stopped, seal water solenoid shall remain energized for an adjustable period of time.

D. Auxiliary Features:

- 1. Provide each variable frequency drive with the following:
 - a. Status Indicators: Status indicators shall include separate pilot lights for indication of motor run (red), and bypass mode (blue).
 - b. Shutdown Indicators: Shutdown indicators shall include separate pilot lights (amber) for each shutdown condition. Arrange shutdown indication circuitry so that, when activated, indicator requires manual reset.
 - c. Contact Outputs: Contact outputs shall include separate dry contacts for remote indication of motor run, seal water alarm for equipment with seal water systems, each shutdown condition, and controller faults.
 - d. Speed Output: Speed output shall include four- to 20-mADC signal for remote indication of motor speed.

E. Wiring and Device Identification:

- 1. Provide control wiring and device identification for each variable frequency drive:
 - a. Identify all control conductors with permanent type wire markers. Each wire shall be identified by a unique number and shall be attached to wire at each termination point.
 - b. Identify each control device with permanent type marker. Each device shall be identified by a unique number and shall be attached to each device.
 - c. Numbering system for each wire and control device shall be identified on wiring diagrams and shall reflect actual designations used in the Work.

2.7 SOURCE QUALITY CONTROL

A. Tests:

1. Perform factory tests on each variable frequency drive prior to shipping. Test shall consist of simulating expected load to be driven by operating load through speed ranges specified for driven equipment, for minimum of two hours per drive unit.
2. Provide factory control and alarm tests on each drive unit by simulating each control signal and each alarm function to verify proper and correct drive unit action.
3. Perform specified tests in addition to standard factory tests typically performed.

B. Factory tests as outlined above shall be witnessed by the OWNER's representative:

1. The manufacturer shall notify the OWNER two (2) weeks prior to the date the tests are to be performed.
2. The manufacturer shall include the cost of transportation and lodging for up to three (3) OWNER's representatives.

PART 3 - EXECUTION

3.1 INSPECTION

- #### A.
- Examine conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- #### A.
- Install equipment in accordance with manufacturer's recommendations and instructions and in conformance with Laws and Regulations, and the Contract Documents.
- #### B.
- Unless otherwise shown or indicated, install equipment at existing location of drive unit being replaced.
- #### C.
- Install equipment with sufficient access and working space provided for ready and safe operation and maintenance.
- #### D.
- For installations against masonry walls, provide an insulation board, 1/4-inch minimum thickness, between equipment and wall for corrosion protection. Trim board neatly within outline of equipment.
- #### E.
- Install all terminations, lugs, and required appurtenances necessary to properly terminate power supplies.
- #### F.
- Install control wiring terminations and appurtenances necessary to complete installing control and monitoring devices.

3.3 FIELD QUALITY CONTROL

A. Site Tests:

1. After installation, inspect, adjust, and test each variable frequency drive at the Site. Testing and inspection shall be in accordance with manufacturer's recommendations and be performed by manufacturer's factory-trained representative. Through CONTRACTOR, manufacturer's factory-trained representative shall inform OWNER and ENGINEER when equipment is correctly installed and ready to be energized. Do not energize equipment without permission of OWNER.
2. Perform the following equipment inspection and testing and provide reports documenting procedures and results.
 - a. Verify all device settings and drive adjustments.
 - b. Inspect all mechanical and electrical interlocks and controls for proper operation.
 - c. Test each drive through specified speed ranges and loads for a minimum of two hours per drive unit.
 - d. Test each drive by using actual control signal for remote and local operation.
 - e. Test each drive alarm function.
 - f. Perform other tests recommended by equipment manufacturer.
 - g. Perform Harmonics testing
 - 1) Testing of the Harmonic limits shall be per a VFD system as operating under natural conditions.
 - 2) Utilize the recorded maximum current recorded for the operating VFD system as I Load.
 - 3) Submit all calculations, all collected field data and graphs for review to Engineer.

B. Manufacturer Services:

1. Unloading and Installation: Manufacturer's factory-trained representative shall be present during unloading of equipment and installation at equipment's final location. Representative shall train installing personnel in advance in the proper handling and rigging of equipment. Services by manufacturer's representative under this paragraph shall be at least 2 eight-hour days at the Site.
2. Post-installation Check: Manufacturer's factory-trained representative shall check and approve the installed equipment before initial operation. Manufacturer shall calibrate, set and program variable frequency drives provided. Services by manufacturer's representative under this paragraph shall be at least 2 eight-hour days at the Site. Manufacturer's factory-trained representative shall adjust the system to final settings as specified in Article 3.5 of this section. Manufacturer's factory trained representative shall test as specified in section 3.3.A of this section. Representative shall operate and test the system in presence of ENGINEER and verify that equipment is in conformance with the Contract Documents. Services by manufacturer's representative under this paragraph shall be at least 2 eight-hour days at the site.
3. Representative shall revisit the Site as often as necessary until all deficiencies are corrected, prior to readiness for final payment.

4. Provide services of manufacturer's factory-trained representatives to correct defective Work within 72 hours of notification by OWNER during the correction period specified in the General Conditions as may be amended by the Supplementary Conditions.
5. Replacement parts or equipment provided during the correction period shall be equal to or better than original.
6. Training: Provide services of qualified factory trained specialists from manufacturer to instruct OWNER's operations and maintenance personnel in recommended operation and maintenance of equipment.

3.4 ADJUSTING

- A. Following Substantial Completion, when inspection and testing are complete and variable frequency drives are operating, manufacturer's representative shall return to the Site and make final adjustments as required to each variable frequency drive furnished under this Section.

END OF SECTION 262923

SECTION 263200

STANDBY ELECTRICAL GENERATOR SYSTEM

PART 1 GENERAL

1.01 REFERENCE

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 and 23 specification sections, apply to work of this section.
- B. Division 26, Section 260000, Electrical General Provisions, and Section 260500, Basic Materials and Methods, apply to work of this section.
- C. NFPA 30
- D. Ohio Fire Code.
- E. Ohio Building Code.

1.02 CONTENTS

- A. Described herein are the requirements for the standby electrical generator systems.

1.03 SCOPE

- A. The extent of generator system work is indicated on the drawing and by requirements of this section.

PART 2 PRODUCTS

2.01 STANDBY ELECTRICAL GENERATOR SYSTEM

- A. General
 - 1) The emergency generator system shall be a prototype tested, factory built, production tested, site tested, of the latest commercial design, together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein. The equipment supplied and installed shall meet the requirements of the national Electrical Code, U. L. and all applicable codes and regulations. All equipment shall be by a U. S. firm which manufactures the generator and controls, and assembles the standby generator sets as a matched unit so that there is one-source responsibility for warranty, parts, and service through a local representative with factory-trained service personnel.
 - 2) Design is based on a Kohler engine/generator set. Any changes to building, ventilation fuel system, exhaust system, clearances and electrical connections required for proper operation of an engine/generator other than base manufacturer shall be the responsibility of the contractor, without additional cost to the contract.

Units manufactured by MTU or Caterpillar will be considered equal.

- 3) Shop drawing submittal shall include specification sheets showing all standard and optional accessories to be supplied, performance data, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and other remote devices included elsewhere in these specifications. Include generator sizing calculations confirming selected generator is adequate for project.
- 4) **Testing:** To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer shall be responsible for design prototype tests as described herein: Components of the emergency system, such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes which will not be sold, shall be used for these tests. Prototype test programs shall include the requirements of NFPA-110 and the following:
 - a. Maximum power (KW).
 - b. Maximum starting (KVA) at 35% instantaneous voltage dip.
 - c. Alternator temperature rise by embedded thermocouple and by resistance method per NEMA MG1-22.40 and 16.40
 - d. Governor speed regulation under steady-state and transient conditions.
 - e. Voltage regulation and generator transient response.
 - f. Fuel consumption at 1/4, 1/2, 3/4, and full load.
 - g. Harmonic analysis, voltage wave-form deviation, and telephone influence factor.
 - h. Three (3) phase line-to-line short circuit test.
 - i. Alternator cooling air flow.
 - j. Torsional analysis testing to verify that the generator set is free of harmful torsional stresses.
 - k. Endurance testing.
- 5) **Warranty:** The emergency generator system and transfer switch shall be warranted by the manufacturer for one (1) year from the date of acceptance by the owner.
- 6) Furnish a proposal to the owner for a service and maintenance agreement for time past the requirements of the warranty.

- B. The standby electric generating sets shall include a diesel fueled liquid cooled electric plant, rated at 480/277 volt, three (3) phase, four (4) wire, 60 Hertz, 350 KW continuous standby,

437.5 KVA at .8 power factor. It shall be a package unit of new and current equipment consisting of a diesel fueled engine-driven electric plant with engine mounted start-stop control system, and other mounted accessories as specified. An automatic load transfer control to provide automatic starting and stopping of the plant and switching of the load shall be included.

- C. The engine shall be diesel fueled with radiator and fan for cooling, alternator, governor, and oil lubrication system, designed for automatic starting upon loss of normal building power. Engine and generator shall be mounted on common structural steel base with vibration isolation. Intake and free-turn exhaust valves shall be heat resisting alloy steel with high tungsten-chrome alloy steel exhaust valve seat inserted. Full pressure lubrication shall be supplied by a gear oil pump. The engine shall have an oil filter with replaceable element, dipstick and oil drain. Engine speed shall be governed by a electronic governor to maintain alternator frequency within one-half of one percent from no-load to full-load alternator output. The engine shall have a 12 volt, DC battery charging alternator with solid state voltage regulator. Starting shall be by a 12 volt, solenoid shift electric starter. Unit shall have fuel filters and electric shut-off valve and dry-type replaceable air cleaning element.
- D. The engine instrument panel shall be permanently mounted to unit with vibration isolation. Unit shall have fused DC circuit with removable plug-in circuitry. Unit shall include the following:
- 1) AC meters for volts, amps and frequency.
 - 2) Meter phase selector switch.
 - 3) DC meters for volts, engine, water temperature, and oil pressure.
 - 4) Running time meter.
 - 5) Alarm horn and silencing switch per NFPA-110.
 - 6) Lamp test switch.
 - 7) Front-mounted voltage adjusting rheostat.
 - 8) Panel lamps (two).
 - 9) Cyclic cranking per NFPA-110.
 - 10) Engine cool-down timer, five (5) minutes.
 - 11) High-Engine-Temperature safety shutdown and lamp (red).
 - 12) Low oil pressure safety shutdown and lamp (red).
 - 13) Overspeed safety shutdown and lamp (red).
 - 14) Overcrank safety shutdown and lamp (red).
 - 15) Low coolant temperature/level safety shutdown lamp (red).
 - 16) Run-Off/Reset-Auto switch (engine start).
 - 17) Local/Remote two (2) wire. Start/stop control
- E. The electric plant shall contain a complete engine start control which operates on closing and stop control which operates on opening contact. A cranking limiter shall be provided to open the starting circuit in approximately seventy-five (75) seconds if the plant is not started within that time. The electric plant controls shall also include a three (3) position selector switch with the following positions: RUN-STOP-REMOTE. High coolant temperature, low oil pressure and overspeed shutdown with signal light and alarm terminal shall also be provided.
- F. The alternator shall be a four (4) pole revolving field type with brushless exciter and solid state voltage regulator. No commutator or commutator brushes shall be allowed. The starter shall be directly connected to the engine flywheel housing and the rotor shall be driven through a

semi-flexible driving flange to ensure permanent alignment. The generator shall have a single maintenance free battery.

- G. Unit Performance: Frequency regulation shall be isochronous from no load to rated load and +/- 0.5% for continuous operation. Voltage regulation shall be within plus or minus 2% of rated voltage, from no load to full load. The instantaneous voltage dip shall be less than 20% of rated voltage when full load and rated power factor is applied to the alternator. Motor starting maximum voltage dip shall be 35%. Recovery to stable operation shall occur within five (5) seconds. Stable or steady operation is defined as operation with terminal voltage remaining constant within plus or minus 1% of rated voltage. A rheostat shall provide a minimum of plus or minus 5% voltage adjustment from rated value. Temperature rise shall be within rating as defined by NEMA MG1-1.66 with Class F temperature rise and material.

On loss of normal power, the generator shall start and the electrical systems are to be on line within ten (10) seconds. The retransfer time from emergency to normal power shall be fifteen (15) minutes minimum, with an additional five (5) minutes minimum running time of the generator prior to shutdown.

- H. The electric plant shall be mounted on a welded steel base which shall provide suitable mounting to any level surface. Vibration isolators shall be provided between the engine-generator and the base.

- I. All accessories needed for the proper operation of the generator shall be furnished. These shall include:

- 1) Battery rack, battery cables, 12-volt battery(ies) capable of delivering the minimum cold-cranking amps required at zero degrees Fahrenheit per SAE Standard J-537. Provide manufacturer's float type battery charger.
- 2) Gas proof, seamless, stainless steel, flexible exhaust connector(s) ending in pipe thread of SAE flange.
- 3) Flexible fuel line(s) rated 300°F and 100 psi ending in pipe thread.
- 4) Engine exhaust silencer, coated to be temperature and rust resistant, rated for critical applications. Exhaust noise shall be limited to 85 dba as measured at 10 feet in a free-field environment. Silencer shall be installed within enclosure and all piping to be protected from exposure.
- 5) Block heater shall be selected by the manufacturer to be of proper wattage and voltage, thermostatically controlled to maintain engine coolant at proper temperature to meet the start-up requirement of NFPA-99 or NFPA-110, based on the ambient temperature conditions of the project.
- 6) Steel weather-protective enclosure with removable or hinged side panels to allow inspection and maintenance shall be provided for units installed outdoors. The enclosure shall be coated with ASA gray primer and two (2a) coats of high-gloss, weatherproof, sag resistant vinylac in the manufacturer's standard color through an electrical bonding process. The specified exhaust silencer shall be vibra-mounted and installed in the enclosure. Skid end caps and rodent protection shall be installed

with the housing. Provide knock-out closers on all openings in the skids to prevent rodent entry to the unit.

- 7) Enclosure shall be sound attenuating type. Sound pressure level performance is to be 71db(A) log average around unit from no-load to full load measured at 7 meters (23 ft.).
 - 8) One (1) main line circuit breaker rated 500 amperes.
 - 9) Two (2) N.O. engine run relay contacts.
 - 10) One (1) N.O. engine alarm/trouble contact.
 - 10) Radiator duct flange.
- J. The battery shall be lead acid type of adequate ampere hour capacity, mounted on a suitable rack as supplied by the battery manufacturer, adjacent to the generator set. Battery to be furnished by equipment manufacturer.
- K. Provide an NFPA 99 remote annunciator panel which provides the following:
- 1) Pre-alarm - high engine temperature.
 - 2) Pre-alarm - low oil pressure.
 - 3) Low water temperature.
 - 4) Low fuel.
 - 5) High engine temperature.
 - 6) Low oil pressure.
 - 7) Emergency stop.
 - 8) Overspeed.
 - 9) Battery charger fault.
 - 10) Low battery voltage.
 - 11) Auxiliary fault.
 - 12) Overcrank.
 - 13) Line power.
 - 14) Generator power.
 - 15) System ready.
 - 16) Generator switch not in auto.
 - 17) Alarm horn.
 - 18) Silence switch.
 - 19) Lamp test.
- L. Provide 774 gallon (24 hour) sub-base fuel tank with dual walls, leak detection and alarm. Tank shall be U. L. listed for above-ground use for containing flammable and combustible liquids.
- 1) The public shall be safeguarded from access to, or unauthorized entry to, the storage area. The genset and tank shall be enclosed in a chain link fence no less than six (6) feet in height, and there shall be as a minimum four (4) feet of clearance on all four sides of genset.

- 2) There shall be vehicular barrier protection, i.e., bollards, guardrail, bumper posts, located on all sides subject to vehicular damage.
- 3) A spill container having a capacity of not less than 5 gallons shall be provided for each fill connection.
- 4) Vent lines are required to be located 12 feet above ground level and outside of any enclosure.
- 5) The top of the foundation for the tank installation shall be six (6) inches above the expected 100-year flood plain.
- 6) The electrical contractor shall fill tank to 100% full after all testing has been performed. Fuel for testing requirements shall be included.

M. Automatic Transfer Switch

1. The automatic transfer switch shall be rated to withstand the rms symmetrical short circuit current available at the automatic transfer switch terminals, with the type of overcurrent protection and voltage as shown on the plans. Switch shall be 30 cycle rated switch.
2. The automatic transfer switch shall consist of a power transfer module and a control module, interconnected to provide complete automatic operation. The automatic transfer switch shall be mechanically held and electrically operated by a mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double-throw. The switch shall be mechanically held and interlocked. The switch shall have dual operator for transfer.
3. The control module shall be supplied with a protective cover and be mounted separately from the transfer switch for ease of maintenance. Sensing and control logic shall be microprocessor based and mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Interfacing relays shall be industrial control grade, plug-in type with dust covers and locking clips.
4. Automatic operation of the switch shall not require power from any source other than the line-to-line voltage of the source to which the switch is transferring.
5. Control panel shall meet ANSI C37.90c-1974 voltage surge withstand capacity.
6. The transfer switch shall be supplied with the genset and be covered by a single source of responsibility with genset for the warranty period. Transfer switch(es) shall be rated 480 volt, four (4) pole, three (3) phase, four (4) wire, NEMA 1, ampacity noted on drawings, with solid neutral. Switches shall be by generator manufacturer, Asco or Russell.
7. The transfer switch shall include all standard sensing, status lights, and time delays required by U.L. and NFPA. The transfer switches shall include the following accessories:

- a. Test push button to simulate a power failure on normal. Required by U.L.
 - b. Disconnect plug on wiring harness to disconnect switch control logic.
 - c. Main shaft auxiliary contact rated 10 ampere at 480V (one closed on normal and one closed on emergency).
 - d. Voltmeter, frequency meter and amp meter to monitor all phases of both normal and emergency.
 - e. Momentary lamp test switch.
 - f. Plant exerciser adjustable over a seven (7) or fourteen (14) day period in one (1) minute increments for exercising load or without load with selector switch and override. This exercise shall not send building into alarm, sound fire alarm, or send elevator into emergency recall.
 - g. **In-Phase Monitor:** Monitors normal and emergency sources and permits transfer when phase voltages are plus/minus two (2) degrees and plus/minus two (2) cycles. If the source supplying the load fails or drops below 70%, the monitor will permit immediate transfer.
 - h. For this project center off delay switching is acceptable to reduce transients resulting from switching with both sources available.
 - i. Provide transfer to normal or emergency source for the following parameters:
 - Voltage Loss
 - Phase Rotation
 - Single Phase Condition in any Phase
- N. Unit shall be 100% load bank tested for four (4) hours at the site before acceptance by the owner. Factory tests are not acceptable. Tests shall include:
- 1) Single step load pickup.
 - 2) Transient and steady-state governing.
 - 3) Safety shutdown device testing.
 - 4) Voltage regulation.
 - 5) Complete transfer switch operation.
 - 6) Test again under building load for one hour after all major equipment is operational. Test all variables noted above.
 - 7) Submit all recorded test data in Operation and Maintenance Manual.
- O. Submit complete shop drawings.

- P. Engine Exhaust Emissions: Comply with all applicable federal, state and local government requirements at the location of the installation, as of the effective dates of regulations, and dates of manufacture and installation. Include all equipment required to comply with the regulations. In addition, in no case, shall required EPA Tier and emission levels be exceeded.

PART 3 EXECUTION

- A. The equipment shall be installed as shown on the plans, in accordance with the manufacturer's recommendations and all applicable codes.
- B. **Site Tests:** Installation check, start-up, load bank, and building load tests shall be performed by the manufacturer's local representative. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
 - Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations under the environmental conditions, present and expected.
- C. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. This shall include:
 - Engine heaters, battery charger, generator strip heaters, etc.
- D. Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.
- E. Automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper systems coordination. Engine temperature, oil pressure, and battery charge level along with generator voltage, amperes, and frequency shall be monitored throughout the test.
- F. Record all test results and submit with Operation and Maintenance Manuals.

END OF SECTION

SECTION 265000

LIGHTING

PART 1 GENERAL

1.01 REFERENCE

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 and 23 specification sections, apply to work of this section.
- B. Division 26, Section 260000, Electrical General Provisions, and Section 260500, Basic Materials and Methods, apply to work of this section.

1.02 CONTENTS

- A. Specified herein: Requirements for installation of interior and exterior equipment.
- B. Described herein are the following:
Luminaires.

1.03 SCOPE

- A. The work shall comprise, but is not necessarily limited to the following:
 - 1) Interior luminaires.
 - 2) Exterior luminaires.
 - 3) Battery operated emergency lighting and exit lights.

PART 2 PRODUCTS

- A. Provide luminaires as indicated on drawings, completely installed, wired and connected in place, tested and left in satisfactory operating condition.
- B. Fixtures shall be complete with all necessary appurtenances, wiring, lamp holders, shade holders, lamps, reflectors, glassware, canopies, wall bases, pendants, etc. All pendants and canopies shall be of the type required for the specific luminaires and shall be of the same manufacturer as the luminaire. Fixtures shall carry U.L. labels. All acrylic lenses on fluorescent fixtures are to be .125" thick minimum.
- C. LED light sources and fixtures shall be tested in compliance with the current version of LM-79 (IESNA Approved Method for the electrical and Photometric Measurement of Solid State Lighting Products) and LM-80 (IESNA Approved Method for Measuring Lumen Maintenance of LED and Lighting Sources).
 - 1) LED light sources and driver shall be RoHS compliant with internal components

assembled using modular components.

- 2) Input wattage, voltage and lumen output shall be as specified on the drawings. Values shown are design minimums and must be verified with plans.
 - 3) Drivers shall be dimming type 0 - 10V DC, three wire or DALI as shown on plan. All dimming controls shall be tested with the specified LED package by the manufacturer to ensure proper operation.
- D. Self-contained emergency lighting unit shall be constructed to conform to Underwriters Laboratories, Inc., Standard No. 924 and installed to conform to Article 700 of the National Electrical Code. It shall be designed to provide automatic emergency lighting for a minimum of 90 minutes upon failure of normal electric power. Emergency power source shall be a 6 or 12 volt rechargeable maintenance-free (gel type) battery. Electronics shall be of solid state design. Controls shall include a "test" switch and a pilot light assembly indicating charge rate. All test switches shall be located integral to the fixture housing; however, switch shall be accessible without removal of fixture parts.
- E. Exit sign to be L.E.D. type with diffused lens. Housing to be white with red letters. Arrows to comply with plans. Full field flexibility shall be capable through the use of individual conversion kits. Exit signs shall be complete with self-contained battery backup.
- F. Luminaires shall be as cataloged on the fixture schedule.

PART 3 EXECUTION

3.01 LUMINAIRE AND WIRING

- A. Install luminaires of types indicated, where shown and at indicated heights, in accordance with luminaire manufacturer's written instructions and with recognized industry practices, to ensure that fixtures comply with requirements and serve intended purposes. Comply with NEMA standards and requirements of National Electrical Code pertaining to installation of interior luminaire and with applicable portions of NECA's "Standard of Installation."
- B. Fully coordinate construction detail with ceiling system in which they are installed viz: support system dimensions, flanges where required, acoustical tile or pan pattern, etc. Verify ceiling construction and provide all mounting details and construction and accessories for each luminaire and trim to match ceiling system with color as selected by architect. Provide miscellaneous support steel for structure span where required for support of fixtures. All mounting hardware (screws, nuts, bolts, etc.) shall be stainless steel or brass for exterior luminaires.
- C. Wiring to lay-in type fixtures shall be arranged to facilitate relocation of the fixture to the adjacent ceiling tile in any direction.
- D. Clean interior luminaires of dirt and debris upon completion of installation.
- E. Protect installed fixtures from damage during remainder of construction period.

- F. After systems have been installed, check for proper operation of all fixtures. Tighten any loose components or connections, and make sure all fixtures are in good condition and properly installed.
- G. Check all switching and leave in good condition. The exact locations of all switches are to be verified in the field with door swing and generally be opposite the hinge side of door.
- H. Clean all electrical panels and luminaires of construction dirt and labels upon completion of project.
- I. Where surface mounted fixtures are installed in exposed construction, coordinate installation with piping and ductwork. Fixtures are to be hung below piping and ductwork. Support from structure, not from duct or pipes.
- J. All surface mounted fixtures are to be mounted tight to wall or ceiling surfaces and any gaps between fixture mounting plate or body are to be filled and finished.

END OF SECTION

SECTION 282000 - TELEMETRY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Under this contract the Contractor shall furnish, install, loop test and place in successful operation, and furnish all field services throughout the warranty period for a Telemetry System. The system shall be comprised of equipment as specified and it shall operate over 1001, tone-grade, leased telephone circuits furnished by the Contractor.
- B. The system consists of the equipment as shown on the drawings.
 - 1. 1 - FSK Transmitter and Receiver for the remote pump station.
 - 2. 1 - FSK Transmitter and Receiver at the Treatment Plant.
 - 3. Control panels for the remote pump station and water treatment plant, complete with breakers, starter in the remote panel and an alternator at the central panel and control transformers.
 - 4. Telephone line protectors and lightning protection for each end of the telephone line.
 - 5. One complete set of transmitting, receiving and power supply equipment, line and lightning protectors shall be provided as spares. Provide test equipment for telemetry units.
- C. All systems shall be factory integrated, tested and should be ready for installation. The only field connections required shall be power and signals.

1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

1.4 QUALIFIED MANUFACTURERS

- A. The proposed system is as manufactured by Bristol, QEI, Inc., or DAQ Electronics Inc. It is the intention that the control system will be the standard product of a manufacturer regularly engaged in the design and supply of equipment of this type, having an inventory of the major elements as used in this system, and having service representatives located in Ohio with 24-hour response capability.

- B. It is not the intention of this specification to restrict competition, but it is intended that a reliably-performing system with quality equipment and documentation will be furnished and that "one-of-a-kind" or experimental equipment by vendors not having a proven performance record is strictly disallowed.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, application instructions and panel shop drawings.

PART 2 - PRODUCTS

2.1 EQUIPMENT DESCRIPTION

A. General

1. The telemetering transmitter and receiver shall each be housed in a single module, and must plug into the same frame required for the FSK audio tone used for carrying the data signals.
2. Unit shall be equipped with screw-type terminal block for customer electrical interface.
3. Transmitter and receiver shall operate on 120 VAC, 60 HZ, 1 phase voltage source. If DC power is required for the transmitter and receiver, power supplies shall be provided.
4. Overall system accuracy shall be within 0.5% (analog in to analog out) over the full temperature range.
5. Equipment shall operate over a temperature range of -30 to +60 degrees Centigrade.
6. All integrated circuit logic chips shall be equipped with plug-in sockets to facilitate maintenance and repair of the units.
7. Telephone line protectors shall be supplied and installed as a part of this contract.
8. The system shall operate at 100 HZ spacing with 1075 HZ and higher as the center frequency. Data transmission speed shall be 40 baud, minimum. Same frequency shall be used for all transmitters.

B. FSK Tone Transmitter

1. Transmitter shall be capable to accept four (4) analog and eight (8) digital inputs, or as specified in Special Provisions.
2. Transmitter shall be strappable for transmission of analog data in either binary or BCD format to simplify the handing off of received data to computers and digital displays.
3. Analog inputs shall be fully isolated from one another and from internal circuitry by using a "flying capacitor" or equivalent technique. Digital inputs shall be isolated by photo-couplers, buffer relays, or equivalent devices.
4. Transmitter shall include parity checking, and be equipped for optional double scan, for message security.
5. Transmitter shall be strappable for offset signals of 0, 20% and 50% in order to accommodate all common unipolar and bipolar inputs.

6. Analog input to the transmitter shall be 4-20 mADC. Appropriate size resistor shall be provided.
7. Transmitter shall be equipped with front panel switches to enable user to transmit 0, 50% and 100% signals for calibration and checking of equipment.
8. Transmitter shall have front control to enable user to repeatedly transmit any one of the multiple analog inputs, bypassing the others, to aid in the calibration of the channel.
9. The transmitter and power supply shall be enclosed in NEMA 1 housing for inside use and NEMA 4X housing for outside use.

C. FSK Tone Receiver

1. Analog receiver shall be capable to provide four (4) analog and eight (8) digital outputs, or as specified in Special Provisions.
2. For increased message security when required, receiver shall be strappable for double scan such that two (2) identical data messages must be received in succession prior to acceptance and output of the updated word.
3. The last valid reading of all analog and status values shall be retained in memory indefinitely, and all outputs maintained, so that last current recorder, meter, and status readings will be maintained in the event of a failure of the communication circuit. User shall be able to restrap unit in the field to cause reset of all data to zero upon line failure, if desired.
4. Receiver analog and status outputs shall be fully isolated from system ground.
5. Receiver status outputs shall be relay buffered, with output contacts rated at five (5) amperes.
6. The receiver shall supply both an analog and a digital representation of the received analog quantity, so that both a recorder (chart) or meter and a digital display may be used simultaneously where desired. The output of the receiver shall be 4-20 mADC at 24 VDC to drive 600 ohms impedance load.
7. The receivers and its power supply shall be mounted in standard swing type chassis.

D. Enclosures

1. All enclosures shall be of the appropriate NEMA 4 and 4X rating as stated and shall be sized large enough to contain all the necessary telemetry equipment and controls as specified for the particular unit. The panel shall be constructed of not less than 14 gauge cold rolled steel. All enclosures shall have back plates for mounting interior equipment and shall have a base primer coating and gray hammertone exterior final coating.

E. Circuit Breakers

1. All panels shall be supplied with properly sized control circuit breakers. The breakers shall be mounted inside the enclosures and internally mounted on all others.

F. Power Supply

1. The incoming service for the central control panel shall be 120 VAC single phase, 2 wire, 60 cycle for all panels. Panels shall include appropriately sized and fused for DC power supplies to achieve the desired functions.
2. Power supply to the remote pump panel shall be 480 VAC, 3 phase, 60 Hz. Provide control transformer and fused DC power supply to the telemetry equipment.

G. Duplex Receptacles

1. Duplex receptacles shall have a minimum rating of NEMA 1 and shall be provided inside the enclosures.

H. Line Protection Units

1. Two (2) line protection units will be provided at each phone line termination. This unit will protect the system from phone line voltage transients and lightning strikes.

I. Lightning Protection

1. All panels shall be supplied with a lightning arrestor which shall be connected to each line of the incoming side of the power input terminals. The arrestors shall protect the controls from damage due to lightning strikes on the incoming power line.

J. Wiring and Relays

1. All wiring shall have not less than 600 volt insulation and all power wiring and shall be in complete conformity with the National Electric Code and State and Local and NEMA Electrical Standards. Control and power wiring shall be color coded. All job connections required to conveniently replace control components shall be made an approved type terminal blocks with engraved bakelite marker strips or similar approved means. Underground wiring shall be adequately protected with conduit.
2. All interposing relays shall be supplied under this item. All power supplies shall be supplied with the equipment.

K. Heaters

1. All enclosures mounted at the remote pump stations shall be provided with electrical resistance heaters to protect the equipment from freezing temperatures. The contractor shall provide heaters which shall maintain temperature in the range of 40 to 80 degrees F. A thermostat shall be provided to adjust the temperature.

PART 3 - EXECUTION

3.1 FIELD SERVICES AND START-UP SUPERVISION

- A. The services of a factory trained, qualified representative shall be provided by the manufacturer, to inspect the completed installation, make all adjustment necessary to place the system in trouble-free operation and instruct the operating personnel.

3.2 SPECIAL PROVISIONS

- A. The pump station shall receive and transmit the following digital signals:
 - 1. Pump Status - 1 Signal (Transmit)
Frequency = 1475 @ 100 Hz Spacing
 - 2. Pump Start - 1 Signal (Receive)
Frequency = 1475 @ 100 Hz Spacing
- B. Pump station control panel will require NEMA 4X enclosures with heaters and shall be suitable for wall mounting.
- C. Enclosure for water treatment plant shall be NEMA 1, suitable for wall mounting.
- D. Provide starter, overloads, HOA switches and breaker, indicating lights, receptacles, relays, and any other control equipment required for the pump station control panel.
- E. The new pump control panel located at the water treatment plant shall be provided with HOA switches, a 3 pump system alternator, indicating lights, elapsed time meter, breaker, relays, control transformers and terminal strips for interface with existing control panel.
- F. The contractor is responsible for complete loop check and a complete operating system as per the telemetry drawing. The contractor shall also rewire the existing pump control panel as required, to interface with the alternator. All wire and conduit to pump and panels shall be part of this contract.

3.3 ALTERNATE BID

- A. Replace FSK Transmitters and Receivers with AM Transmitters and Receivers. All other items will be identical to the FSK system.

3.4 PAYMENT

- A. The lump sum price bid for the telemetry system shall include the furnishing of all labor, materials, equipment and service necessary to place the system in successful operation as shown on the drawings and/or specified herein.

END OF SECTION 282000

SECTION 310000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work covered by this Section shall include all excavation, trenching and related work for the construction of the designated structures and pipelines, backfill and other incidental work.
- B. The Work covered by this Section consists of:
 - 1. making all necessary excavations for the construction of all Work;
 - 2. preparing subgrade for foundations, slabs, walks, and pavements;
 - 3. doing all pumping, fluming, and dewatering necessary to keep the trenches and other excavation free from water;
 - 4. providing for uninterrupted flow of existing drains and sewers, and the disposal of water from any sources during the progress of the Work;
 - 5. supporting and protecting all trench walls, structures, pipes, conduits, culverts, posts, poles, wires, fences, buildings and other public and private property adjacent to the Work;
 - 6. removing and replacing existing sewers, culverts, pipelines and bulkheads where necessary;
 - 7. removing after completion of the Work all sheeting and shoring or other soil support materials not necessary to support the sides of trenches;
 - 8. removing and disposing all surplus excavated material;
 - 9. doing all backfilling and grading, of compacting backfill to limits specified or ordered by the Engineer;
 - 10. restoring all property damaged as a result of the Work involved in this Contract.
- C. The Work includes transporting surplus excavated materials not needed for backfill at the location where the excavation is made, to other parts of the Work where filling is required, and disposal of all types of surplus material off the site.
- D. The Work includes low strength mortar backfill material intended for use in backfilling as shown on the Drawings.

1.2 DEFINITIONS

- A. Backfill: Soil or granular materials used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, not including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Bedding: Layer placed over the excavated subgrade in a trench before laying pipe.
- C. Borrow: Satisfactory soil imported for use as fill or backfill.

- D. Excavation: Removal and disposal of material encountered above subgrade or foundation elevations.
1. Additional Excavation: Excavation below subgrade or foundation elevations as directed by Engineer.
 2. Trench: Narrow linear excavation
 3. Unauthorized Excavation: Excavation below subgrade or foundation elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
 4. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface or subsurface conditions encountered, including rock, soil materials and obstructions.
- E. Embankment: A structure consisting of soil, granular material, shale, rock, or other approved material, constructed in layers to a predetermined elevation and cross-section.
- F. Granular materials: Natural aggregate, such as broken or crushed rock, gravel, or sand that can be readily incorporated into an 8-inch layer, and in which at least 65% by weight of the grains or particles are retained in a No. 200 sieve.
- G. Laboratory Dry Weight: The maximum laboratory dry weight shall be the weight provided by the laboratory when the sample is tested in accordance with ASTM D-698 Method A, C, or D.
- H. Optimum Moisture: The water content at which the maximum density is produced in a soil by a given compaction effort (ASTM D-698).
- I. Pavement Prism: Also referred to as the zone of influence. The area below a line drawn 45 degrees to the horizontal from the surface at the edge of pavement, sidewalk or curb.
- J. Pipe Embedment: The material placed in a trench surrounding a pipe or conduit consisting of the foundation, bedding, haunching, and initial backfill.
- K. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material one (1) cu. yd. or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2 inches.
- L. Shale: Laminated material, formed by the consolidation in nature of soil, having a finely stratified structure. For the purpose of these specifications, the following bedrock types shall also be considered shale: mudstone, claystone, siltstone and hard clay.
- M. Soil: All earth materials, organic or inorganic, which have resulted from natural processes such as weathering, decay, and chemical reaction.

- N. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, pavement, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- O. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage course, or topsoil materials.
- P. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 SUBMITTALS

- A. Comply with all provisions of Section 013323, Shop Drawings and Submittals.
- B. Product Data: For the following:
 - 1. Source-locations of all materials shall be identified to the Engineer.
 - 2. Source quality laboratory test of all fill materials as required to show compliance with material specifications.
- C. Shop Drawings: Submit information for the following items:
 - 1. Sheeting and bracing (*prepared and stamped by a professional engineer, registered in the State of Ohio*).

1.4 REFERENCES

- A. AASHTO M 43 Standard Specification for Size of Aggregate for Road and Bridge Construction
- B. ASTM C-150 Standard Specification for Portland Cement
- C. ASTM C-618 Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- D. ASTM D-698 Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49-kg) Rammer and 12-in. (305-mm) Drop
- E. ASTM D-1586 Standard Method for Penetration Test and Split-Barrel Sampling of Soils
- F. ASTM D-2487 Standard Test Method for Classification of Soils for Engineering Purposes
- G. ASTM D-2940 Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports

- H. ASTM D-4253 Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
- I. ASTM D-4254 Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
- J. State of Ohio - Department of Transportation - Construction and Material Specifications, Item 304, Aggregate Base.
- K. State of Ohio - Department of Transportation - Construction and Material Specifications, Material Detail 703.16, Suitable Materials for Embankment Construction.
- L. State of Ohio - Department of Transportation - Construction and Material Specifications, Material Detail 703.02.A.2, Fine Aggregate for Portland Cement Concrete

1.5 QUALITY ASSURANCE

- A. Qualifications
- B. Regulatory Requirements
- C. Certifications
- D. Field Samples
- E. Mock-ups
- F. Pre-Construction Conference

1.6 PROJECT CONDITIONS

- A. Environmental Requirements
- B. Existing Conditions
 - 1. Existing ground elevations of the site are shown by figures and/or by contours on the Drawings. The contours and elevations of the present ground are believed to be reasonably correct, but do not purport to be absolutely so, and, together with any schedule of quantities, are presented only as an approximation. The Contractor shall satisfy himself, however, by actual examination on the site of the Work, as to the existing elevations and contours, and the amount of work required.
- C. Existing Utilities
 - 1. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated.

2. Notify Engineer not less than two days in advance of proposed utility interruptions.
3. Do not proceed with utility interruptions without Engineer's written permission.
4. Contact utility-locator service for area where Project is located before excavating.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to the site, store and protect under provisions of Section 016600, Product Handling and Protection.

1.8 SEQUENCING AND SCHEDULING

- A. Refer to 013326 for testing laboratory service scheduling.

1.9 PROHIBITION OF EXPLOSIVES

- A. The use of explosives is not permitted.

1.10 FIELD MEASUREMENTS

- A. The Contract Drawings may indicate locations where certain utilities, structures or facilities might possibly interfere with the installation of new improvements. The Contractor shall dig such exploratory test pits as may be necessary to determine the exact location and elevation of the indicated subsurface structure and shall make acceptable provision for their protection, support and maintenance in operation.

The Engineer shall be provided advance notification when and where excavation for test pits will take place. The Contractor shall provide the Engineer a record of field locations of all listed utilities, structures or facilities a minimum of five (5) days prior to initiating construction of the project. Locations and elevations are to be provided by a Surveyor registered in the State of Ohio.

PART 2 - PRODUCTS

2.1 GRANULAR PIPE EMBEDMENT

- A. Crushed gravel or crushed limestone meeting AASHTO M 43 gradation shall be used for bedding, haunching, and initial backfill as shown on the Drawings.

2.2 SAND PIPE EMBEDMENT

- A. Fine aggregate consisting of natural sand meeting the gradation requirements of ODOT Item 703.02.A.2 or shown on the Drawings. The material shall not be lumpy

or frozen, and shall be free from slag, cinders, ashes, rubbish, and other deleterious or objectionable material. Sand shall not contain a total of more than 10% by weight of loam and clay.

2.3 ONSITE BACKFILL

- A. Excavated soil material, capable of meeting specified compaction, and approved by the Engineer for use as backfill in designated locations.
- B. Based upon subsurface investigation, the Owner does not guarantee the onsite soils in its present state consists of the proper moisture content to achieve the specified compaction without drying or adding water.
- C. Unsuitable Backfill Material
 - 1. Onsite materials that are unsuitable for backfill, unless otherwise specifically shown in the Drawings, include rock or other materials greater than six (6) inches in their largest dimension, pavement, rubbish, debris, wood, metal, plastic, frozen earth, and the following soils classified per ASTM D-2487:

Symbol	Description
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
CH	Inorganic clays of high plasticity, fat clays
OH	Organic clays of medium to high plasticity
PT	Peat, muck, and other highly organic soils

2.4 SPECIAL BACKFILL MATERIAL (ODOT Item 304)

- A. Special backfill material shall meet the gradation requirements of ODOT Item 304 and shall consist of crushed gravel or crushed limestone in combination with natural sand or stone. The aggregate shall meet the following gradation requirements:

Sieve	Total Percent Passing
2 inch	100
1 inch	70-100
¾ inch	50-90
No. 4	30-60
No. 40	9-33
No. 200	0-15

2.5 LOW STRENGTH MORTAR BACKFILL

- A. Cement shall conform to ASTM C-150, Type 1
- B. Fly ash shall be Class F, ASTM C-618.

C. Aggregate

1. Fine Aggregate shall be natural sand consisting of mineral aggregate particles. The gradation of the sand shall be as follows:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/4"	100
200	0 - 10

2. It is intended that the sand be fine enough to stay in suspension in the mixture to the extent required for proper flow. The Engineer reserves the right to reject the sand if a flowable mixture cannot be produced.

D. Mortar Mix Proportioning

1. The initial trial mixture shall be as follows:

Quantity of Dry Materials per Cubic Yard

Cement	100 lbs.
Fly Ash	250 lbs.
Sand (SSD)*	2700 lbs.
Water	500 lbs.

* saturated-surface dry

2. These quantities of materials are expected to yield approximately 1 cubic yard of mortar of the proper consistency. Adjustments of the proportions may be made providing the total absolute volume of the materials is maintained.

2.6 ACCESSORIES

A. Warning Tape

1. Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
 - a. Red: Electric.
 - b. Yellow: Gas, oil, steam, and dangerous materials.
 - c. Orange: Telephone and other communications.
 - d. Blue: Water systems.
 - e. Green: Sewer systems.

B. Detectable Warning Tape

1. Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection,

detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

- a. Red: Electric.
- b. Yellow: Gas, oil, steam, and dangerous materials.
- c. Orange: Telephone and other communications.
- d. Blue: Water systems.
- e. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Excavation; Temporary Sheeting, Shoring, and Bracing
 1. All excavation shall be in accordance with the Occupation Safety and Health Administration (OSHA) regulations.
 2. The Contractor shall furnish and install adequate sheeting, shoring, and bracing to maintain safe working conditions, and to protect newly built work and all adjacent neighboring structures from damage by settlement.
 3. Bracing shall be arranged so as not to place a strain on portions of completed work until construction has proceeded 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.
 4. All sheeting shall be removed unless specifically authorized in writing by the Engineer to be left in place.
- B. 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. 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 this Contract.

3.2 REPLACING, MOVING AND REPAIRING OF EXISTING UTILITIES

- A. The Contractor shall:
 1. replace, move, repair and maintain all utilities and all other structures encountered in the work
 2. coordinate and communicate with applicable utility companies

3. repair all damage done to any of the said structures and appurtenances through his acts or neglect and shall keep them in repair during the life of this contract. The Contractor shall in all cases leave them in as good condition as they were previous to the commencement of the work and to the satisfaction of the Engineer.

3.3 DEWATERING

A. Drainage and Removal of Water

1. The Contractor shall dispose of water from the Work in a suitable manner without damage to adjacent property or structures.
2. The Contractor shall, when ordered by the Engineer, construct tight bulkheads across trench and provide pumps suitable for the removal of any water which may be encountered or which may accumulate in the trenches. Unless otherwise provided for in the Contract Documents, drainage water will not be permitted to flow through the conduit.
3. The trench shall be kept free from sewage and storm, surface, and subsurface water to at least 2 feet below the bottom of the excavation.
4. Where open water courses, ditches, or drain pipes are encountered during the progress of the Work, the Contractor shall provide protection and securing of the continuous flow in such courses or drains and shall repair any damage that may be done to them.

3.4 EXCAVATION CLASSIFICATION

- A. All excavated materials are unclassified as defined in Article 1.3.

3.5 GENERAL EXCAVATION

- A. All necessary excavation for buildings, structures, pavements, and site improvements shall be performed to accommodate the completion of all related Contract Work.
- B. The Drawings show the horizontal and the lower limits of structures. The methods and equipment used by the Contractor when approaching the bottom limits of excavation shall be selected to provide a smooth surface and to prevent disturbing the soil below the bottom limits of excavation. All soil loosened during excavation shall be removed from the bottom of the excavation.
- C. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
- D. Excavation which is carried below the bottom limits of structures shall be classified as Unauthorized Excavation, unless said excavation below bottom limits of structures has been authorized by the Engineer prior to each occurrence.

- E. Unauthorized Excavation shall be filled with Class B concrete to the bottom limits of structures. Under circumstances where structural integrity is not a factor, the Engineer may authorize the filling of Unauthorized Excavation with Low Strength Mortar Backfill or Special Backfill material compacted to 100% density as specified under the compaction requirements in this Section. Such work shall be at the cost of the Contractor.

3.6 TRENCH EXCAVATION

- A. Excavation for trenches in which pipelines, sewers, and conduits are to be installed shall provide adequate space for workmen to space and joint pipe properly, but in every case the trench shall be kept to a minimum width. The width of trench shall not exceed the limits shown on the Drawings.
- B. Excavation shall be to the depth necessary for placing of granular bedding material under the pipe as shown on the Drawings. If over-excavation occurs, the trench bottom shall be filled to grade with compacted granular bedding material.
- C. Trenching operations shall not be performed beyond the distance that will be backfilled and compacted the same day.
- D. In general, backfilling shall begin as soon as the conduit is in approved 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 and proper condition.

3.7 EXCAVATION OF UNSUITABLE MATERIALS

- A. Unsuitable materials existing below the Contract bottom limits for excavation shall be removed as directed by the Engineer. Such excavation shall not exceed the vertical and lateral limits as prescribed by the Engineer.
- B. In utility trenches, the voids left by removal of unsuitable excavated material shall be filled with AASHTO M 43 No. 1 and No. 2 aggregate conforming to the material requirements of Article 2.1 of this Section.
- C. In excavations other than utility trenches, the voids left by removal of unsuitable excavated material shall be filled with material consisting of either: (1) Special Backfill Material; (2) Class B concrete; or (3) Low Strength Mortar Backfill, whichever is ordered by the Engineer.
- D. Removal of unsuitable excavated material and its replacement as directed will be paid on basis of Contract Conditions relative to Changes in Work unless specific unit prices have been established for excavation of unsuitable material.

3.8 DISPOSAL OF UNSUITABLE AND SURPLUS MATERIAL

- A. It shall be the responsibility of the Contractor to dispose of all surplus material that cannot be used in backfill or embankments at his expense outside the limits of the project. Unsuitable excavated material, including rock or large boulders, shall be disposed of outside the limits of the project.
- B. Surplus material may be wasted adjacent to or incorporated in the regular construction only when ordered in writing by the Engineer.

3.9 BACKFILL

- A. Pipelines, Sewers and Conduits
 1. All pipe shall have bedding extending the width of the trench with depth in conformance with the Drawings. The bedding material shall be thoroughly compacted by tamping until no further densification is possible.
 2. Pipe cover material shall be used for filling above the pipe bedding along the sides of the pipe and to a height of twelve (12) inches over the top of the pipe. The pipe cover material shall be brought up evenly on both sides of the pipe to eliminate the possibility of lateral displacement of the pipe and shall be thoroughly compacted by tamping until no further densification is possible. Care shall be taken to spade the aggregate under the pipe haunch below the spring line.
 3. All trenches and excavations shall be backfilled immediately after pipe is laid therein, unless otherwise directed by the Engineer.
 4. After the pipe cover has been placed and compacted around the pipe as specified above, the remainder of the trench may be backfilled by machine. The backfill material shall be deposited in eight (8) inch horizontal layers, and each layer shall be thoroughly compacted to the specified density by approved methods before a succeeding layer is placed. In no case will backfilling material from a bucket be allowed to fall directly on a pipe and in all cases the bucket must be lowered so that the shock of the falling earth will not cause damage.
 5. Puddling of sand bedding and pipe cover material is acceptable provided an acceptable method for removal of water is provided.
- B. Structures
 1. Backfilling shall not commence before concrete has attained specified strength. Do not use equipment for backfilling and compaction operations against structures that will overload the structure.
 2. Backfilling around and over structures shall be carefully placed and tamped with tools of suitable weight to a point one (1) foot above the top of same. Additional backfill may be required to protect the structure from damage from heavy equipment. Backfill shall be placed in uniform layers not exceeding eight (8) inches in depth. Each layer shall be placed, then carefully and uniformly compacted to the specified density so as to eliminate the possibility of displacement of the structure.

3. After the backfill has been placed and compacted around the structure to the height specified above, the remainder may be backfilled by machine. The backfill material shall be deposited in eight (8) inch horizontal layers, and each layer shall be thoroughly compacted to the specified density by approved methods before a succeeding layer is placed.
In no case will backfilling material from a bucket be allowed to fall directly on a structure, and in all cases the bucket must be lowered so that the shock of the falling earth will not cause damage.
- C. Where any new, proposed, or future pavement, driveway, parking lot, curb, curb and gutter, or walk is to be placed over a backfilled area, Special Backfill material shall be used for any portion of the trench falling within the pavement prism.
- D. 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 approved Granular Pipe Embedment Material compacted in place in eight (8) inch layers to the required density. The approved Granular Pipe Embedment Material shall extend outward from the spring line of the conduit a distance of two (2) feet on either side and thence downward at its natural slope.

3.10 LOW STRENGTH MORTAR BACKFILL

- A. Low strength mortar backfill shall be discharged from the mixer as recommended by the supplier and approved by the Engineer.
- B. Low strength mortar backfill may be placed in the trench in as few lifts as may be practical.
- C. Secure conduit or pipelines before placing low strength mortar backfill to prevent conduits and pipelines from floating during backfilling.
- D. For low strength mortar backfill placed against existing structures of unknown strength, backfill material shall be brought up uniformly in maximum 12 inch lifts and allowed to cure for a minimum of 24 hours or until it can carry a person's weight without leaving imprints before the next lift is placed.
- E. Low strength mortar backfill shall be brought up to subgrade elevation or the pavement prism, whichever may be applicable.

3.11 SUBGRADE

- A. All soil subgrade shall be prepared in accordance with this subsection.
- B. Drainage
 1. The surface of the subgrade shall be maintained in a smooth condition to prevent ponding of water after rains to insure the thorough drainage of the subgrade surface at all times.
- C. Unsuitable Subgrade

1. Where unsuitable subgrade or subgrade not meeting the required bearing capacity is encountered in cuts, due to no fault or neglect of the Contractor, in which satisfactory stability cannot be obtained by moisture control and compaction, the unstable material shall be excavated to the depth required by the Engineer.
 2. Suitable material required for the embankment to replace the undercut will be paid on basis of Contract Conditions relative to changes in Work.
 3. Where soft subgrade in cuts is due to the failure of the Contractor to maintain adequate surface drainage as required in this article, or is due to any other fault or neglect of the Contractor, the unstable condition shall be corrected as outlined above at no expense to the Owner.
- D. Full Width New Pavement Construction
1. After the surface of the subgrade has been shaped to approximate cross section grade, and before any pavement, base or subbase material is placed thereon, the subgrade shall be compacted. When the rolling is completed, all surface irregularities shall be corrected and the surface of the subgrade shall be shaped as necessary to conform to the grade and cross section shown on the Drawings within the tolerance set forth in this Section and shall be so maintained until the overlying course is in place.

3.13 TOLERANCES

- A. The Contractor shall check the work under this item with templates, slope boards or other devices satisfactory to the Engineer. The completed work shall conform to the Drawings within the following tolerances:
1. For subgrade, the surface shall at no place vary more than $\frac{1}{2}$ inch from a ten-foot straight edge applied to the surface parallel to the centerline of the pavement, nor more than $\frac{1}{2}$ inch from subgrade elevation established by construction layout stakes.

3.14 CONSTRUCTION WITH MOISTURE AND DENSITY CONTROL

- A. All backfill, shall be constructed using moisture and density control. All subgrade, except rock and shale in cut sections, shall be constructed using moisture and density control.
- B. Backfill and subgrade material which does not contain sufficient moisture to be compacted in accordance with the requirements of Article 3.17 of this Section shall be sprinkled with water as directed by the Engineer to bring the moisture content to within the range of optimum plus or minus two (2) percent. Water shall be thoroughly incorporated into the material by means of discs or other approved equipment.
- C. Backfill and subgrade material containing excess moisture shall be dried, prior to installation, to a moisture content not greater than two (2) percentage points above

optimum, except that for material within the moisture content range specified herein that displays pronounced elasticity or deformation under the action of loaded construction equipment, the moisture content shall be reduced to optimum or below if necessary to secure stability. For subgrade material, these requirements for maximum moisture shall apply at the time of compaction of the subgrade and also at the time of placing pavement or subbase. Drying of wet soil shall be expedited by the use of plows, discs, or by other approved methods when so ordered by the Engineer.

3.15 PROOF ROLLING

- A. Proof rolling shall be performed on areas described on the Drawings or as directed by the Engineer.
- B. Proof rolling equipment shall consist of a single unit, tandem axle dump truck capable of being loaded to 30,000 pound axle load with a gross vehicle weight of 60,000 pounds. Tire pressure shall be maintained at 90 psi. Loading shall be verified by a certified weight slip.
- C. Procedure
 1. The designated areas of subgrade, prior to the placing of the overlying course, shall be compacted to requirement of this Section. The Contractor shall be responsible for performing a minimum of two (2) proof rollings of the subgrade, as directed by the Engineer, prior to paving. The first proof rolling shall be performed after the installation of underground improvements and rough grading has been completed. After fine grading and just prior to paving, the subgrade shall be proof rolled again. The proof roller shall operate in a systematic manner so that the number of coverages over all areas can be readily determined and recorded. Maximum spacing shall not exceed six (6) feet.
 2. Moisture content of the subgrade at the time of proof rolling shall conform to the requirements of this Section.
 3. The equipment shall be operated at the speed directed, but in no case shall the speed exceed five (5) miles per hour, and the normal operating speed shall not be less than two (2) miles per hour.
 4. Where the operation of the proof roller shows the subgrade to be unstable or to have non-uniform stability, the Contractor shall correct the unstable areas so that the stability of the subgrade will be uniform and satisfactory. The subgrade shall then be checked for conformance to the plan lines and any irregularities of the surface caused by operation of the proof roller shall be corrected and the subgrade shall be shaped to the plan lines within the tolerances specified in this Section.
 5. The proof roll is a subjective test and does not relieve the Contractor of his responsibility under the Contract to provide an acceptable subgrade.
 6. If the subgrade fails due to the Contractor using it as a haul road or due to his negligence, the subgrade shall be repaired, retested, and proof rolled again at no additional cost to the Owner.

3.16 COMPACTION REQUIREMENTS

- A. The bottom of excavations upon which concrete foundations or structures are to be placed shall be compacted so as to obtain 100% of maximum dry density per ASTM D-698 in the top twelve (12) inches.
- B. The top twelve (12) inches of stripped original subgrade and final subgrade shall be compacted to not less than 100% of maximum dry density per ASTM D-698.
 - 1. Subgrade under new, proposed, or future pavement shall be compacted 18 inches beyond the edge of pavement, paved shoulders or paved medians.
- C. Compaction of subgrade for sidewalks (regardless of paving material) shall be 100% of maximum dry density per ASTM D-698 in the top six (6) inches.
- D. Compaction of non-paved areas shall be 90% of maximum dry density per ASTM D-698.
- E. Aggregate pipe embedment and aggregate backfill around structures shall be compacted to not less than 100% of maximum dry density per ASTM D-4253 and ASTM D-4254.
- F. Final backfill shall be compacted to not less than 100% of maximum dry density per ASTM D-698.
- G. Fill placed within the interior of structures shall be compacted to not less than 100% of maximum dry density per ASTM D-698.
- H. Embankment shall be placed and compacted in layers until the density is not less than the percentage of maximum dry density indicated in the following table determined by ASTM D-698.

EMBANKMENT SOIL COMPACTION REQUIREMENTS

Maximum Laboratory Dry Weight <u>Pounds/Cubic Foot</u> 90-104.9 105-119.9 120 and more	Minimum Compaction Requirements Percent Laboratory <u>Maximum</u> 102 100 98
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- I. Test Sections
 - 1. If it is determined by the Engineer that the composition of the material is such that it cannot be tested for density using a nuclear densometer or other methods; or where, in the opinion of the Engineer, in-place compaction testing is not feasible; and if approved by the Engineer, the Contractor may construct a test section to demonstrate acceptable compactive effort in lieu of in-place compaction testing. Test sections shall be constructed at no additional cost to the Owner.

2. The test section shall be completed by repeatedly compacting the material until no further density is achieved. This value shall be the Minimum Test Section Density (MTSD). The compaction equipment used to complete the test section shall be of suitable size to compact the material and shall be the same equipment used to compact the in-place material.
3. The test section shall be constructed with moisture density control as specified in this Section.
4. The material shall be compacted to at least 98% of the MTSD.
5. Each lift of in-place fill or backfill shall be densified using a compactive effort equal to or greater than the effort applied to achieve the MTSD; i.e., if six passes were required to achieve MTSD, then each lift of material shall be compacted using six or more passes.
6. Construct a new test section when, in the opinion of the Engineer, the fill or backfill material has changed character or when the supporting material has changed character.

3.18 GRADING

- A. Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading
 1. Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - a. Lawn or unpaved areas shall be graded to plus or minus (*1 inch*).
 - b. Walks shall be graded to plus or minus (*1 inch*).
- C. Grading inside Building Lines
 1. Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

END OF SECTION 310000

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes construction dewatering.
- B. Related Sections include the following:

- 1. Division 31 – Section 310000

1.3 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrades.
 - 1. Maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Accomplish dewatering without damaging existing buildings adjacent to excavation.
 - 4. Remove dewatering system if no longer needed.

1.4 SUBMITTALS

- A. Shop Drawings for Information: For dewatering system. Show arrangement, locations, and details of wells and well points; locations of headers and discharge lines; and means of discharge and disposal of water.
 - 1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
 - 2. Include a written report outlining control procedures to be adopted if dewatering problems arise.
 - 3. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Qualification Data: For Installer and Professional Engineer.

- C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.
- D. Record drawings at Project closeout identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions performed during dewatering.
 - 1. Note locations and capping depth of wells and well points.
- E. Field Test Reports: Before starting excavation, submit test results and computations demonstrating that dewatering system is capable of meeting performance requirements.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by the Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for dewatering.
 - 2. The geotechnical report is referenced elsewhere in the Project Manual.
- C. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
 - 1. During dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify the Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
- B. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.

- E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- F. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to Owner.
 - 1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

3.3 OBSERVATION WELLS

- A. Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated and additional observation wells as may be required by authorities having jurisdiction.
- B. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
- C. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. Suspend construction activities in areas where observation wells are not functioning properly until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
 - 1. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

END OF SECTION 312319

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes temporary excavation support and protection systems.
- B. Related Sections include the following:

- 1. Division 31 – Section 310000

1.3 PERFORMANCE REQUIREMENTS

- A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.
 - 1. Provide professional engineering services needed to assume engineering responsibility, including preparation of Shop Drawings and a comprehensive engineering analysis by a qualified professional engineer.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.
 - 4. If steel sheet piling is utilized consider vibrating it to required depth to minimize ground vibrations.

1.4 SUBMITTALS

- A. Shop Drawings for Information: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems.
 - 1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation, registered with the State of Ohio.
- B. Qualification Data: For Installer and professional engineer.
- C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by the absence of, the installation of, or the performance of excavation support and protection systems.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by the Owner and then only after arranging to provide temporary utility services according to requirements indicated.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
 - 1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.
 - 2. The geotechnical report is referenced elsewhere in the Project Manual.
- C. Survey adjacent structures and improvements, employing a qualified professional engineer or land surveyor; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
 - 1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A 36, or ASTM A 992.
- C. Steel Sheet Piling: ASTM A 328, ASTM A 572, or ASTM A 690 with continuous interlocks.
- D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches or greater.
- E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- F. Reinforcing Bars: ASTM A 615, Grade 60.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by ground vibration, settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by Owner.
- C. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces is not impeded.
- D. A competent person (OSHA Definition) must monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- E. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

3.2 SOLDIER BEAMS AND LAGGING

- A. Install steel soldier beams before starting excavation. Space soldier beams at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment.
- B. Install wood lagging within flanges of soldier beams as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.
- C. Install wales horizontally at centers indicated and secure to soldier beams.

3.3 SHEET PILING

- A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Limit vertical offset of adjacent sheet piling to 60 inches (1500 mm). Accurately align exposed faces of sheet piling to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

- A. Tiebacks: Drill for, install, grout, and tension tiebacks into position. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.
 - 1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system.
 - 2. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
 - 1. Do not place bracing where it will be cast into or included in permanent concrete work, unless otherwise approved by the Engineer.
 - 2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
 - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
 - 1. Repair or replace, as approved by the Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

SECTION 321216 - ASPHALT CONCRETE PAVING AND MATERIALS

SECTION 1 - MATERIALS

- 1.1 The asphalt concrete mixture and installation thereof shall meet Ohio Department of Transportation (ODOT) Specifications except as modified in these specifications.
- 1.2 In the ODOT Specifications substitute "Engineer" for "Department" (except as stated below in reference to ODOT 403 for Department VA testing and acceptance).
- 1.3 No steel slag shall be used as coarse or fine aggregate for any asphalt concrete.
- 1.4 All asphalt cement utilized on this project shall meet AASHTO Provisional Standard MP1 or any superseding AASHTO specification for performance graded asphalt cement binder in conformance with PG 64-22.
- 1.5 Except where designated otherwise in the plans or specifications all asphalt concrete mixes shall be designed for medium traffic volumes. Where light or heavy traffic pavements are designated in the plan, the contractor shall use an asphalt concrete mix designed for such traffic conditions.
- 1.6 Acceptance of the mixture will be based upon the certification that the mixture was produced according to the approved JMF within the production control and composition tolerances of the specifications. The Contractor shall hire and pay for an independent testing lab approved by the Engineer to perform all sampling, testing, monitoring, analysis and certification required by the Laboratory, Monitoring Team or Department in ODOT 403 and 441. All work by the independent laboratory shall be performed by personnel with ODOT Level II Bituminous Concrete certification.
- 1.7 ODOT 401.20 - "Asphalt Binder Price Adjustment" shall not apply to this contract.
- 1.8 Monument box and valve box risers shall be East Jordan Iron Works No. 8626, No. 8631, or approved equal. The Contractor shall follow the manufacturer's recommended installation procedure. New manhole frames and grate or frame and cover shall be EJIW 1710.
- 1.9 Brick used for manhole, catch basin, or inlet basin castings adjusted to grade under ODOT 611.10 Method D.1. shall be red shale or clay sewer brick meeting the requirements of ASTM C32 sewer brick, grade SM.
- 1.10 Risers used for manhole castings adjusted to grade under ODOT 611.10 Method D.2. shall be manufactured by Manhole Systems, Model MS-101TB, or approved equal.
- 1.11 All inlets and manholes shall be adjusted to grade after installation of the intermediate course(s), if any and prior to installation of the surface course.
- 1.12 All materials delivered to this project must have been weighed on a platform scale with electronic imprinter to show gross, tare, and net weights. No payment will be made for

materials which are not correctly weighed as necessary. Material weight shall not exceed the current legal allowable limit.

- 1.13 Unless specified elsewhere in the specifications, material for berms shall be limestone only. Recycled concrete and asphalt concrete will not be permitted.

SECTION 2 - PAVING EQUIPMENT

- 2.1 All spreading equipment shall be self propelled. The Contractor shall identify the make and model of the paving machine that will be used for the intermediate and surface courses for approval prior to the pre-construction meeting.
- 2.2 All equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working order at all times. The Contractor shall be prepared to furnish proof of certification that all equipment to be used on the project has been calibrated within the past six (6) months.

SECTION 3 - GENERAL - PAVING

- 3.1 All paving shall be done on a single-lane basis.
- 3.2 If traffic loop detectors are encountered and broken, the Contractor is to repair as per local specifications. The cost for this work will be paid under the loop detector replacement bid item, if any; at negotiated unit prices; or by time and materials as directed by the Engineer.
- 3.3 Tack Coat, Item 407, shall be applied at the rate of from 0.05 to 0.15 gallons per square yard as appropriate for the surface conditions with sand cover if required.
- 3.4 Asphalt driveway aprons shall be matched to new pavement with 24" transition sections or as shown on the drawings or required by the Engineer. The Contractor shall install apron wedge as required in the detailed drawings.
- 3.5 Unless otherwise shown on the drawings, jointing of new to existing pavement shall be by milled butt joints six (6) feet in width (or as shown on the plans) from edge of pavement to edge of pavement. Depth of this milled area shall equal the total of subsequent intermediate course and surface course as specified.
- 3.6 One (1) copy of each hauled/weighed material truck load ticket (plant ticket) for materials incorporated in this project shall be provided to the project representative daily. All bulk materials delivered to this project must have been weighed on a platform scale with electronic imprinter to show gross, tar and net weights. No payment will be made for materials which are not correctly weighed as necessary. Material weight shall not exceed the current legal allowable limit. If a partial load is used, the Contractor's foreman and the project representative shall confer and come to an agreement as to what portion of the product was used. The percent of material of this load, as reported by the project representative, is what shall be recorded as utilized.

- 3.7 For variable depth courses where tonnage tickets are used for determining quantities for payment, the conversion to cubic yards shall be number of tons verified and approved by the Engineer divided by 2.00 regardless of the actual density of the mix.
- 3.8 Positive drainage is to exist subsequent to the completion of the surface course. The Contractor shall take any necessary measures to assure positive drainage of the surface course. It shall be the responsibility of the Contractor to repair any low/puddled areas at his own cost by milling out the affected areas to a minimum depth equal to the nominal depth of the course being repaired and replacing with the specified asphalt concrete to grades that will correct the drainage problem.
- 3.9 Surface tolerances for all completed surface courses shall be as noted in ODOT 401.19. This tolerance shall apply regardless of whether or not an intermediate course is installed.
- 3.10 At the direction of the Engineer, periodic weight checks of asphalt concrete in loaded trucks shall be made by the Contractor and verified by the Engineer.
- 3.11 All quality control testing data performed on material incorporated into this project shall be forwarded to the Engineer for review as soon as it is available.
- 3.12 Quantity verification (but not necessarily payment quantity) for all asphalt concrete incorporated into the work shall be by weight tickets as produced by the plant or supplier or other means approved by the Engineer. Tack coat shall be verified by a ticket filled out and signed by the Contractor's tack truck driver based on weights taken or observations of level indicators. All verification tickets are required to be submitted to the Engineer on the day the material is incorporated into the work; however, the Engineer may, at his sole discretion, accept verification tickets for any items up to seven (7) calendar days subsequent to the work being performed. **After that date additional verification tickets for material will not be accepted for consideration of payment.**
- 3.13 No work is to be performed without the presence of the Engineer or his designated Project Representative. Forty-eight (48) hour advance notice of work shall be given to the Engineer and Owner by the Contractor.
- 3.14 All edges of surface courses abutting curbs or other appurtenances shall be sealed with hot AC-20.
- 3.15 The asphalt concrete, intermediate or surface course work will conform to ODOT Items 448-1 – Intermediate and Surfaces Courses and 448-2 – Intermediate Course. The paving foreman, at the Engineer's request, will be required to correctly calculate the asphalt concrete "yield." "Yield" is defined as the rate of material used, in cubic yards, in proportion to the area paved. The Contractor must be aware if he is under or over plan quantities for the area in question.

END OF SECTION 321216

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of chain link fences and gates is indicated on drawings.

1.3 QUALITY ASSURANCE

- A. Provide chain link fences and gates as complete units controlled by a single source including necessary erection accessories, fittings, and fastenings.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, and installation instructions for metal fencing, fabric, gates and accessories.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Dimensions indicated for pipe, roll-formed, and H-sections are outside dimensions, exclusive of coatings.
- B. Available Manufacturers: Submit to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
 - 1. Aluminum Fencing and Fabric:
 - a. Chain Link Fence Company of Pennsylvania
 - b. Security Fabricators, Inc.

2.2 ALUMINUM FABRIC

- A. Fabric: 0.148" mill finished aluminum wires, ASTM B 211, alloy 6061, 2" mesh, with top selvages knuckled for fabric 60" and under, and both top and bottom selvages twisted and barbed for fabric over 60" high.
 - 1. Furnish one-piece fabric widths for fencing up to 12' high.

2.3 FRAMING AND ACCESSORIES

- A. Aluminum Framework, General: ASTM B 221, Alloy 6063, mill finished aluminum.
1. Fittings and Accessories: Mill finished aluminum or galvanized steel, to suit manufacturer's standards.
- B. End, Corner and Pull Posts: Minimum sizes and weights as follows:
1. Either 2.875" OD aluminum pipe 2.0 lbs. per lin. ft. or 2.50" square tubing, 2.9 lbs. per lin. ft.
- C. Line Posts: Space 10' o.c. maximum, unless otherwise indicated, of following minimum sizes and weights.
1. Up to 8' fabric height, either 2.375" OD aluminum pipe, 1.26 lbs. per lin. ft. or 2.25" x 1.875" H-section, 1.25 lbs. per lin. ft.
 2. Over 8' fabric height, 2.875" OD aluminum pipe, 2.0 lbs. per lin. ft.
- D. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
- | <u>Leaf Width</u> | <u>Gate Post</u> | <u>lbs./lin. ft.</u> |
|-------------------|------------------|----------------------|
| Up to 6' | 2.875" OD pipe | 2.004 |
| Over 6' to 13' | 4.000" OD pipe | 3.151 |
| Over 13' to 18' | 6.625" OD pipe | 6.564 |
| Over 18' | 8.625" OD pipe | 9.878 |
- E. Top Rail: Manufacturer's longest lengths, with expansion type couplings, approximately 6" long, for each joint. Provide means for attaching top rail securely to each gate corner, pull and end post.
1. 1.66" OD pipe, .86 lbs. per ft.
- F. Tension Wire: 7 gage, coated coil spring wire, metal and finish to match fabric.
1. Locate at bottom of fabric.
 2. Locate at bottom and top of fabric.
- G. Wire Ties: 11 ga. galvanized steel or 11 ga. aluminum wire, to match fabric core material.
- H. Post Brace Assembly: Manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.
- I. Post Tops: Provide weathertight closure cap with loop to receive tension wire or top rail; one cap for each post.

- J. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into post.
- K. Stretcher Bar Bands: Space not over 15" o.c., to secure stretcher bars to end, corner, pull, and gate posts.
- L. Barbed Wire Supporting Arms: Manufacturer's standard barbed wire supporting arms, metal and finish to match fence framework, with provision for anchorage to posts and attaching 3 rows of barbed wire to each arm. Supporting arms may be either attached to posts or integral with post top weather cap and must be capable of withstanding 250 lbs. downward pull at outermost end. Provide following type:
 - 1. Single vertical arm; for 3 strands barbed wire, one for each post.
 - 2. Single 45 deg arm; for 3 strands barbed wire, one for each post.
 - 3. Vee-type with 2 arms at 45° to vertical, one for each post.
 - 4. Inverted Vee-type with 2 cross-braced arms at 45 deg to vertical, one set for each post.
- M. Barbed Wire: 2 strand, 12-1/2 ga. wire with 14 ga. 4-point barbs spaced not more than 5" o.c.; metal and finish to match fabric.

2.4 GATES

- A. Fabrication: Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members maximum of 8' apart unless otherwise indicated.
 - 1. Provide same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15" o.c.
 - 2. Install diagonal cross-bracing consisting of 3/8" diameter adjustable length truss rods on gates to ensure frame rigidity without sag or twist.
 - 3. Where barbed wire is indicated above gates, extend end members of gate frames 1'-0" above to member and prepare to receive 3 strands of wire. Provide necessary clips for securing wire to extensions.
- B. Swing Gates: Fabricate perimeter frames of minimum 1.90" OD pipe.
- C. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A 153, and in accordance with the following:
 - 1. Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 deg gate opening. Provide 1-1/2 pair of hinges for each leaf over 6' nominal height.
 - 2. Latch: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.

3. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.
 4. Double Gates: Provide gate stops for double gates, consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock.
- D. Sliding Gates: Provide manufacturer's standard heavy-duty inverted channel track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, hardware, and accessories as required.
- E. Concrete: Provide concrete consisting of portland cement, ASTM C 150, aggregates, ASTM C 33, and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not begin installation and erection before final grading is completed, unless otherwise permitted.
- B. Excavation: Drill or hand excavate (using post hole digger) holes for posts to diameters and spacings shown, in firm, undisturbed or compacted soil.
1. If not indicated on drawings, excavate holes for each post to minimum diameters as recommended by fence manufacturer, but not less than 4 times largest cross-section of post.
 2. Unless otherwise indicated, excavate hole depths approximately 3" lower than post bottom, with bottom of posts set not less than 36" below finish grade surface.
- C. Setting Posts: Center and align posts in holes 3" above bottom of excavation.
1. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
 - a. Unless otherwise indicated, extend concrete footings 2" above grade and trowel to a crown to shed water.
- D. Top Rails: Run rail continuously through post caps, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer.
- E. Center Rails: Provide center rails where indicated. Install in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.
- F. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

- G. Tension Wire: Install tension wires through post cap loops before stretching fabric and tie to each post cap with not less than 6 ga. galvanized wire. Fasten fabric to tension wire using 11 ga. galvanized steel hog rings spaced 24" o.c.
- H. Fabric: Leave approximately 2" between finish grade and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released.
- I. Stretcher Bars: Thread through or clamp to fabric 4" o.c., and secure to posts with metal bands spaced 15" o.c.
- J. Barbed Wire: Pull wire taut and install securely to extension arms and secure to end post or terminal arms in accordance with manufacturer's instructions.
- K. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- L. Tie Wires: Use U-shaped wire, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing.
 - 1. Tie fabric to line posts, with wire ties spaced 12" o.c. Tie fabric to rails and braces, with wire ties spaced 24" o.c. Tie fabric to tension wires, with hog rings spaced 24" o.c.
- M. Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

END OF SECTION 323113

SECTION 329200.19 – SEEDING AND MULCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Installation of seeded areas shall be to the extent shown on Contract Drawings and shall include supplying all seed, topsoil, soil conditioning materials, mulching materials and watering, and the incorporation of these materials into the work as specified.
- B. The Contractor shall place topsoil at the depths specified in those areas requiring seeding. Topsoil shall be furnished by the Contractor.

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. Provide copies of soils tests for both new topsoil (provided) and onsite topsoil for review and approval. This applies to all areas that require seeding, including reconditioned areas.
 - 2. Provide location of properties from which topsoil is to be obtained, names and addresses of owners, depth to be stripped, and crops grown in the past 2 years.
 - 3. Provide the name of the seed supplier, name and phone number, list of the seed, including varieties of seed, labels, and an analysis of the seed for review, 4 weeks prior to the start of seeding.
 - 4. Provide soil amendments information based on soils test requirements.
 - 5. Hydroseed mixture, mulch and application rates prior to performing the work.

1.3 QUALITY ASSURANCE

- A. Any subcontracted restoration work shall be performed by a qualified firm specializing in landscape work.
- B. The Contractor shall have a soils test done at his expense and analyzed by a state approved testing agency. Soil tests shall be done on both the topsoil stockpiled from the site and new topsoil brought to the site. A minimum of two (2) tests shall be done. The tests shall include percent organic matter, pH, Buffer pH, Phosphorus, Exchangeable Potassium, Calcium, Magnesium, Cation Exchange Capacity and Percent Base Saturation with recommendations for nitrogen, phosphate, potash, magnesium and lime based on plant type and use.

- C. Seed: All seed specified shall meet O.D.O.T. specifications as to the percentage purity, weed seed, and germination. All seed shall be approved by the State of Ohio, Department of Agriculture, Division of Plant Industry, and shall meet the requirements of these specifications.
- D. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

1.4 PROJECT CONDITIONS

- A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, such conditions shall be rectified by the Contractor before planting, with approval from the Owner's Representative.
- C. Soil Stabilization: The Contractor shall provide permanent or temporary soil stabilization to denuded areas within fifteen (15) days after final grade is reached on any portion of the site. Any such area which will not be regraded for longer than fifteen (15) days shall also be stabilized. Soil stabilization includes any measures which protect the soil from the erosive forces of raindrop impact and flowing water. Applications include seeding and/or mulching, or the use of other erosion control measures as directed by the Owner's Representative. If necessary, the Contractor shall coordinate soil stabilization practices with the local Soil and Water Conservation District.
- D. Spring-sown work shall be installed between April 1st and May 30th and Fall-sown work shall be installed between September 1st and October 15th. No permanent seeding shall take place between May 30th and September 1st and between October 15th and April 1st. The dates for seeding may be changed at the discretion of the Owner's Representative.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Topsoil shall be furnished by the Contractor. Stockpiled material, if any, shall be utilized prior to obtaining additional topsoil.
- B. All topsoil shall conform to the U.S. Department of Agriculture soil texturing triangle and shall contain between 3% to 8% organic matter. Topsoil shall be loamy and not consist of more than 38% clay. New topsoil shall be screened to remove clay lumps, brush, weeds, litter, roots, stumps, stones larger than ½" in any dimension and any other extraneous or toxic matter harmful to plant growth.

New topsoil shall be obtained only from naturally well drained sites where topsoil occurs in a depth of not less than 4". Do not obtain from bogs or marshes.

- C. Soil amendments shall be added according to the soils test requirements. Amendments can include, but are not limited to fertilizer, lime, compost, sand, and organic matter. Organic matter shall consist of composted leaves or other approved material.

2.2 SEED

- A. Seed shall be vendor mixed, delivered in original bags and shall be proportioned as follows:

<u>Common Name</u>	<u>Proportion by Weight</u>
Kentucky Blue Grass	50%
Perennial Rye	50%

2.3 MULCH

- A. Mulch shall be clean straw free of seed and weed seed.
 - 1. Anchoring for mulch shall be an ODOT specified SS-1 at 60 gal./ton non-toxic tackifier such as Hydro-stik, or equal, or by securing with a photo degradable netting.
- B. If hydroseeding is used, wood fiber mulching material shall be used and shall consist of virgin wood fibers manufactured expressly from whole wood chips and shall conform to the following specifications.

- Moisture content	10.0% ± 3.0%
- Organic content	99.2% ± 0.8% O.D. Basis
- pH	4.8 ± 0.5
- Water holding capacity, minimum	1,000 (grams of water per 100 grams of fiber)

Wood fiber mulching material shall be processed in such a manner as to contain no growth or germination inhibiting factors, and must contain a biodegradable green dye to aid in visual metering during application.

PART 3 - EXECUTION

3.1 PREPARATION - GENERAL

- A. Rough grading to a depth necessary to accept the specified thickness of topsoil must be approved prior to placing topsoil.
- B. Loosen subgrade, remove any stones greater than 1/2" in any dimension. Remove sticks, roots, rubbish, and other extraneous matter.
- C. Spread topsoil to a minimum depth of 4 inches, to meet lines, grades, and elevations shown on plan, after light rolling and natural settlement. Remove sticks, roots, rubbish, stones greater than 1/2" in any dimension, and other extraneous matter. Topsoil shall be tilled thoroughly by plowing, disking, harrowing, or other approved methods. Add specified soil amendments and mix thoroughly into the topsoil.

- D. Preparation of Unchanged Grades: Where seed is to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for planting as follows: Till to a depth of not less than 6 inches. Apply soil amendments and initial fertilizers as specified. Remove high areas and fill in depressions. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter. Soils test requirements apply here as well.
1. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of project limits. Do not turn existing vegetation over into soil being prepared for seed.

If necessary, supply and install topsoil in areas where there is no topsoil left after vegetation has been removed.
 2. Apply specified soil amendments at rates specified in the soils test and thoroughly mix into upper 2 inches of topsoil. Add topsoil if existing grade has less than 4" of topsoil. Delay application of amendments if planting will not follow within two (2) days.
- C. Fine grade areas to smooth, even surface with loose, uniformly fine texture. Roll, rake, and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Remove sticks, roots, rubbish, stones greater than 1/2" in any dimension, and other extraneous matter. Limit fine grading to areas which can be planted immediately after grading.
- D. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.
- E. Restore areas to specified condition, if eroded or otherwise disturbed, after fine grading and prior to planting.

3.2 SEEDING

- A. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage. Seed shall not be sown when the ground is frozen, muddy, or when weather conditions prevent proper soil preparation, interference with sowing and/or proper incorporation of seed into the soil.
- B. Sow seed using a spreader or hydroseeder. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing 3 lbs. per 1000 S.F. at right angles to each other. Total amount to equal a minimum of 6 lbs. per 1000 S.F.
- C. For seed sown with a spreader, mulch shall be spread uniformly to form a continuous blanket at a rate of 100 lbs. per 1,000 S.F. Mulch shall be 1 1/2" loose measurement over seeded areas and shall be anchored.
- D. Contractor has the option to hydroseed large lawn areas, using equipment specifically designed for such application. The rate of application of wood fiber mulching materials is 40 lbs./1,000 S.F. Contractor shall not hydroseed within close proximity to buildings and structures, or when unfavorable wind conditions may blow the hydroseed material onto the structure. Contractor shall clean all areas not to be seeded of overspray.

- E. The seeded area shall be watered, as soon as the seed is applied, at the rate of 120 gallons per 1000 square feet. The water shall be applied by means of a hydroseeder or a water tank under pressure with a nozzle that will produce a spray that will not dislodge the mulching material. Cost of this watering shall be included in the cost of seeding and mulching.

3.3 DORMANT SEEDING METHOD

- A. Seeding shall not take place from October 15 through November 20. During this period prepare the seed bed, add the required amounts of lime and fertilizer, and other amendments, then mulch and anchor.
- B. From November 20 through April 1, when soil conditions permit, prepare the seed bed, lime and fertilize, apply the selected seed mixture, mulch, and anchor. Increase the seeding rate by 50 percent.

3.4 RECONDITIONING EXISTING LAWNS

- A. A soils test shall be required for existing lawns prior to any reconditioning.
- B. Recondition all existing lawn areas damaged by Contractor's operations including storage of materials and equipment and movement of vehicles. Also recondition existing lawn areas where minor regrading is required.
- C. Provide soil amendments as called for in the soils test.
- D. Provide new topsoil, as required, to fill low spots and meet new finish grades.
- E. Cultivate bare and compacted areas according to the topsoil specifications.
- F. Remove diseased and unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from the Contractor's operations, including oil drippings, stone, gravel, and other loose building materials.
- G. All work shall be the same as for new seeding.
- H. Water newly planted seed areas. Maintenance of reconditioned lawns shall be the same as maintenance of new lawns.

3.5 ESTABLISHMENT

- A. Maintain work areas as long as necessary to establish a uniformly close stand of grass over the entire lawn area. A uniformly close stand of grass is defined as the seeded areas having 90%+ coverage of grass at 60 days after seeding. 90%+ coverage is defined as very little or no dirt showing when seeded area is viewed from directly overhead.
- B. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth acceptable lawn.

1. Mowing
 - a. Mow lawn areas during the period of maintenance to a height of 2 inches whenever the height of the grass becomes 3 inches. A minimum of 3 mowings is required during the period of maintenance.
2. Refertilizing
 - a. Distribute fertilizer on the seeded area between August 15 and October 15, during the period when grass is dry, and in accordance with the manufacturer's recommendations. The fertilizer shall be as specified in the soils test.
3. Reseeding
 - a. Reseed with the seed specified for the original seeding, at the rate of 4 lbs. per 1,000 S.F. in a manner which will cause minimum disturbance to the existing stand of grass and at an angle of not less than 15 degrees from the direction of rows of prior seeding.
4. Watering
 - a. The Contractor shall keep all work areas watered daily to achieve satisfactory growth. Water shall be applied at a rate of 120 gallons per 1,000 square feet. If water is listed as a pay item, it shall be separately paid for based on the actual amount of water used, measured in thousands of gallons.
5. Any mulching which has been displaced shall be repaired immediately. Any seed work which has been disturbed or damaged from the displacement of mulch shall be repaired prior to remulching.

3.6 INSPECTION AND ACCEPTANCE

- A. When seeding work is complete and an acceptable stand of growth is attained, the Contractor shall request the Owner's Representative to make an inspection to determine final acceptance.
- B. Acceptance shall be based upon achieving a vigorous uniformly stand of the specified grasses. If some areas are satisfactory and some are not, acceptance may be made in blocks, provided they are definable or bounded by readily identified permanent surfaces, structures, or other reference means. Partial acceptance decisions may be made by the Owner's Representative. Excessive fragmentation into accepted and unaccepted areas shall not be allowed. Unaccepted areas shall be maintained by the Contractor until acceptable.
- C. No payment shall be made until areas are accepted.
- D. All seeded areas shall be guaranteed for one full growing season to commence upon final acceptance of the areas.

END OF SECTION 329200.19

SECTION 329300.23 - TREES, SHRUBS, AND GROUND COVER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

- A. Installation of trees, shrubs, and ground covers shall be to the extent shown on Contract Drawings and shall include supplying all plant material indicated on the plans, plant mix, soil conditioning materials, mulching materials, guying and staking, watering and the incorporation of these materials into the work as specified.

1.3 QUALITY ASSURANCE

- A. Landscaping shall be done by a single firm specializing in landscape work.
- B. Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
- C. All plant material shall conform to ANSI Z60.1 "American Standard for Nursery Stock"; and State of Ohio, Department of Transportation, "Construction and Material Specifications", current edition.
- D. All plant material shall be labeled with a securely attached waterproof tag indicating species and size.
- E. All tree trunks shall be wrapped prior to leaving the nursery to protect the trunk from injury during transport. Wrapping shall stay on until planting is completed and removed after the tree is planted.
- F. All plant material shall be provided with protective covering (tarping) during transport to reduce desiccation.
- G. The Contractor shall have soils tests done at his expense by a State approved soils testing laboratory to determine amendments to the existing soils. Copies of the soils tests shall be provided to the Owner's Representative prior to planting the plant materials for review and approval.
 - 1. Soils tests shall determine percent organic matter, pH, buffer pH, available phosphorus, exchangeable potassium, calcium, magnesium, Cation Exchange Capacity (CEC), and percent base saturation with recommendations for nitrogen, phosphate, potash, magnesium and lime based on plant type and use.

- H. Plants may be subject to inspection and approval by the Owner's Representative at the place of growth or holding yard for conformity to specification requirements as to quality, size and variety. Notify Owner's Representative prior to transport of plant material to the site.
- I. The Contractor shall hire an arborist certified by the International Society of Arboriculture (ISA). The arborist shall be on site full time during tree planting operations to ensure that correct planting procedures are followed.

1.4 JOB CONDITIONS

- A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, such conditions shall be rectified by the Contractor before planting with approval from the Owner's Representative.
- C. All plants shall be guaranteed for the entire maintenance period covered by the Maintenance Bond.

1.5 PRE-BID SUBSTITUTIONS

- A. Every reasonable effort shall be made to find the material specified by the architect. The landscape contractor is responsible for qualifying his/her proposal to document any plant suitability or availability problems. The landscape contractor may offer substitutions to the landscape architect for his/her consideration. The landscape contractor will notify the landscape architect if there are known diseases or insect resistant species that can be substituted for a selected pest-prone plant.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

- A. All plant material shall be of the quantity, size, genus, species, and variety shown, and conforming to ANSI Z60.1, "American Standard for Nursery Stock". Provide healthy, vigorous stock, nursery grown, free of disease, insects, eggs, larvae, and defects such as sun-scald, injuries, abrasion or disfigurement.
- B. All plant material shall be of typical proportion and form for the species.
- C. Provide freshly dug trees and shrubs.
- D. Provide ground cover plants and other plant materials as specified on the drawings.

2.2 OTHER PRODUCTS

- A. Mulch shall be double shredded hardwood, free of deleterious materials.
- B. Soil amendments shall conform to the soils tests.
- C. Organic matter shall consist of composted leaves, composted sludge, or other approved material. Peat moss is not an acceptable material.
- D. Filter fabric, i.e., soil separator shall be a non-woven, heat-bonded geotextile fabric made of 100% polypropylene, with a weight of 3.5 oz. to 4.02 oz. per square yard a minimum grab strength of 100 lbs. and a water flow rate of 100 gpm/ft.
- E. Structural soil.
 - 1. A uniformly blended mixture of 20-70% Crushed Stone, 20-25% Loam topsoil and 10-15% organic material mixed to proportions that meet CBR #50.
 - a. Crushed Stone shall be AASHTO M43 #57 (limestone aggregate).
 - 2. Submit sample of Structural Soil for testing. The air void/porosity of the soil compacted to 100% maximum density per ASTM D698 shall be 25% to 30%. Submit California Bearing Ratio test results for each sample compacted to peak standard density. The soaked CBR shall equal or exceed a value of 50.
- F. Inorganic soil additives shall be Perlite (coarse texture), Vermiculite or approved equal.
- G. A water retaining, soil conditioning polymer (polyacrylamide) such as "Soil Moist", by JRM Chemical or approved equal.

PART 3 - EXECUTION

3.1 PLANTING PREPARATION

- A. All planting shall be done during the proper planting season for each species. Planting shall not be done under extreme wet, cold or dry conditions. Planting adjacent to heavily treated streets shall only be done in the spring.
- B. All fall planted B&B trees shall have a minimum diameter root ball increased in size to that of the minimum diameter required for the next larger caliper size.
- C. Deliver trees and shrubs after preparation for planting has been completed, and plant immediately. If planting is delayed more than 6 hours after delivery, set plant material in shade, protect from weather and mechanical damage and keep roots moist by covering with mulch, burlap, or other acceptable means of retaining moisture. No plants shall be stored more than 2 weeks unless with approval of Owner's Representative. Do not remove container grown stock from containers until planting time.

- D. Layout individual tree and shrub locations and areas for multiple plantings. Stake locations and outline areas and secure Owner's Representative's approval prior to start of planting. Make adjustments as directed by the Owner's Representative.
- E. Planting beds shall be installed after lawn areas have been brought to finish grade and fine graded, but not seeded.

3.2 TREE PLANTING

- A. Excavate pits with flared sides and with bottom of pit at the same depth as the rootball. An auger shall not be used to dig planting pits.
- B. For balled and burlapped plants and container plants, pits shall be two and one-half times greater in diameter than the ball and the same depth as the ball.
- C. Dispose of any unsuitable subsoil. Plant mix shall consist of existing soil which is free of debris, sticks, rubbish and stones greater than 1", and twenty percent (20%) organic matter by volume. Add amendments as per the soils test requirements.
- D. For balled and burlapped material, set tree ball on bottom of pit, centered, and so the flare of the trunk sits at the same grade as it was in the nursery, when settled. Peel back burlap, cut first two rings of wire. When set, place additional plant mix around base and sides of ball, and work each layer to settle plant mix and eliminate voids and air pockets. Water after placing final layer of plant mix.
- E. For container plants, remove plant from container and loosen rootball. Make 4 – 5 cuts $\frac{3}{4}$ the length of the rootball with a sharp knife. Spread out root mass and place on bottom of pit, centered, so the flare of the trunk sits at the same grade as it was in the nursery when settled. When set, place additional plant mix around base and sides of ball and work to settle plant mix and eliminate voids and air pockets. Water thoroughly.
- F. Form a 3" high dish of backfill around the planting area to allow for mulching, as per detail.
- G. Provide mulch to a uniform depth of 2". Do not touch mulch to trunk of plant.
- H. Guy and stake trees immediately after planting, as indicated on the drawings. Remove wrapping around tree trunks.

3.3 PLANTING BEDS

- A. Loosen subgrade of planting bed areas to a minimum depth of 12" using a culti-mulcher or similar equipment. Remove stones greater than 1" in any dimension, remove sticks, rubbish, and any other extraneous matter. Planting soil mixture shall be the same as plant mix in the tree planting section. Remove all stones greater than 1" in any dimension in plant mix. Remove sticks, rubbish and any other extraneous matter. Soil amendments apply here as well.
- B. Spread planting soil mixture to a depth of 12" to meet line, grades, and elevations shown

after light rolling and settlement. Place approximately 1/2 the total amount of planting soil required. Thoroughly mix into loosened subgrade to create a transition layer, then place remainder of plant soil.

- C. Set container grown stock as specified for balled and burlapped stock, except remove container and loosen root system. Plants, when settled, must be set at the same elevation as when in the container.
- D. Set bare root stock on cushion of planting soil mixture. Spread out roots without tangling or turning up to surface. Cut injured roots clean; do not break roots. Carefully work backfill around roots by hand, and puddle with water until plant mix layers are completely saturated. Plumb before backfilling and maintain plumb while working plant mix around roots and placing layers of soil mixture above roots. Plants, when settled, must be set at the same elevation as they were in the nursery.
- E. Form a 3" saucer of backfill around the planting area, as per detail. Mulch planted areas to a uniform depth of 2" and finish level with adjacent grades. Do not touch mulch to trunk of plant.
- F. Space ground cover plants as indicated on the planting plan. Dig holes large enough for spreading of roots, and backfill with planting soil mixture. Eliminate air pockets. Water thoroughly after planting, taking care not to cover crowns of plants with wet soils. Mulch areas between plants to a uniform depth of 2".
- G. Newly planted trees and shrubs shall be pruned in accordance with supplier's recommendations. All pruning must be done by experienced personnel.

3.4 CONTAINED PLANTER BEDS

- A. Drainage
 - 1. Install drainage material and structures in all planting areas as per plan. Areas to be planted must be clean of extraneous material and debris. Insure that planter drains are operable and free of debris. The landscape architect may review the installation of the drainage systems prior to placing any backfill mixes.
 - 2. Install filter fabric above drainage material. Make sure filter fabric does not slip during the backfill installation.
- B. Planting soil mixture shall consist of 2 parts topsoil, 1-part organic matter and 1-part inorganic soil additive.
- C. Soil Placement
 - 1. Place soil in 12" layers and lightly tamp to eliminate air pockets and minimize settling. Care should be taken in placing soil so as to not compact and restrict drainage. Due to anticipated settling, soil fill may exceed final grade.
 - 2. Prior to planting, the landscape contractor shall regrade and repair any areas which settle or are uneven.

- D. Planting Operations: Sections for plant materials and planting execution shall apply. Set plants 2” below top of the planter wall to allow for mulching.
- E. Bracing Operations: See drawings for bracing techniques. In some cases, galvanized steel eye bolts can be imbedded into the sides of the planter to allow the connection of guy wires.

3.5 STREETSCAPE TREE PLANTING

- A. Do not proceed with the installation of the Structural Soil material until all walls, curb footings and utility work in the area have been installed. For site elements dependent on Structural Soil for foundation support, postpone installation until immediately after the installation of Structural Soil.
- B. Install subsurface drain lines as shown on the drawings prior to installation of Structural Soil.
- C. Excavate and compact the proposed sub-grade to depths, slopes and widths as shown on the drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted sub-grades of adjacent pavement or structures.
- D. Confirm that the sub-grade is at the proper elevation and compacted as required. Sub-grade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the drawings.
- E. Clear the excavation of all construction debris, trash, rubble and any foreign material.
- F. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use ½” plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
- G. All Structural Soil mixing shall be performed at the Contractor’s yard and not at the project site to assure proper quality control.
- H. Install Structural Soil in 6-inch lifts and compact each lift to maximum density per ASTM D698 and to required CBR value.
- I. Bring Structural Soils to finished grades as shown on the drawings. Immediately protect the Structural Soil material from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix with plastic or plywood as directed by the Engineer.
- J. Planting Operations: Sections for plant materials and planting execution shall apply.
- K. Bracing Operations: See drawings for bracing techniques.

3.6 LANDSCAPE WATERING

- A. The Contractor shall furnish water for watering plants on a weekly basis in absence of 1 ½” rainfall. All plant material shall be thoroughly watered throughout the period of establishment.
- B. Saturate the root zone and mulched area of each plant without causing run-off. During the period from May 15 to September 15, the Contractor shall install one Tree Gator or approved equal drip irrigation bag with each tree planted. Use upright for deciduous trees and flat for evergreen trees. After completion of planting trees, the Contractor shall remove tape from drip irrigation bags and fill with water. Shrubs and trees too small to accept drip irrigation bags shall be watered by other means approved by the Owner.
- C. The Contractor shall water plant material at least once a week through-out the period of establishment, unless there has been adequate rainfall. An average of 1-½” rainfall per week shall be considered adequate to suspend watering, at the Owner’s Representative’s direction.
- D. The Contractor shall conduct an inspection of the trunk surrounded by and the area beneath each TreeGator irrigation bag on a bi-weekly basis. If any evidence of pests or disease is noticed, the Owner’s Representative shall be notified in writing.

3.7 PERIOD OF ESTABLISHMENT

- A. Before final inspection, all plants shall be in place and under the care of the Contractor for a period of establishment. This period shall begin immediately upon completion of the planting operations and shall continue until October 1st. In no case shall it be less than one growing season, June 1 to October 1.
- B. During this period of establishment, follow all horticultural practices that will ensure the vigor and growth of the transplanted material. This includes watering, remulching, restaking, guying and cultivating. Weeding shall be performed either manually or by chemical control. If there is evidence of deer damage, then a deer inhibitor shall be applied.
- C. On or about September 14 the Owner’s Representative will inspect the planting and supply the Contractor with a list of missing and dead plants and those that have died back beyond normal pruning lines. Replant as required in accordance with the specifications of the original material. However, plants replaced and planted in the Fall, that die before or during the Spring planting season, shall be replaced immediately.
- D. The Contractor is responsible for removing all stakes and guy wires from all plants approximately one year after final acceptance of the planting. The Owner’s Representative shall be notified prior to removal.

END OF SECTION 329300.23

SECTION 330130 - MISCELLANEOUS TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 MAINTENANCE OF SANITARY FLOWS

- A. The Contractor for this contract shall be responsible for maintaining all sanitary flows through the existing sanitary sewerage systems. Provisions shall be made for temporary pumping and/or storage of sanitary flows during periods of sewer and manhole reconstruction, or when flows must be interrupted to make connections to the new facilities as directed by the Engineer.

END OF SECTION 330130

SECTION 333100 - SANITARY SEWER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Furnishing all labor, materials, tools, equipment, and services for all sanitary sewers as shown on the Drawings.
- C. Although such is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a functional and complete installation.

1.2 RELATED DOCUMENTS AND SECTIONS

- A. Section 013319 – Field Testing Requirements.
- B. Section 310000 – Earthwork.

1.3 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Granular pipe bedding and cover material specified in Section 310000 – Earthwork.
- B. Special backfill material specified in Section 310000 – Earthwork.

1.4 SUBMITTALS

- A. Product Data
 - 1. PVC pipe, each type specified
 - 2. Ductile iron pipe
 - 3. Manhole castings
 - 4. Precast concrete manholes
 - 5. Manhole steps

- B. Shop Drawings
 - 1. Precast concrete manholes showing:
 - a. Orientation plan for each manhole or inlet indicating where all pipes connect.
 - b. The size and elevation of connecting pipes.
 - c. Details of drop connections.
 - d. Invert concrete channeling details.
 - e. Pipe to manhole connection details.
 - f. Casting and step orientation.
- C. Samples
- D. Quality Control Submittals
 - 1. Design Data
 - 2. Test Reports
 - 3. Certificates
 - a. Evidence of current membership in specified manufacturer's associations.
 - b. Evidence of ODOT precertification for the manufacturing RCP pipe.
 - c. Evidence of National Precast Concrete Association (NPCA) certification for the manufacture of precast concrete manholes.
 - 4. Manufacturer's Instructions

1.5 REFERENCES

- A. ASTM A-48 Standard Specification for Gray Iron Castings
- B. ASTM C-76 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- C. ASTM C-150 Standard Specification for Portland Cement
- D. ASTM C-270 Standard Specification for Mortar for Unit Masonry
- E. ASTM C-478 Standard Specifications for Precast Reinforced Concrete Manhole Sections
- F. ASTM C-990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- G. ASTM C-1173 Standard Specification for Flexible Transition Couplings for Underground Piping Systems
- H. ASTM D-2321 Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
- I. ASTM D-3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

- J. ASTM D-3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
- K. ASTM F-477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- L. ASTM F-679 Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
- M. ANSI/AWWA C111/A21.11 American National Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
- N. ANSI/AWWA C151/A21.51 American National Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids
- O. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution

1.6 PROJECT CONDITIONS

A. Existing Conditions

1. Verify locations of underground utilities.
2. Protect existing structures and utilities from damage. Repair if damaged by this work.
3. Do not change pipe sizes without securing written approval of Engineer.

B. Field Measurements

1. If it becomes necessary to change location of sanitary sewer lines due to underground utility interference, secure approval of Engineer.
2. If Contractor initiated, make changes approved by the Engineer without added cost to Owner.

1.7 PROJECT CONDITIONS

A. Existing Conditions

1. Verify locations of underground utilities.
2. Protect existing structures and utilities from damage. Repair if damaged by this work.
3. Do not change pipe sizes without securing written approval of Engineer.

B. Field Measurements

1. If it becomes necessary to change location of sanitary sewer lines due to underground utility interference, secure approval of Engineer.
2. If Contractor initiated, make changes approved by the Engineer without added cost to Owner.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site

1. All material and all equipment shall be subject to visual inspection and acceptance or rejection after delivery to the site of the work. All rejected material shall immediately be removed from the site.

1.9 SEQUENCING AND SCHEDULING

- A. Perform no pipe work in fill areas until embankment or fill has been completed to at least two (2) feet above proposed top of pipe and fill has been properly compacted.

PART 2 - PRODUCTS

2.1 PIPE

A. Polyvinyl Chloride Pipe (PVC) 4" - 15" Diameter

1. All polyvinyl chloride pipe in this size range shall conform to ASTM D-3034 SDR 35, shall be integral bell and spigot type, with joints conforming to ASTM D-3212 and elastomeric seals conforming to ASTM F-477.
2. All pipe and fittings shall be marked or stenciled in conformance with ASTM D-3034. All gaskets shall be marked or stenciled with the ASTM specification designation, name or trademark of the manufacturer, and pipe size.
3. Acceptable manufacturers shall be current members of the Uni-Bell Plastic Pipe Association.

B. Polyvinyl Chloride Pipe (PVC) 18" - 36" Diameter

1. All large diameter polyvinyl chloride pipe shall conform to ASTM F-679 PS46, shall be integral bell and spigot type, with joints conforming to ASTM D-3212 and elastomeric seals conforming to ASTM F-477.
2. All pipe and fittings shall be marked or stenciled in conformance with ASTM F-679. All gaskets shall be marked or stenciled with the ASTM specification designation, name or trademark of the manufacturer, and pipe size.
3. Acceptable manufacturers shall be current members of the Uni-Bell Plastic Pipe Association.

C. Ductile Cast Iron Pipe

1. Ductile cast iron pipe shall be designed in accordance with ANSI/AWWA C150/A21.50 and manufactured in accordance with ANSI/AWWA C151/A21.51. Pipe shall be coated with a bituminous material on the outside and shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4. Joints shall be mechanical or push-on in conformance with ANSI/AWWA C111/A21.11 incorporating rubber gaskets. Mechanical joints shall be used wherever joint

restraint is required. Bolts for mechanical joints shall be made of either high strength cast iron containing a minimum of 0.50 percent copper or high strength low alloy steel conforming to ANSI/AWWA C111/A21.11.

2. The minimum wall thickness of the pipe barrel shall be that indicated in ANSI A21.50 (AWWA) C150 for laying condition "2", 150 psi internal working pressure and a surge pressure of 100 psi and 5 feet depth of cover unless otherwise indicated on the drawings.
3. All pipe shall be marked or stenciled in conformance with ANSI/AWWA C151/A21.51. All gaskets shall be marked or stenciled with the ASTM specification designation, name or trademark of the manufacturer, and pipe size.
4. Within structures, flanged joints shall conform to AWWA C110 or ANSI A21.10. Appurtenances used to make flanged joints shall include: 1/16th thick red rubber gaskets, bolts having American Standard Unfinished Hexagonal head and nut dimensions in conformance with ANSI B18.1 and material for bolts and nuts shall conform to ASTM A-575 or A-576.
5. The ductile iron pipe, fittings and appurtenances buried underground, shall be encased with 8 mil polyethylene film conforming with AWWA C105, unless noted otherwise.
6. Fittings shall be cast grey iron/ductile iron castings conforming to the latest applicable AWWA and/or ANSI specifications for pressure fittings with end conditions as specified herein. AWWA C110 (ANSI A21.10) shall be applicable for all cast grey iron/ductile iron fittings.
 - a. Fittings for pipe sizes of 12 inch diameter and smaller shall be rated for 250 psi working pressure in accordance with AWWA C110.
 - b. The end conditions of each fitting shall be as required to accommodate the jointing requirements for the particular pipe material being connected to the fitting in accordance with the piping layout shown on the plans. The particular pipe material to be connected to the fitting is specified elsewhere in these specifications.
 - c. The outside surface of all cast grey iron/ductile iron fittings shall be shop coated with either a coal tar or asphalt base bituminous material. If this coating material is found to be damaged prior to the pipe trench being backfilled, the Contractor shall provide and apply additional material of that required to repair the damages. The Contractor shall have sufficient coating material available at the job site prior to laying the pipe.
7. Acceptable manufacturers are:
 - a. U.S. Pipe
 - b. Tyler Pipe

D. PVC Pressure Rated Pipe

1. PVC pressure pipe shall be designed in accordance with AWWA C909 and ASTM F-1483 and shall be minimum Thickness Class DR 18. The bell section shall be as hydrostatically strong as the pipe wall. Joints for PVC pressure pipe shall be push-on with elastomeric ring in conformance with ASTM D-3139. Gaskets shall conform to ASTM F-477.
2. All pipe and fittings shall be marked or stenciled in conformance with AWWA C909. All gaskets shall be marked or stenciled with the ASTM specification designation, name or trademark of the manufacturer, and pipe size.

3. Fittings shall conform to Paragraph 2.1(B)(6) of this Section.
4. Acceptable manufacturers shall be current members of the Uni-Bell Plastic Pipe Association.

2.2 PRECAST CONCRETE MANHOLES

- A. All precast manhole units shall be manufactured in accordance with the provisions of ASTM C-478.
- B. Joints between manhole units shall be gasketed and shall comply with the requirements of ASTM C-443. All gaskets shall be marked or stenciled with the ASTM specification designation, name or trademark of the manufacturer, and pipe size.
- C. The standard length of riser units shall be 48 inches. Lengths of 32 inches or 16 inches shall be used to meet required dimensions.
- D. Openings for connecting pipes in riser units, bottom riser units, integral base units, and for access in flat slabs shall be preformed or cored by the manufacturer. Cut-out openings shall be made immediately after the pipe is removed from the casting form.
- E. Connectors between new precast concrete manholes and pipes shall be made by casting the connector integrally with the manhole wall. The connectors shall be composed of EPDM with stainless steel take down bands for compressing the connector against the outside diameter of the pipe. The connectors shall comply with the requirements of ASTM C-923, and shall be "Z-Lok" Type as manufactured by A-Lok Products; or an approved equivalent.
- F. All openings in existing manholes shall be field cored and shall have mechanical connectors complying with the requirements of ASTM C-923 and shall be equal to Kor-N-Seal as manufactured by NPC, Inc., Milford, NH.
- G. Annular spaces at pipe entrances shall be field sealed with a one component, hydraulic cement based, fast setting repair mortar equal to Thoro Products Waterplug as manufactured by ChemRex Inc., Shakopee, MN.
- H. The top four (4) inches to twelve (12) inches of the manhole shall provide for adjustment of casting to grade. Adjustment shall be through the use of a maximum of two (2) precast concrete adjusting collars.
- I. Where pressure tight manhole frames and covers are specified, 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.
- J. Where required by the drawings, manhole coatings shall be an acrylic modified cementitious, high-build, waterproof coating equal to Thoroseal Foundation Coating as manufactured by ChemRex Inc., Shakopee, MN.
- K. Precast concrete shall be manufactured by an NPCA certified plant.

2.3 MANHOLE STEPS

- A. All steps shall be minimum of twelve (12) inches in width with safety side lugs to prevent slipping and shall conform to the latest OSHA requirements. Manhole steps shall be of polypropylene plastic reinforced with a 3/8", No. 60 grade epoxy coated reinforcing rod.
- B. Manhole steps shall conform to the requirements of ASTM C-478.
- C. Acceptable manufacturers are:
 - 1. American Step Company, Inc.
 - 2. Lane International, Inc.
 - 3. M. A. Industries, Inc.

2.4 CASTINGS

- A. All castings shall be true to pattern and free from cracks, gas holes, flaws and excessive shrinkage. Surfaces shall be free from burnt-on sand and shall be reasonably smooth. Runners, fins, risers and other cast-on pieces shall be removed. Castings for manhole frames and covers and for any other purpose under these specifications shall conform to all the requirements for Class No. 35B for Gray Iron Castings of the ASTM A-48. All castings shall be commercially machineable and, in the case of manholes, the frame and cover shall be so machined that it will be impossible to rock the cover after it has been seated in the proper position in the frame.
 - 1. Manhole frames and covers shall be as detailed on the Drawings.
 - 2. Frame and cover shall be painted with one coat of the manufacturer's standard asphaltum paint.

2.5 MASONRY MORTAR

- A. Mortar shall conform to ASTM C-270, Type M, but shall not contain masonry cement.
- B. Mortar shall be UltraMortar Type M as manufactured by UltraKote Products, Inc. or Lafarge Mortar Cement, Type M as manufactured by Lafarge Corporation, or approved equal.
- C. Only sufficient mortar shall be prepared for immediate use, and any mortar that has set shall not be retempered or used in the work.
- D. Setting accelerators or anti-freeze compounds shall not be used.

2.6 PREFORMED BUTYL MASTIC SEALANT

- A. Preformed butyl mastic sealant material shall be furnished in 1-inch wide strips conforming to the requirement of ASTM C-990.

- B. The butyl mastic sealant shall be Bidco C-56 as manufactured by Bidco Sealants, Inc., Park Hills, MO or equal.

2.7 COUPLINGS

- A. Couplings for connecting dissimilar pipe materials or pipe sizes shall be a rubber type coupling with a sealing "O" ring under each of two sealing clamp bands and a Type 316 stainless steel shear ring. Coupling shall be manufactured with natural and synthetic rubbers conforming to ASTM C 425 and ASTM C 1173.
- B. Coupling shall be Flex-Seal Adjustable Repair Coupling as manufactured by the Mission Rubber Company, Corona, CA, or approved equal.

PART 3 - INSTALLATION

3.1 ALIGNMENT AND GRADE

- A. Horizontal and Vertical Control
 1. All horizontal and vertical control required for the complete layout and performance of the Work under this contract shall be done by a registered surveyor at the Contractor's expense, and any observations by the Engineer of the Contractor's methods will not relieve the Contractor of his responsibility.
 2. The Contractor shall be solely responsible for the accuracy of all horizontal
- B. Alignment and grade shall be established by means of a laser beam.
- C. The Contractor shall furnish all material and labor to establish line and grade of the generated laser beam from the benchmarks and control points indicated on the Drawings. The laser shall be securely anchored and checked periodically by the Contractor. The laser calibration shall be demonstrated when requested by the Engineer. Strict adherence to the manufacturer's operation procedure shall be observed. Only qualified and trained employees may be assigned to install, adjust, or operate laser equipment, and proof of qualifications of the equipment operator must be available at all times. Areas in which lasers are used must be posted with standard laser warning placards, and the laser beam shall be turned off when not needed. During rain, snow, dust, excessive heat, or fog the operation of laser systems shall be prohibited where practicable because of beam scatter.

3.2 PIPE INSTALLATION

- A. All pipe installation shall conform to the trench and bedding details shown on the Drawings.
- B. PVC pipe shall be installed in full compliance with ASTM D-2321. Clay pipe shall be installed in full compliance with ASTM C-12. All concrete pipe shall be installed in conformity with recommended practices published by the American Concrete Pipe Association in the "Concrete Pipe Installation Manual".

- C. Only one type and strength of pipe shall be used between any two consecutive manholes, unless otherwise shown on the Drawings.
- D. After the trench has been excavated and the pipe bedded , the pipe shall be laid to the line and grade as shown on the Drawings. All joints shall be made as hereinafter specified. In no case shall any material except bedding material be placed under the bell of the pipe to secure proper grade.
- E. Prior to being lowered into the trench, each pipe shall be carefully inspected and those which are damaged or not meeting the specified requirements shall be rejected and clearly marked as rejected and removed from the Work. Satisfactory means shall be used to hold the pipe in line until embedment of pipe is complete. Precautions shall be taken to insure that the spigot end of the pipe being laid is pushed the proper depth into the bell of the preceding pipe.
- F. All conduit shall be laid starting at the outlet end and laid with the bell end upstream.
- G. In no case shall more than thirty (30) feet of trench be opened in advance of the pipe laying operations.
- H. Conduit shall not be laid in water, mud, or any otherwise unsuitable trench No drainage shall run through the newly laid pipe. All sewers shall be temporarily capped with a watertight seal at the open ends at the completion of each day's work and no drainage water shall be permitted to flow through the sewer.
- I. All trenches and excavations shall be backfilled as specified as soon as possible after the pipe is laid and jointed. Where concrete encasement or cradle is used, pipe shall not be backfilled for at least twenty four (24) hours after placing concrete except that pipe may be covered to a depth of not to exceed sixteen (16) inches over the top of the pipe.

3.3 JOINTING

- A. Polyvinyl Chloride (PVC) Pipe
 - 1. Dust, dirt and foreign matter shall be removed from joint surfaces. When jointing pipe using the required compression type joint, a lubricant recommended by the gasket manufacturer shall be used. The gasket shall be lubricated by drawing it through lubricant held in the hand of the worker, thus coating the entire surface of the gasket.
 - 2. When laying the pipe in concrete bedding, care shall be exercised to prevent the joint materials from coming in contact with the fresh concrete until after the joint has been completed.
- B. Ductile cast iron push-on joints
 - 1. The gasket seat and the gasket shall be thoroughly cleaned and should be wiped with a clean cloth and a thin film of lubricant applied to the inside surface of the gasket that will come in contact with the entering pipe. Use only the lubricant furnished with the pipe. In no case shall a mineral oil or petroleum base lubricant be used.

2. The plain end of the pipe to be jointed shall be thoroughly cleaned and started into the socket so that it is in contact with the gasket. In some cases it may be desirable to apply a thin film of lubricant to the outside of the plain end for about one (1) inch back from the end. The joint is then completed by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket. Any manufacturer approved method may be used to home the pipe.
3. When laying the pipe in concrete bedding, care shall be exercised to prevent the joint materials from coming in contact with the fresh concrete until after the joint has been completed.

3.4 PERMISSIBLE DEFLECTION AT JOINTS

- A. No pipe deflections or springing of joints, to effect a change in direction will be allowed, except by permission or direction of the Engineer, or as shown on the Drawings. Any permitted or directed deflection shall be a maximum of 80 percent of the allowable deflection value established by the pipe manufacturer.

3.5 MANHOLES

- A. Build each manhole to dimensions shown on Drawings and at such elevation that pipe sections built into wall of manhole will be true extensions of line of pipe.
- B. Set frames for manholes, within areas to be paved, to final grade. In asphalt pavement, surround frames set to grade with a ring of compacted asphalt concrete base material immediately after backfilling operations are complete. Place asphalt concrete mixture up to one (1) inch below top of frame, slope to grade, and compact with hand tamp.
- C. Precast bases shall be placed on a bed of crushed gravel or crushed limestone, meeting AASHTO M 43 gradation, having a minimum thickness of three (3) inches. The bedding shall be compacted and provide uniform support for the entire area of the base.
- D. Provision shall be made for a minimum of four (4) inches and a maximum of twelve (12) inches of precast concrete grade rings between the uppermost precast section and the bottom of the cast iron manhole frame in order to set manhole cover to grade.
- E. No more than two lifting holes or other lifting devices shall be utilized for handling the precast sections. All lifting holes shall be acceptably sealed with a hydraulic cement based, fast setting repair mortar, meeting the requirements of Article 2.2 of this Section, prior to backfilling around the manhole.
- F. Inverts shall be formed to the equivalent of half-pipes in concrete and as follows:
 1. Carry concrete out to the manhole wall with a slope of $\frac{1}{2}$ in./ft. from the top of the half-pipe.
 2. The bottoms of all manholes shall be channeled to conduct flow in the planned direction. Channels shall be the true shape of the lower half of the sewer pipe and shall match inverts of connecting pipe at the manhole wall.

3.6 BRANCH CONNECTIONS

- A. In general, provision shall be made in the sewers for service connections by inserting a wye branch in the sewer at the location shown on the Drawings, where required or ordered, for each service connection with a branch size called for by the Drawings but never less than six (6) inch, for sewers ten (10) feet or less in depth. Where indicated on the plans, the Contractor shall construct a riser, as per detail, in such manner, that the top of the riser shall be not less than seven (7) feet below grade or at such elevation as to properly receive the required service connection, with full regard to elevation of service sewer and slope from building or structure to the sewer which shall not be less than one percent (1%).
- B. The approximate location of service connections are shown on the Drawings based upon available information. The Owner may increase the number of connections or delete some connections as the sewer is being built.
- C. Openings at the outer ends of the connections shall be closed and sealed with approved stoppers when connection is not immediately placed into service.

3.7 MAINTAINING SEWAGE FLOW

- A. The Contractor shall be required to maintain the flow in all existing live sewers during construction and the method employed shall be approved by the Engineer.

3.8 REPLACING, MOVING AND REPAIRING OF EXISTING UTILITIES

- A. The Contractor shall replace, move, support, or repair and maintain all pipes for water, steam, air or gas, and all wire conduit(s), and all other structures encountered in the work and repair all damage done to any of the said structures and appurtenances through his acts or neglect and shall keep them in repair during the life of the Contract. The Contractor shall in all cases leave them in as good condition as they were previous to the commencement of the work and to the full satisfaction of the Owner.

3.9 CONNECTION TO EXISTING SEWER SYSTEM

- A. The Contractor shall make connections to the existing sewer system as shown on the Drawings. The connections shall be made by the Contractor at such hours that will cause the least disturbance to the flow in the existing sewer system. The Contractor, however, shall notify the Engineer at least five working days in advance of the time he desires to make the connections and no such connections shall be made until the permission of the Engineer is obtained.

3.10 CLEAN-UP

- A. Before final acceptance for the Work, the Contractor shall clear the sewers of any mortar, dirt or other refuse that may have been left or accumulated in the sewers. All manholes and other structures shall be cleared of all forms, scaffolding, bulkheads, centering, surplus mortar, rubbish or dirt and left in a clean and proper condition.

3.11 DEFECTS TO BE MADE GOOD

- A. If, at any time before the completion of the contract, any broken pipes, or any defects, are found in the sanitary sewers or in any of their appurtenances, the Contractor shall cause the same to be removed and replaced by proper material and workmanship, without extra compensation for the labor and material required. All materials shall be carefully examined by the Contractor for defects before placing and any found defective shall not be placed in the line.

END OF SECTION 333100

SECTION 352226 - SLUICE GATES AND SLIDE GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. This section includes the furnishing and installation of wall thimbles, gate frames, sluice gates, slide gates, floor stands, extension stems, stem guides, operating devices, position indicators, wall brackets, floor boxes, anchors, and all appurtenances.
- B. Motors and electrical work incidental to installation and operation of sluice gates and slide gates shall be included herewith unless otherwise directed under other Contract Items.

1.3 QUALITY

- A. Sluice gates and their appurtenances shall conform to applicable portions of AWWA Standard for Sluice Gates, C501.

1.4 PROTECTION

- A. All gates shall be shipped, stored, and installed in such a way as to avoid warping the frame and to maintain tolerances between seating faces.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application instructions.
- B. Sluice gates, slide gates, operators, and appurtenances shall be as shown on the Drawings, scheduled, as specified, or as ordered.

PART 2 - PRODUCTS

2.1 SLUICE GATES – **Not Used**

- A. Sluice gates shall consist of an iron-bodied and bronze-mounted gate with bronze faced wedges and wedge blocks. Side wedges shall be adjustable. Top and bottom wedges shall withstand seating and unseating heads shown in the Schedule included in the Drawings.
- B. Frames shall be circular or rectangular flanged frames to connect with wall thimbles and provide for openings of the shape and dimensions specified unless otherwise indicated.

- C. Guides shall be of cast iron and of sufficient length so that at least one-half of the disc is within them at full opening.
- D. Operating stems and extensions shall be ASTM A 276 stainless steel with high finish corrosion-resistant restraint threads and shall operate without binding or jamming in the lift nut. Adjustable stem guides shall have bronze bushings.
- E. Wall thimbles shall be of cast iron and similar to Type "F" as manufactured by Rodney Hunt Mfg. Co., Hydro-Gate; or equal, unless otherwise noted.
- F. Each extension stem shall be the same material and the same size as the stem of the gate it operates. If the extension is more than 8 ft. long, intermediate stem guides shall be installed and supported from the wall by suitable brackets at 8-ft. intervals. Brackets and stem guides shall be made of cast iron and fully adjustable. The guide block shall be bushed where it contacts the extension stem.
- G. All gates which are to be operated by T-wrench shall have 2-in. square operating nut at the top of the extension stem. A T-wrench shall be supplied for each gate with operating nut.
- H. Sluice gates shall be manufactured by Rodney Hunt Mfg. Co., Hydro-Gate; or equal.

2.2 SLIDE GATES (ALUMINUM)

- A. The guides shall be of extruded aluminum incorporating a dual slot design. The primary slot shall accept the plate of the disc and the secondary slot shall be sufficiently wide to accept the reinforcing ribs of the disc. The guides shall be designed for maximum rigidity, shall have a weight of not less than 3 lbs. per foot and will be provided with keyways to lock it into the concrete. The invert of the frame shall be an angle welded to the lower ends of the guides to form a seating surface for the resilient seal mounted on the disc.
- B. Where the guides extend above the operating floor, they shall be sufficiently strong so that no further reinforcing will be required. The yoke to support the operating benchstand will be formed by two angles welded at the top of the guides to provide a one piece rigid frame. The arrangement of the yoke shall be such that the disc and stem can be removed without disconnecting the yoke.
- C. The disc or sliding member shall be of aluminum plate reinforced with "A" shaped aluminum extrusions welded to the plate not more than 16 inches apart. Reinforcing ribs shall extend into the guides so that they overlap the seating surface of the guide. A specially molded resilient seal shall be mounted on both vertical sides and the bottom of the disc to provide flush bottom closure or as noted on the slide gate schedule. The shape of the seal shall produce a seating surface having a minimum width of 3/4" and the seal shall extend into the secondary slot of the guide. The vertical face of the seal shall be in contact with the seating surface of the guide to provide a proper seal at the corners.
- D. All parts of the gate shall have a minimum thickness of 1/4".

- E. Operation of the gate shall be by means of a handwheel or crank operated benchstand mounted on the yoke of the gate. The benchstand will be fully enclosed, equipped with roller bearings above and below the operating nut and with a mechanical seal around the operating nut. On a crank operated benchstand, the pinion shaft will be cadmium plated and supported on roller bearings. A mechanical seal will be provided around the pinion shaft where it extends from the hoist enclosure. The operating stem shall be of Type 304 stainless steel designed to have an L/r of less than 200, to withstand at least twice the rated output of the benchstand and to have a minimum diameter of 1-1/2". The stem shall be connected to the disc by means of a cast aluminum stem connector threaded and bolted to the stem and welded to the disc.
- F. All necessary attaching bolts and anchor bolts shall be stainless steel and will be furnished by the slide gate manufacturer.
- G. Slide gates shall be manufactured by Rodney Hunt Mfg., Hydro-Gate; or equal.

2.3 SLIDE GATES (STEEL) – **Not Used**

- A. Gate seat and angle frame shall be an integral unit of steel structural shapes, assembled by welding or bolting, to form the waterway opening. Side angles, filler bars, and cover bars shall form guides for the slide and holes shall be provided for mounting on anchor bolts.
- B. Slide gate shall be fabricated from plate having 1/4- in. minimum thickness and shall be reinforced with structural shapes sized to withstand the specified seating and unseating heads with a maximum deflection of 1/360 of the gate span. The slide shall be provided with a pocket for attaching the stem. This pocket shall be attached to the slide by welding and shall be capable of taking the full thrust developed during normal gate operation.
- C. Gates so designated in the Gate Schedule shall be provided with a flush bottom seal. All parts shall be as specified above except a solid rubber seal shall be securely fastened to the bottom cross member of the frame with a retainer and threaded fasteners. The top surface of the seal shall be flush with the invert of the gate opening. The seal shall be replaceable without disassembly of the gate.
- D. The gates, frames, stems and extensions shall be fabricated entirely of ASTM A 36 steel.
- E. Slide gates shall be manufactured by Rodney Hunt Mfg., Hydro-Gate; or equal.

2.4 LIFT ASSEMBLIES

- A. Floor stands shall be of the enclosed gear pedestal lift type with single or double gears as required, and with thrust bearings above and below the flange on the bronze lifting nut. Bevel and pinion gears shall be steel with cut teeth, and spur gear shall be cast iron with cut teeth. Bearings for the gear and pinion shaft shall be bronze bushed. The lift shall operate on a 25-lb. pull on the crank. A clear butyrate plastic pipe stem cover shall be provided with Mylar open and close indication.
- B. The guides on self-contained gates shall extend above the operating floor. They shall be sufficiently strong so that additional reinforcing is not necessary. The yoke to support the operating benchstand will be formed by welding two angles across the top of the guides.

- C. Where the head frame extends higher than 4 ft. above the operating floor, the gate operator shall include a bevel gear assembly.
- D. Electric Gate Operator (Open-Close)
 - 1. The operator shall be the helical and worm gear type driven by electric motor. All power gearing shall be grease lubricated. The valve manufacturer shall furnish the value of the maximum operating torque required to operate the valve as defined in the Appendix to AWWA C501. The operator manufacturer shall furnish evidence that the operator is designed to equal or exceed the torque requirements.
 - 2. Unless otherwise noted, the operator shall be geared to operate the gate at a rate of approximately 12 in. in 60 seconds under the full specified operating head. It shall be possible to change this cycle time by substituting suitable gear trains. The operator shall be equipped with a declutchable handwheel for manual operation. The operator shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering.
 - 3. Suitable reduction gearing shall be provided off the main shaft of the gearing, turning approximately 270 degrees while the valve performs full travel. The reduction gearing shall be equipped with a mechanical position indicator dial. Other indicating devices shall be provided as indicated.
 - 4. Each operator shall be equipped with adjustable torque switches for overload protection in both opening and closing directions with torque switch bypass for unseating.
 - 5. Each operator shall be equipped with four adjustable train gear limit switches. Each limit switch shall include a switch and counter gear. The setting accuracy shall be less than 1/10 turn of the operator output shaft. Two (2) gear limit switches are for switching off when reaching end positions.
 - 6. Each motor shall be 480 volts, 60 Hz, three phase, squirrel cage, totally enclosed type suitable for modulating service. The motor shall be capable of starting and stopping with a frequency of 10 cycles per minute and of reversing service after a minimum delay of 50 msec.
 - 7. Three (3) thermostats in series placed in the winding shall provide the motor with thermal protection. They shall interrupt the control circuit as soon as the temperature goes beyond the permissible winding temperature.
 - 8. Each operator shall be equipped with a reversing magnetic starter. The starter shall be capable of receiving contact closures from remote sources to actuate the operator in either direction. Control voltage shall be 120 volts supplied by a transformer included in the control enclosure. Each operator shall include a local OPEN-STOP-CLOSE control switch and a pad lockable LOCAL-OFF- REMOTE selector switch.
 - 9. All electrical components shall be integral with the operator, housed in an explosionproof NEMA 7 enclosure and completely wired.
 - 10. A circuit-breaker disconnect shall be provided with the operator.
 - 11. Easily identifiable terminal blocks shall be provided for all external power, control, and signal connections.
 - 12. Operator, located outdoors, shall include thermostats and space heaters in the motor and control compartments and heavy duty PVC stern covers.
 - 13. The operator shall be as manufactured by Limitorque; EIM; or equal.

2.5 PAINTING AND FINISHING

- A. All unmachined surfaces of the cast iron sluice gates and slide gates shall be shop cleaned by shot or sandblasting and painted with one coat of a polyester resin primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be as shown on the Drawings and in conformance with AWWA Standard C501 for sluice gates.

3.2 TESTING

- A. After installation the Contractor shall test each gate for satisfactory operation and watertightness against maximum operating pressure insofar as practicable.

- B. Leakage limits shall be as follows:

1. Without resilient seal
 - a. Seating head up to 20 ft. - 0.3 gpm/lin. ft. of perimeter
 - b. Unseating head up to 20 ft. - 0.6 gpm/lin. ft. of perimeter
2. With resilient seal
 - a. Seating head up to 20 ft. - 0.2 gpm/lin. ft. of perimeter
 - b. Unseating head up to 20 ft. - 0.4 gpm/lin. ft. of perimeter

3.3 OPERATION AND MAINTENANCE MANUALS

- A. Prior to or with the delivery of equipment, the manufacturer shall provide copies of an operation and maintenance manual including storage, installation, start-up, operating and maintenance instructions and a complete parts list and recommended spare parts list. The O & M manuals shall be in compliance with the General Requirements.

END OF SECTION 352226

SECTION 400507 - PROCESS PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes hangers and supports for process piping systems and equipment.

1.3 DEFINITIONS

- A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of hanger and support.
- C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Shop Drawings shall be signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code-Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

- C. NFPA Compliance: Comply with NFPA 13 for hangers and supports used as components of fire protection systems.
- D. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
 - 1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- E. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

1.6 PERFORMANCE REQUIREMENTS

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
 - 1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
 - 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.
- C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.
- D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36 (ASTM A 36M), steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, nonshrink, nonmetallic.
 - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is nonstaining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Water: Potable.
 - 4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATION

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at

changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

- F. Install concrete inserts in new construction prior to placing concrete.
- G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.
- H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.
- I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- K. Support fire protection systems piping independent of other piping.
- L. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- M. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- O. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
 - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
 - 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees (3.1 rad) and have dimensions in inches (mm) not less than the following:

	LENGTH	THICKNESS
<u>NPS (Inches)</u>	<u>(Inches)</u>	<u>(Inches)</u>

1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

4. Pipes 8 Inches (DN 200) and Larger: Include wood inserts.
5. Insert Material: Length at least as long as the protective shield.
6. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touching Up: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal is specified in Division 9, Section 099700 - Special Coatings.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.7 WARRANTY

- A. The equipment supplier shall warrant for a period of 12 months that its equipment shall be free from defects in material and workmanship; and that it will replace or repair, F.O.B. its factory, any part or parts returned to it which examination shall show to have failed under normal use and service by the user. Warrantee period will commence upon completion of all project improvements.

END OF SECTION 400507

SECTION 400523 – PROCESS VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Divisions apply to this section:
 - 1. Division 41 – Equipment
 - 2. Division 13 – Special Construction
 - 3. Section 016600 – Product Handling and Protection
 - 4. Section 017850 – Starting of Systems Commissioning
 - 5. Section 013325 – Warranty
 - 6. Section 017860 – Testing, Adjusting and Balancing
 - 7. Section 017870 – Operational Demonstration
 - 8. Section 017900 – Maintenance
 - 9. Section 099700 – Special Coatings

1.2 SUMMARY

- A. Extent of each type of size of valve required is indicated on drawings and/or schedule.
- B. All valves used for a particular service are to be of the same manufacturer, make and style for each valve type.
- C. Each valve unit shall be of the proper size and type to suit the intended service with appropriate body style, operator, joint accessories, coatings, guides, supports, pertinent accessories to be complete, in placed, tested and ready for service in conformance with project conditions.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Provide manufacturer's illustrated catalog data depicting general construction, materials list, coatings and necessary appurtenances in sufficient detail to verify product compliance.
- C. Shop Drawings: Provide manufacturer's drawings showing; principal dimensions, operator detail and arrangements, project schedule tag reference or location of intended usage as required to suit project conditions.

1.4 QUALITY ASSURANCE

- A. Each valve shall be subjected to operation and hydrostatic tests at the manufacturer's plant as specified within applicable AWWA Standards.
- B. All coated surfaces shall receive manufacturer's production and holiday testing as specified in applicable AWWA Standards.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Preparation for Transport: Prepare valves for shipping as follows:
 - 1. Ensure valves are dry and internally protected against rust and corrosion.
 - 2. Protect valve ends against damage and entry of dirt, etc. by use of appropriate end protectors.
 - 3. Set valves in best position for handling. Set gate valves closed to prevent rattling; set ball and plug valves open to minimize exposure of functional surfaces; set butterfly valves closed or slightly open; and block swing check valves in either closed or open position.
- B. Storage: Use the following precautions during storage:
 - 1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.
- C. Handling: Use a sling to handle valve whose size requires handling by crane or lift. Rig valves to avoid damage to exposed or internal valve parts. Do not use handwheels and stems as lifting or rigging points.

1.6 WARRANTY

- A. All equipment furnished shall be warranted per Section 013325.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Valves bodies shall be of either cast or ductile cast iron and shall have the name, monogram, or initials of the manufacturer cast thereon.
- B. Valves shall have nonrising stems, open by turning left or counter-clockwise and be provided with either a 2-inch square nut for buried valves or handwheel for exposed valves unless otherwise noted. The direction of opening shall be indicated by an arrow cast on the body and/or the actuator.

- C. All body bolts and nuts shall be bronze or stainless steel for buried, submerged or nonprotected applications and cadmium plated for exposed or interior applications that will receive protective finish coatings.

2.2 GATE OR TAPPING VALVES **Not Used**

- A. The valves, described in this section shall be resilient seated gate valves manufactured to meet or exceed AWWA C509. Valves shall be of compression type seal design, providing bubble tight shut-off with bi-directional seating ability for pressures up to 200 psi.
- B. The valve shall have a smooth, unobstructed waterway free from any sedimentation pockets. Valve shall provide a 100% port of nominal pipe size when fully open. Tapping valve port shall be sized to permit a full pipe port tap.
- C. Body style shall be mechanical joint type for buried service, flange joint type for exposed service and when required, to include special end connections for tapping requirements or otherwise if indicated on the contract drawings.
- D. Stuffing boxes shall be O-ring seal type with two (2) rings located in steam above thrust collar.
- E. Thrust bearings shall be of the low friction torque reduction type, located both above and below the steam collar.
- F. Valves shall be as manufactured by; American-Darling, Clow, M & H, Stockham, U.S. Pipe or an approved equal.

2.3 BUTTERFLY VALVES - WATER **Not Used**

- A. Butterfly valves shall comply with the latest revision of AWWA Specification C504, Class 150B. Valve discs shall be ductile iron, one (1) piece cast design for constant drip tight closure with flow in either direction for pressure up to 150 psi.
- B. Body style shall be full bodied, mechanical joint for buried service and flange joint type for exposed service unless otherwise indicated on the contract drawings.
- C. Wafer or lug body styles, when called for, shall have body applied seats that totally encapsulate the inside surface of the valve and also serve as the flange gaskets.
- D. All valve seat mating surfaces shall be against a 304 stainless steel or nickel-chromium disc edge surface for body applied seats or a 304 stainless steel surface with an O-ring seal against the body for disc applied seats as applied by means of manufacturers specified herein.
- E. Full body style valve seats shall be of Buna-N (Nitrile) rubber applied to either the body or the disc:
 - 1. Body applied seats shall be retained by a bonding process meeting ASTM-D-429, Test Method "B" or may be mechanically retained.

2. Disc applied seats to be mechanically secured by a 304 stainless steel retention ring and fasteners to allow for field adjustability or replacement.

F. Shafts shall be 316 or 304 stainless steel construction. Shaft bearings shall be self-lubricated sleeve type. Shaft seals may be of V-type packing or standard O-ring seals allowing replacement without removing the valve shaft.

G. Valves shall be as manufactured by; American-Darling, Mueller, Pratt, DeZurik, Keystone or an approved equal.

2.4 BUTTERFLY VALVES - AIR - **Not Used**

A. Valves utilized shall be specifically designed for air service and 25 psi air pressure.

B. Butterfly valves shall meet the intent of the latest AWWA Specification C504, Class 25. These valves shall be a fully lugged wafer type or a flanged type design as indicated on the contract drawings; with cast iron body, ASTM A126, Class B.

C. Disc to be ductile iron, ASTM A536, Grade 65-45-12 with electroless nickel plating or solid welded on nickel disc edge.

D. Elastomer seats shall be in the body. Seat on disc edge is not acceptable in air systems. Seats shall be of EPDM, and be field replaceable without special tools. Elastomer thickness, not inclusive of backing rings or stiffeners, shall be a minimum of 3/8-inch for valves 6 inches and smaller; and 1/2-inch for valves 8 inches and larger.

E. Shafts shall be of 304 or 316 stainless steel construction. Shaft seals shall be adjustable chevron packing or O-ring.

F. Discharge butterfly valves shall have locking lever operators.

G. The valves shall be the product of Keystone, DeZurik or an approved equal.

2.5 CHECK VALVES – WATER **Not Used**

A. Swing Check: Valves shall be quiet closing and constructed for a minimum of 150 pounds working pressure. They shall be iron body, bronze seats, with outside lever and adjustable weights and have hinge pins of stainless steel or bronze. Valves shall be a product of American-Darling, Clow, Empire-GA, Mueller, U.S. Pipe or an approved equal.

B. Swing Flex Check: Valves shall be quiet closing, low headloss and constructed for a minimum of 150 pounds working pressure. Valves shall be Val-Matic Series 500, Cla-Val Model 540, American-Darling or approved equal.

C. Air Cushioned Swing Check: Valves shall be GA Industries Model 250-D cushioned swing check valves with outside lever and weight; APCO; or an approved equal. Cushioned check valves shall be installed in the locations noted.

D. Valves shall be in full compliance with the latest revision of AWWA Specification C508.

2.6 CHECK VALVES - AIR **Not Used**

- A. The body of wafer type construction shall be designed for 25 psi air pressure.
- B. Valves shall have an EPDM sealing member suitable for continuous duty operation.
- C. Bodies shall be cast iron, ASTM A126, Class B with aluminum bronze plates. The valve shall be drilled to match standard ANSI 125 flanges.
- D. Valves shall be Mission "Duo-Check II"; Techno Check Valve, Apco, Val-Matic; an approved equal.

2.7 KNIFE GATE VALVES **Not Used**

- A. Knife gate valves shall be wafer style with tapped bolt holes, one (1) piece body design, and suitable for 0 to 150 psig drip-tight shut-off service. Valves over 20 inches in diameter shall be suitable for 50 psig rating.
- B. Valve, bodies, blade, stem, and all other wetted parts shall be 304 stainless steel. The gate shall have a rounded bottom with beveled knife edge and all sides of gate should be finish ground.
- C. Valves shall have handwheel with rising stem and rated for service pressures. Valves over 20 inches in diameter shall be bevel gear operated.
- D. Flanges shall be drilled to ANSI B 16.1, CL 125, 150 psi standard.
- E. Valve packing shall be suitable material, multiple V-ring, compression type with a definite packing gland coated with plastic or epoxy to prevent corrosion.
- F. The yoke sleeve shall be acid resisting bronze.
- G. Provide neoprene elastomer seat ring.
- H. Valves shall be the product of DeZurik Series L825, Ecolaine Series 7L, Red Valve Series G or an approved equal.

2.8 PLUG VALVES - **Not Used**

- A. Valves shall be the nonlubricated, eccentric type with resilient, soft faced Buna-N rubber plugs providing bi-directional dead-tight shut-off to the full valve rating. Valve pressure ratings shall be 175 psi through 12 inches and 150 psi for valves over 12 inches.
- B. Bodies of valves shall be furnished with a welded overlay seat of not less than 90% pure nickel. Seat area shall be completely covered with raised surface weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.

- C. Plugs shall be of ASTM A126 Class B cast iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat shall be externally adjustable in the field with valve in line under pressure.
- D. Valve bearings shall be sleeve type, oil impregnated, permanently lubricated, stainless steel. Nonmetallic bearings shall not be acceptable.
- E. Shaft seals may be of the multiple V-ring or O-ring type conforming with ASTM C504 and shall be externally adjustable and replaceable without removing the valve while under pressure.
- F. Valves shall be full port equivalent to the nominal pipe diameter.
- G. Valves shall be as manufactured by; DeZurik, Keystone, Milliken or an approved equal.

2.9 PRESSURE RELIEF VALVES - AIR **Not Used**

- A. The pressure relief valves shall be compatible with the operating conditions of the blowers as defined elsewhere in these specifications. Each of the blowers shall be furnished with a weighted pressure relief valve on the discharge as shown on the drawings.
- B. The weight loaded pressure relief valve shall be cast iron body with cast iron weights. The cast iron weights shall be easily added or subtracted so that an adjustment can be made to accommodate the blower's pressure capabilities.
- C. The weighted pressure relief valves shall be as manufactured by Fuller Company; Roots Type PW; or an approved equal.

2.10 PRESSURE RELIEF VALVES - WATER; TANK TYPE **Not Used**

- A. Valves to be of floor and wall type as required to suit project conditions. All such valves are to be of same manufacturer throughout project and installed per published recommendations of such.
- B. Valves shall be of flanged body style and be complete with body, or wall, pipe in length of concrete thickness being placed, removable strainer and soft composition rubber seats on both the body and cover.
- C. Floor types have integral locking lugs to retain cover, but allow for removable if necessary.
- D. Wall types shall be hinged with bronze pin and may permit use of an independent wall casting if strainer is mounted within the valve unit.
- E. Valves shall be as manufactured by; American-Darling, Clow, Trumbull Industries or an approved equal.

2.11 SURGE RELIEF VALVE **Not Used**

- A. Valves shall open rapidly when system pressure exceeds the intensity for which the spring is set and close upon pressure subsidence below spring setting. Provision shall be incorporated to adjust the spring setting for opening. Initial relief pressure to be factory set.
- B. The valve disc shall close slowly against an oil cushion chamber and cylinder and be adjustable.
- C. The valve shall be capable of operating in any position. The valve body shall be an angle design.
- D. The valve interior trim shall be bronze conforming to ASTM B62.
- E. Valve seat shall be 316 SS.
- F. A visual valve position indicator shall be provided for observing the valve position at any time.
- G. Valve shall be as manufactured by Dezurik Series 3000A angle style, GA Industries Figure 625 or an approved equivalent.

2.12 COMBINATION AIR VALVE ASSEMBLIES – SEWAGE SERVICE **Not Used**

A. Combination Air Valves

1. Wastewater Combination Air Valves shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both Wastewater Air Release and Wastewater Air/Vacuum Valves and furnished as a Single Body or Dual Body Type as indicated on the plans.
2. Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.
3. Single Body Valves sizes 4 in. (100 mm) and smaller shall have full size NPT inlets and outlets equal to the nominal valve size with a 2 in. (50 mm) inlet on 1 in. (25 mm) valves. The body inlet connection shall be hexagonal for a wrench connection. The valve body shall have 2 in. NPT cleanout and 1 in. NPT drain connections on the side of the casting.
4. Dual Body Valves sizes 3 in. (75 mm) and smaller shall have full size NPT inlets and outlets equal to the nominal valve size with a 2 in. (50 mm) inlet on 1 in. (25 mm) valves. The body inlet connection shall be hexagonal for a wrench connection. Valve sizes 4 in. (100 mm) and larger shall have bolted flanged inlets and NPT outlets. Flanges shall be in accordance with ANSI B16.1 for Class 125 iron flanges.
5. The valve shall have three additional NPT connections for the addition of backwash accessories.

6. Both Single and Dual Body Valves shall provide body with a through flow area equal to the nominal size. Bodies shall provide a non-clog design with extended length and sloped bottom. Floats shall be unconditionally guaranteed against failure including pressure surges. A resilient bumper shall be provided on 4 in. (100 mm) and larger sizes to cushion the float during sudden opening conditions. The seat shall provide drop tight shut off to the full valve pressure rating.
7. Dual Body Valves shall consist of a Wastewater Air Release Valve piped to a Wastewater Air/Vacuum Valve with a full-ported brass ball valve.
8. The Wastewater Air Release Valve shall have an extended leverage mechanism with sufficient mechanical advantage so that the valve will open under full operating pressure. An adjustable threaded resilient orifice button shall be used to seal the precision discharge orifice in the cover.
9. The Wastewater Air/Vacuum Valve sizes 4 in. (100 mm) and larger shall have a cover fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The tandem float assembly shall have a hexagonal guide shaft supported in the body by circular bushings to prevent binding from debris. The upper float shall be protected against direct water impact by an internal baffle. The seat shall be a minimum of ½ in. (12 mm) thick on 2 in. (50 mm) and larger valves and secured in such a manner as to prevent distortion.
10. Single Body Valves shall have a full port orifice, a double-guided plug, and an adjustable threaded orifice button. The 1 in. (25 mm) body shall be globe style to increase float clearance and reduce clogging. The plug shall be protected against direct water impact by an internal baffle and an extended float stem. The plug shall have a precision orifice drilled through the center stem. The float shall include a sensitivity skirt to minimize spillage.
11. The valve body and cover shall be constructed of ASTM A126 Class B cast iron.
12. The float, plug, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic guides and bushings are not acceptable. Resilient seats shall be Buna-N.
13. Options:
 - a. Backwash accessories shall be furnished for severe service when specified and shall consist of an inlet shut-off valve, a blow-off valve, a clean water inlet valve, rubber supply hose, and quick disconnect couplings. Accessory valves shall be quarter-turn, full ported bronze ball valves.
 - b. An optional Regulated Exhaust Device shall be provided when specified to reduce pressure surges due to column separation or rapid changes in velocity and pressure in the pipeline.
 - c. The Regulated Exhaust Device shall be mounted on the outlet of the Wastewater Air/Vacuum Valve, allow free air flow in and out of the valve, close upon rapid air exhaust, and control the air exhaust rate to reduce pressure surges.

- d. The device shall have a threaded or flanged globe-style body with a center guided disc and seat assembly. The disc shall have threaded holes to provide adjustment of the air exhaust rate through the valve. The holes shall provide a flow area of 5% of the normal valve size.
- e. The material of the body shall be consistent with the air valve. The seat and disc shall be ASTM A351 Grade CF8M stainless steel.
- f. Optional body materials include ASTM A536 Grade 65-45-12 ductile iron, ASTM A351 Grade CF8M stainless steel, and ASTM B584 Alloy 836 cast bronze.
- g. Optional non-stick coating of fusion bonded epoxy shall be provided for severe service when specified.

2.13 TIDE CHECK VAVLES **Not Used**

- A. Unless otherwise indicated, flap gates/tide gates shall be as follows:
 - 1. Valves are to be all rubber and the flow operated check type with a flanged end connection. The port area shall contour down to a duckbill, which shall allow passage of flow in one direction while preventing reverse flow. The flange and flexible duckbill sleeve shall be one-piece rubber construction with nylon reinforcement.
 - 2. The flange drilling shall conform to ANSI B16.1 Class 125/ANSI B16.5, Class 150 standards.
 - 3. Valves shall be as manufactured by Tideflex, Series 35-1 and furnished with 304 stainless steel back-up rings for installation.

2.14 OPERATORS

- A. All valves 6 inches and larger, and all buried, submerged, or chain operated valves shall be gear operated. Gears for valve operation shall be sized for the working pressure and installed in such a manner that the stuffing box will be accessible for packing.
- B. Manual Operation
 - 1. Valves shall be equipped with nut, handwheel, crank, chain, gears, floor stand, and other appurtenances as required for manual operation as specified or scheduled.
 - 2. Operation shall be designed so that the effort required to operate the handwheel, lever, or chain shall not exceed 25 lbs. applied at the extremity of the wheel or lever.
 - 3. Handwheels on valves 4 in. and larger shall not be less than 12 in. in diameter.
 - 4. Chainwheels shall be provided when installed centerline of valve is over 5 ft.-6 in. above the floor. Chains shall be cadmium plated and loop 3 ft.-6 in. from the floor. Orient chainwheel and provide intermediate pulley mounting, if necessary, to permit unobstructed chain operation.
 - 5. Wrench nuts shall be cast iron or bronze, 1-15/16 in. at top, 2 in. square at base and 1-3/4 in. high with a flanged base.
 - a. Provide one (1) tee wrench for each valve type used and of each significant length differential required. All wrenches supplied shall be a length so that the

bar handle extends approximately 3 feet above finished grade in addition to the required bury depth length(s).

C. Hydraulic Operation

1. Valves for hydraulic operation shall be equipped with cylinders in accordance with AWWA C540, mounted on the valve bonnet. The size of the cylinder shall be determined by the valve manufacturer to be adequate for specified pressure and operating conditions in each instance where a hydraulically operated valve is specified in the definitive specifications of this section. Unless otherwise specified, cylinders above 12 inches in size, or where the cylinder pressure exceeds 100 lbs., shall be cast iron bronze-lined type.

D. Electric Valve Operations

1. The operator shall be the helical and worm gear type driven by an electric motor. All power gearing shall be Oil Bath lubricated. The actuator shall be in conformance with AWWA C540. The valve manufacturer shall furnish the value of the maximum operating torque required to operate the valve as defined in the Appendix to AWWA C540. The operator manufacturer shall furnish evidence that the operator is designed to equal or exceed the torque requirements.
2. Unless otherwise noted, the operator shall be geared to operate the valve from the fully open position to the fully closed position or vice-versa in approximately 60 seconds for $\frac{1}{4}$ turn valves, and 12 inches per minute for multi turn valves. It shall be possible to change this cycle time by substituting suitable gear trains. The operator shall be equipped with a declutchable handwheel for manual operation. The operator shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering.
3. Suitable reduction gearing shall be provided off the main shaft of the gearing, turning approximately 270 degrees while the valve performs full travel. The reduction gearing shall be equipped with the following position indicating devices for each operator:
 - a. Backlit LCD Display
 - b. The output signal shall be 4-20 ma; a standard potentiometer, 1000 ohms with linearity of +/- 1% for indication in the remote controller;
4. Each operator shall be equipped with adjustable torque switches for overload protection in both opening and closing directions with torque switch bypass for unseating. Torque shall be measured electronically. Torque measurements that rely on motor speed, current, or springs are not acceptable.
5. Each operator shall be equipped with four programmable indication contacts. The setting accuracy shall be 0.1% of the operator output turns.
6. Each motor shall be 480 volts, 60 Hz, three phase, induction type as recommended by the operator manufacturer. Motors shall be designed specifically for actuator service and capable of modulating the valve for set point control applications as indicated in PID and or control narrative specifications or other specifications.

7. Three (3) thermostats in series placed in the winding shall provide the motor with thermal protection. They shall interrupt the control circuit as soon as the temperature goes beyond the permissible winding temperature.
8. Each operator shall be equipped with a reversing magnetic starter. The starter shall be capable of receiving contact closures from remote sources to actuate the operator in either direction. Control voltage shall be 120 volts supplied by a transformer included in the control enclosure. Each operator shall include a local OPEN-STOP-CLOSE control, push button station, and a pad lockable LOCAL-OFF-REMOTE selector switch.
9. All electrical components shall be integral with the operator, housed in an explosion-proof NEMA 7 enclosure and completely wired. All enclosures shall be concurrently NEMA 4, 6, and 7 and be rated for submersibility in 60 feet of water for 10 days.
10. A circuit-breaker disconnect shall be provided with the operator. Disconnects shall be heavy duty, and not integral to the actuator housing. Disconnects shall have a NEMA type 4 and 7 enclosure. Motor starting switches are not a suitable alternative to disconnect switches.
11. Easily identifiable terminal blocks shall be provided for all external power, control, and signal connections.
12. Space heaters, desiccants, breathers and drains of any type are specifically prohibited. The actuator shall have a completely sealed enclosure with separately sealed terminal compartment.
13. The operator shall be as manufactured by Rotork or engineer approved equal.

2.15 PROTECTIVE COATINGS

- A. All iron parts of valve assemblies shall be painted before leaving the shop.
- B. All exterior and internal waterway ferrous surfaces of each valve, except finished or bearing surfaces shall be shop painted with a liquid or powder epoxy coating of approximately 10 mils dry film thickness conforming to AWWA C-550.
- C. Glass lined valves lining material shall consist of vitreous and inorganic material applied to the internal surfaces that have been prepared by blasting. The lining shall be applied in a minimum of two (2) coats, separately applied and fired at an approximate temperature of 1400 degrees F. The entire finished coat shall be a minimum of 10 mils (0.01") and a maximum of 25 mils (0.025"). The glass lining shall be tested by "low voltage, wet sponge, non-destructive holiday detection unit" per applicable ASTM D-5162-01, NACE RP 0188-99 and SSPC Coating Manual Volume 1 Section XIV standards and documentation submitted to the Engineer to review. The standard for quality shall be VITCO SG-14, Fast Fabricators/ Waterworks Manufacturing MEH-32, or approved equal.

2.16 EXTENSION STEMS AND STEM GUIDES

- A. When required by drawings, schedule or project details, provide an extension stem made of cold-rolled steel material and the same size as the stem of the valve it operates. If the extension is more than 8 ft. long, intermediate stem guides shall be installed and supported from the wall by suitable brackets at a maximum spacing of 8 ft.
- B. Brackets and stem guides shall be made of cast iron and fully adjustable. The guide block shall be bronze bushed where it contacts the extension stem. Stem guides shall be as manufactured by the Eddy Valve Co., Rodney Hunt, or equal. Secure stem guides to walls with stainless steel bolts. In the event of off-set or misalignment, provide off-set extension rod with universal end fittings at valve actuator and stem drop connection.
- C. Extension stem shall have connecting socket for 2-inch square nut and pinsocket to lock on valve operating nut.

2.17 VALVE BOXES

- A. Valve boxes shall be cast iron, 5-1/4" shaft, three-piece screw type, adjustable boxes. The top section to have a drop lid of which to be marked for service which it is used cast thereon. Cover and boxes shall be round pattern.
- B. Provide proper base size and shape to straddle the valve bonnet without touching or being supported by the valve mechanism. Use No. 6 base size for 6-inch and 8-inch gate valves or typical butterfly valve operators, No. 160 oval base size for 12-inch and larger gate valves or other size necessary to suit a particular valve manufacturer's requirements.
- C. Extension sections shall be provided where the depth of trench is such that they are needed to bring the top of the box to finished grade. The valve box shall be installed so that it is perfectly vertical and centered on the valve operating nut.

2.18 FLOOR BOXES AND STANDS

- A. Each valve operator projecting through a floor shall be equipped with a floor box or floor stand and extension stem.
- B. Floor boxes shall be as manufactured by valve supplier.
- C. Floor stands shall be made of cast iron and shall extend to a level where handwheel or other operator is easily operated. Stands shall be fitted with bronze bushings to maintain proper stem alignment, brass or stainless steel nameplates shall be provided to identify related valve manufacturer, valve type and size or in the case of stand being of valve manufacturer, cast in name would suffice. Provide plastic stem covers with open-close scale for all rising stem applications. Stands shall be anchored to the concrete slab with stainless steel bolts.

2.19 TELESCOPING VALVES (NOT USED)

- A. Valves shall be capable of giving an infinitely variable discharge rate to suit travel range as indicated on the drawings.

- B. Valves shall be of the rising stem type, unless otherwise noted.
- C. General Contractor shall provide normal bolted, cast iron flange at elevation shown on the drawing and shall be responsible to provide sufficient straight pipe below the valve to allow for full travel of the tube inside.
- D. Each valve shall consist of an offset cast iron floor stand with suitable stem guide, cut tooth pinion bar rack assembly, spur gear with ductile iron locking panel, clear plastic stem cover with cap and travel scale indicator. Pinion shaft is operated by a 12-inch diameter offset handwheel with a rotating crank handle, or an 18-inch diameter top mounted handwheel with anti-rotation plate as required by valve schedule and/or plan illustration.
- E. The decant tube is to be of PVC pipe, smooth, stiff, concentric, connected on upper end with stainless steel bail and threaded adjustable rod connected to the bar rack assembly.
- F. Special flange having a neoprene O-ring insert and a flange transition seal gasket shall be provided by the equipment manufacturer to bolt to pipe flange by Contractor. Foundation bolts for operating stand will be stainless steel furnished with the equipment.
- G. Valves shall be as manufactured by Troy, FMC Corporation, Waterman Industries or an approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Valves shall be carefully handled and placed so as not to permit any damage to the interior coatings, disc or seat. Internal type lifting devices shall not be permitted. Do not use handwheels or stems as lifting of rigging points.
- B. All valves shall be carefully installed in their respective positions free from distortion and stress. Connecting joints shall conform to applicable requirements of the specifications.
- C. Stem guides shall be accurately aligned.
- D. If the valve box is tipped or otherwise not centered on the valve operating nut or not installed at the proper elevation, the Contractor shall, at his own expense, make whatever correction is required to remedy the defect promptly, upon notice to do so by the Engineer.

3.2 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance (O&M) manuals shall be submitted and in accordance with Section 017823.

3.3 EQUIPMENT COMMISSIONING

- A. Equipment commissioning shall be in accordance with Section 017850 Starting of Systems/Commissioning.

3.4 TESTING

- A. After completion of installation, the Contractor shall provide for testing per Section 017860. Testing shall be performed in strict conformance with the manufacturer's start up instructions. Testing of the equipment shall demonstrate that the equipment is fully operational.
- B. Field certification shall include inspection of the following:
 - 1. Verify equipment is properly aligned per the installation instruction and drawings.
 - 2. Assure controls and instrumentation work in all modes.

3.5 MANUFACTURER'S SERVICES

- A. The equipment manufacturer shall provide factory testing per Section 017860.
- B. The equipment manufacturer shall be present for Start-up and Commissioning of equipment per Section 017850.
- C. The equipment manufacturer shall provide Instruction of Owner's Personnel per Section 017890.

3.6 VALVE SCHEDULE

- A. Valves to be provided by the Contractor are shown on the Valve Schedule in the Contract drawings. The following abbreviations are used in the Valve Schedule:

OPERATOR

CH – CHAIN

EM – ELECTRIC MOTOR

ES – EXTENSION STEM

FB – FLOOR BOX

FS – FLOOR STAND

GE – GEAR

TW – TURNWHEEL

LE – LEVER

ON – OPERATING NUT

OS&Y – OUTSIDE SCREW & YOKE

VB – VALVE BOX

OWL – OUTSIDE WEIGHT & LEVER

JOINT

FL – FLANGED

MJ – MECHANICAL JOIN

NPT – THREADED

WELD – WELDED

SW – SOLVENT WELD

TYPE

GV – GATE VALVE

CV – CHECK VALVE

BV – BALL VALVE

PRV – PRESSURE REDUCING VALVE

MV – MUD VALVE

END OF SECTION 400523

SECTION 402336 - PROCESS PIPE AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of pipe, tube, and fittings required by this section is indicated on drawings and/or specified in other sections.
- B. Types of pipe, tube, and fittings specified in this section include the following:
 - 1. Steel Pipes
 - 2. Copper Tube
 - 3. Ductile Iron Pipe
 - 4. Plastic Pipe
 - 5. Plastic Tubing
 - 6. Drainage Tile
 - 7. Miscellaneous Piping Materials/Products
- C. Pipes and pipe fittings furnished as part of factory- fabricated equipment are specified as part of equipment assembly in other sections.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- C. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.
- D. Codes and Standards:
 - 1. Welding: Quality welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work. Certify welding of piping work using Standard Procedure Specifications by, and welders tested under supervision of, the National Certified Pipe Welding Bureau (NCPWB).

2. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.
3. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipe and fittings bearing approval label by National Sanitation Foundation (NSF).

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of pipe and pipe fitting. Submit piping schedule showing Manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.
- B. Welding Certifications: Submit reports as required for piping work.
- C. Brazing Certifications: Submit reports as required for piping work.
- D. Maintenance Data: Submit maintenance data and parts lists for each type of mechanical fitting. Include this data, product data, and certifications in maintenance manual; in accordance with requirements of Division 1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Except for concrete, corrugated metal, hub-and-spigot, clay, and similar units of pipe, provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.
- B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
- C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packing with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards. Where any cuprous material contact iron products a dielectric union shall be provided.

- B. Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.2 STEEL PIPES AND PIPE FITTINGS

- A. Black Steel Pipe: ASTM A 53, A 106 or A 120; except comply with ASTM A 53 or A 106 where close coiling or bending is required.
- B. Galvanized Steel Pipe: ASTM A 53 or A 120; except comply with ASTM A 53 where close coiling or bending is required.
- C. Malleable-Iron Threaded Fittings: ANSI B16.3; plain or galvanized as indicated.
- D. Malleable-Iron Threaded Unions: ANSI B16.39; selected by Installer for proper piping fabrication and service requirements, including style, end connections, and metal-to-metal seats (iron, bronze or brass); plain or galvanized as indicated.
- E. Threaded Pipe Plugs: ANSI B16.14.
- F. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.
 - 1. Material Group: Group 1.1.
 - 2. End Connections: Buttwelding.
 - 3. Facings: Raised-face.
- G. Grooved-Joint Couplings/Fittings: ASTM A234
 - 1. Couplings consist of two ductile iron housing segments conforming to ASTM A536 Grade 65-45-12, pressure responsive elastomer gasket (grade to suit the intended service) and ASTM A449 compliant bolts and nuts. Couplings conform to ASTM F1476: Standard for Performance of Gasketed Mechanical Couplings in Piping Applications.
 - a. Rigid Type: Housings cast with offsetting, angle-pattern, bolt pads to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Installation-Ready™ for complete installation without field disassembly. Basis of Design: Victaulic Style 107N.
 - b. Flexible Type: For use in locations where vibration attenuation and stress relief are required: Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.
 - c. AGS two-segment couplings for pipe sizes 14” and larger, with wide-width FlushSeal® gasket and lead-in chamfer on housing key. Basis of Design: Victaulic Style W07 (rigid) and Style W77 (flexible).

2. Installation-Ready™ gaskets are center-leg, with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth.
3. For direct connection between IPS / steel pipe and AWWA / ductile iron pipe, Victaulic Style 307 transition coupling.

2.3 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88; Type L (above grade), Type K (below grade) as indicated for each service; hard-drawn temper, except as otherwise indicated.
- B. Grooved-end Joint Couplings: Shall consist of copper colored alkyd enamel coated ductile iron housings, conforming to ASTM A395 and A536, cast with offsetting angle-pattern bolt pads, complete with pressure responsive synthetic rubber center-leg gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth.
- C. Grooved-end Joint Fittings: Shall be wrought copper, conforming to ASTM B75 and B152 and ANSI B16.22, or bronze sand castings, conforming to ASTM B584-87 and ANSI B16.18. (Fittings manufactured to copper tubing sizes. Flaring of tube and fitting ends to IPS dimensions is not allowed.)
- B. DWV Copper Tube: ASTM B 306.
- D. ACR Copper Tube: ASTM B 280.

2.4 DUCTILE IRON PRESSURE PIPES AND PIPE FITTINGS

- A. Ductile Iron Pipe: ANSI A21.51; AWWA C151.
- B. Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water: ANSI A21.4; AWWA C104.
- C. Polyethylene Encasement for Ductile Cast-iron Piping: ANSI A21.5; AWWA C105.
- D. Ductile Iron-Fittings: AWWA C110. All fittings shall be full body. Compact fittings are not permitted.
- E. Rubber Gasket Joints: AWWA C111.
- F. Grooved-end Joints for Ductile Iron Pipe and Fittings:

1. Grooved-end joint couplings for ductile iron piping designed for the working pressures specified for the piping system with which they are to be used. Couplings shall be self-centering and shall engage and lock in place the grooved pipe and pipe fitting ends, in a positive couple. Coupling housing clamps shall be fabricated in two

or more sections of ductile iron castings, conforming to the requirements of ASTM A 536, Grade 65-45-12. Coupling gaskets shall be molded synthetic rubber, FlushSeal®, conforming to ASTM D 2000, Grade to suit the intended service. Bolts shall be oval neck, track head type, with hexagonal heavy nuts conforming to ASTM A449 and A183. Grooved, hinged flange adapters, with gaskets, shall be furnished for making valve or flanged connections, and shall be constructed of the same materials as used for the couplings. Basis of Design: Victaulic Style 31 (coupling) and Style 341 (flange adapter).

G. Flanged Joints for Ductile Iron Pipe and Fittings:

1. All flanged joints shall conform to ANSI/AWWA C115/A21.15. Full face type rubber gaskets one eighth (1/8) inch thick as manufactured by the U.S. Rubber Company or equal shall be used in all flanged joints.
2. All bolt heads and nuts shall conform in dimensions to the American Standard heavy series and nuts shall be hexagonal cold pressed with well-fitting threads. Bolts and nuts shall be cadmium plated by an approved process with a plate thickness of 0.0003 to 0.0005 inches. In lieu of cadmium plating, galvanizing will be acceptable. All studs shall be made from silicon bronze ASTM B 124 with bronze nuts where used in contact with any liquid or buried underground or Type 316 stainless steel using an anti-seize lubricant during assembly or as called for on the contract drawings.
3. Flanged coupling adapters are permitted as may be useful in pipe assembly. Fittings shall meet or exceed ASTM A536, Grade 65-45-12. Flange shall meet ANSI Class 125. Flange gasket shall be an O ring nitrile butadiene rubber meeting ASTM D 2000. T bolts shall be high strength alloy steel meeting AWWA C111.

H. Mechanical Joints

1. All mechanical joints and accessories shall be in accordance with AWWA C111/A21.11.
2. Gaskets shall be in compliance with ANSI A21.11 and made of SBR rubber unless a material or tip style change is deemed appropriate to suit the needs of the service being conveyed in accordance with pipe manufacture's recommendations.
3. Mechanical joint connections using a smaller diameter PVC or other iron pipe size pipe, an approved duck-tipped transition gasket shall be provided in accordance with the manufacturer's standards and recommendations.
4. M.J. bolt assemblies shall be in accordance with the manufacturer's recommendations using a Tee-head bolt per ANSI/AWWA C-111, thread pitch -ANSI/ASME B1.1 (UNC), thread class 2A and a Hex nut thread pitch -ANSI/ASME B1.1 (UNC), thread class 2B.
5. Bolt assemblies used on inside applications shall be corrosion resistant, high strength, low carbon alloy steel having minimum yield strength of 45,000 psi.

6. All bolt heads and nuts shall conform in dimensions to the American Standard heavy series and nuts shall be hexagonal cold pressed with well-fitting threads. Bolts and nuts shall be cadmium plated by an approved process with a plate thickness of 0.0003 to 0.0005 inches. In lieu of cadmium plating, galvanizing will be acceptable. All studs shall be made from silicon bronze ASTM B 124 with bronze nuts where used in contact with any liquid or buried underground or Type 316 stainless steel using an anti-seize lubricant during assembly or as called for on the contract drawings.
7. All "job" cut pipe ends shall be ground, filed or otherwise properly worked on so as to be beveled and square to the pipe barrel similar to "factory" finished pipe ends. There shall be no "burrs" on any part of the cut pipe end.
8. Joint deflection shall be limited to no more than eighty percent (80%) of the manufacturer's maximum recommendation. Joints shall not be deflected after being secured on pipe.
9. Where shown on the drawings, or ordered, mechanical joints shall be provided with approved harnesses to affect tied joints.
10. No special payment will be made for glands, bolts, nuts, gaskets, harnesses to effect tied joint or lock type joints used for mechanical joint connections. The cost thereof shall be included in the unit price bid for mechanical joint cast/ductile iron pipe and mechanical joint cast/ductile iron fittings. Payment, when specified, on a tonnage basis will be based on the body weight of the pipe or fittings only and shall not include additional weight of accessories.

2.5 PLASTIC PIPES AND PIPE FITTINGS

- A. Polyvinyl Chloride Pipe (PVC): ASTM D 1785.
- B. Polyvinyl Chloride Water Pipe (PVC): AWWA C900, and C905.
- C. Polyvinyl Chloride Sewer Pipe (PVC): ASTM D 2729.
- D. PVC Fittings:
 1. Schedule 80 Socket: ASTM D 2467.
 2. Schedule 80 Threaded: ASTM D 2464.
 3. Sewer Socket: ASTM D 2729.
 4. Fusion ASTM D638
 5. Solvent Cement: ASTM D 2564.
 7. Solvent Cement (To Join PVC to ABS): ASTM D 3138.
 8. Appurtenances used to make flanged joints shall include: 1/8 in. thick red rubber gaskets, bolts having American Standard Heavy Unfinished Hexagonal Head and Nut dimensions in conformance with ANSI B18.1, and material for bolts and nuts shall conform to ASTM A 575 or A 576.

- E. Polyethylene Tubing (PE): ASTM D 2737.
- F. Polyvinyl Chloride Tubing (PVC): ASTM D 2740.
- G. PE Fittings: ASTM D 2609.
- H. PVC Fittings: ASTM D 2609.
- I. Materials of construction, including joints and gaskets, shall be suitable for exposure to raw sewage, and shall also be UV stabilized with either 2% carbon black or titanium dioxide.
- J. Threaded connections will be used and changes in same class as the pipe. It is the intent of these specifications and be put together in such a way that it can be easily rodded and disassembled in short lengths for cleaning.
- K. Push on Joints for PVC Pipe and Fittings:
 - 1. Push on type joints shall be in accordance with applicable ANSI/AWWA or ASTM standards as well as the requirements of the manufacturer's pipe and fittings being used for intended service use of either gravity or pressure pipe application as called for on the contract drawings.
 - 2. Rubber gaskets shall be of type shaped to fit the particular configuration of the bells of the pipe being installed and shall produce a leak free pipe system.
 - 3. Immediately prior to assembly, thoroughly clean all pipe surfaces which the rubber gasket contacts, insert the gasket properly and lubricate the joint surfaces.
 - 4. Schedule 40, 80, and 120 sizes and pressure-rated for water is often belled for use as line pipe. For details of the solvent cement bell, see ASTM Specification D 2672 and for details of belled elastomeric joints, see ASTM Specifications D 3139 and D 3212.
 - 5. All ends shall be beveled and square to the pipe barrel and shall be kept in a straight and square alignment to the receiving bell during assembly.
 - 6. All "job" cut pipe ends shall be ground, filed or otherwise properly worked on so as to be beveled and square to the pipe barrel similar to "factory" finished pipe ends. There shall be no "burrs" on any part of the cut pipe end.

2.6 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

- A. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Installer to comply with installation requirements. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.
- B. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by Installer to comply with installation requirements. Solder shall be lead free.

- C. Brazing Materials: Except as otherwise indicated, provide brazing materials as determined by Installer to comply with installation requirements. Comply with SFA-5.8, Section II, ASME Boiler and Pressure Vessel Code for brazing filler metal materials.
- D. Grooved Joint Lubricants: Lubricate gasket in accordance with the manufacturer's published instructions with lubricant approved for the gasket elastomer and fluid media. Basis of Design: Victaulic Vic-Lube.
- E. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.
- F. Piping Connectors for Dissimilar Non-Pressure Pipe: Elastomeric annular ring insert, grooved-end waterway, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends and subject to approval by plumbing code.
 - 1. Dielectric Waterway: Fittings shall be a copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service. Fittings shall have threaded ends, grooved ends, or a combination. Victaulic Style 647.
- G. Expansion joint fittings: Expansion joint fittings to be integral flanged end wide arch spools where no gaskets are required, rated for a vacuum of 26" Hg and 250 °F continuous service. Tube and cover elastomers to be EDPM. Flanged ends to match drilling pattern of mated piping joint. Sewage lines to have solid filled arch and air lines to have open arch. All expansion joints shall be provided with control units of a style that is compatible with the mated piping joint. Control rods shall be stainless steel and of the style recommended by the manufacturer for the specific application. The number and size of rods shall be based on maximum test pressure. Expansion joints shall be heavy duty Series 1101 as manufactured by General Rubber; Flexicraft Industries – Ultraspool or approved equivalent. Expansion joints and control units shall be of the same manufacturer.
- H. Expansion joint fittings: Expansion joint fittings to be integral flanged end wide arch spools.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

- 1. Install drainage piping (perforated, porous or tile) from lowest end of slope to highest, solidly bedded in filtering or drainage fill. Shape bed for bells of piping (if any). Place bells/hubbs and grooved-ends of units up-stream. Lay perforated pipe with perforations down.

2. All trenches, when pipe laying is in progress, shall be kept dry and all pipes and specials shall be laid accurately to the required lines and grades and shall be uniformly supported along their entire lengths. The bottom of the excavation shall be properly trimmed, with holes at each joint to receive the bell and to permit the properly cementing the joints.
 3. Pipe shall be fully entered and shall abut against adjacent pipe and in such a manner that there will be no unevenness along the inverts.
 4. When pipes enter or pass through concrete walls, manholes, sewers or other structures, holes shall be provided and the pipes properly cemented in place so as to form a watertight joint.
 5. Install gray and ductile cast-iron water mains and appurtenances in accordance with AWWA C600.
 6. Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently- leakproof piping systems, capable of performing each indicated service without piping failure.
 7. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings.
 8. Align piping accurately at connections, within 1/16" misalignment tolerance.
 9. Comply with ANSI B31 Code for Pressure Piping.
- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- C. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical spaces.

3.2 PIPING SYSTEM JOINTS

- A. General: Provide joints of type indicated in each piping system.

- B. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
- C. Braze copper tube-and-fitting joints where indicated, in accordance with ANSI B31.
- D. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
- E. Mechanically Formed Tee Connections: In lieu of providing tee fittings in copper tubing, Installer may, as option, provide mechanically formed tee connections, providing they are in accordance with the following:
 - 1. Size and wall thickness of both run tube and branch tube are listed by Manufacturer of forming equipment as "Acceptable Application".
 - 2. Height of drawn collar is not less than 3 times wall thickness of run tubing.
 - 3. End of branch tube is notched to conform to inner curve of run tube, and dimpled to set exact penetration depth into collar.
 - 4. Resulting joint is minimum of 3 times as long as thickness of thinner joint member, and brazed using B-CuP series filler metal.
- F. Mechanically Formed Couplings: In lieu of providing couplings in copper tubing, Installer may, as option, provide mechanically formed couplings, provided they are in accordance with the following:
 - 1. Form couplings by first annealing area at end of tube where expansion will occur. Insert tube expander to die size required and expand tube end to accept tubing of same size.
 - 2. Resulting joint is a minimum of 3 times as long as thickness of tube, and brazed using B-CuP series filler metal.
- G. Weld pipe joints in accordance with ASME Code for Pressure Piping, B31.
- H. Weld pipe joints in accordance with recognized industry practice and as follows:
 - 1. Weld pipe joints only when ambient temperature is above 0 deg F (-18 deg C) where possible.
 - 2. Bevel pipe ends at a 37.5 deg angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
 - 3. Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10", 8 welds for pipe sizes 12" to 20".
 - 4. Build up welds with stringer-bead pass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures

which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.

5. Do not weld-out piping system imperfections by tack- welding procedures; refabricate to comply with requirements.
6. At Installer's option, install forged branch-connection fittings wherever branch pipe is indicated; or install regular "T" fitting.
7. At Installer's option, install forged branch-connection fittings wherever branch pipe of size smaller than main pipe is indicated; or install regular "T" fitting.

I. Weld pipe joints of steel water pipe in accordance with AWWA C206.

J. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

K. Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically visit the jobsite to ensure best practices in grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.

L. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards:

1. Heat Joining of Thermoplastic Pipe: ASTM D 2657.
2. Making Solvent-Cemented Joints: ASTM D 2235, and ASTM F 402.

M. Open Drain-Tile Joints: Except as otherwise indicated, provide 1/4" open joint, with top 2/3 of annular space covered by joint accessory material.

N. Joint Lubricant: Lubricant shall be nontoxic, not support the growth of bacteria, have no deteriorating effects on the gasket, pipe, or fitting, and shall not impart a taste or odor to the liquid being carried in the pipe.

3.3 CLEANING, FLUSHING, INSPECTING

A. General:

1. Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
2. Inspect pressure piping in accordance with procedures of ASME B31.

- B. Disinfect water mains and water service piping in accordance with AWWA C601.

3.4 PIPING TESTS

- A. Test pressure piping in accordance with ASME B31.
- B. General: Provide temporary equipment for testing, including pump and gages. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.

Testing shall be in accordance with Section 017860.

- C. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- D. Drain test water from piping systems after testing and repair work has been completed.

3.5 COATINGS AND LININGS

- A. Paint: The outside of all interior ferrous pipe and fittings, except plastic coated pipe and fittings, shall be shop primed as specified under Section 099700, Special Coatings.
- B. Bituminous and Coat Tar: The inside of ferrous pipe and fittings shall be coated with an asphaltic material in accordance with ANSI/AWWA C104/A21.4 for ductile iron pipe and fittings, and with a coal tar in accordance with AWWA C203 for steel pipe and fittings. If this coating material is found to be damaged prior to the pipe trench being backfilled, the Contractor shall provide and apply additional material of that required to repair the damages. The Contractor shall have sufficient coating material available at the job site prior to laying the pipe.
- C. Polyethylene Wrap: All underground, buried ductile iron pipe, fittings and appurtenances shall be encased with 8 mil polyethylene film conforming to ANSI/AWWA C105/A21.5, unless noted otherwise. Installation shall include wrapping overlapping terminations at pipe joints.
- D. Glass: A glass lining, where called for, shall be a minimum of two (2) coats, fired separately, for a total thickness of not less than 0.008 inch, have a hardness of 5 to 6 on the MOHS scale with a density of 2.5 to 3.0 grams per cubic centimeter. Glass lining shall be capable of withstanding a thermal shock of 350 deg F., solutions with a pH range of 3 to 10 and no visible loss of surface gloss after immersion in an 8% sulfuric acid solution at 148 deg F. for 10 minutes. In addition, the lining, when tested according to ASTM C283, shall show a weight loss of not more than 3 milligrams per square inch. Lining shall be Ervite Type SG-14 by the Ervite Corporation, the Glass Lined Pipe Company, or equal.

- E. Plastic: A plastic coating and/or lining, when called for, shall not be less than 60 mils thick, be corrosion and abrasion resistant, and be a vinyl polymer conforming to ASTM F491 or a polyethylene copolymer conforming to ASTM F546.
- F. Cement: When called for, pipe and fittings shall be lined with cement mortar and seal coated in accordance with ANSI/AWWA C104/A21.4.

END OF SECTION 402336

SECTION 409000 - FIELD-MOUNTED INSTRUMENTATION EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The general requirements of the instrumentation equipment.

1.02 RELATED SECTIONS

- A. P & ID Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Section 409500
- C. Division 43 - Process Equipment
- D. Division 26 - Electrical

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. Instrument Society of America (ISA).
- C. Underwriters Laboratories (UL): Applicable listings.

1.04 SUBMITTALS

- A. Submit under provisions of Division 1 - General Requirements.
- B. Complete and detailed system schematic drawings showing all components and the pneumatic/hydraulic and electrical point connections of each system together with a description of the operation of the system and equipment.
- C. Instrumentation equipment specifications, outlined dimension drawings, and wiring and piping diagrams for each item of equipment. Duplicate equipment may be covered by one set of literature.
- D. The submittal shall be organized in a logical manner and have a schematic (ladder) diagram for each system.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum five years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.07 RESPONSIBILITY

- A. Under this contract, the General Contractor shall be responsible for the purchase, storage, and proper installation of all field mounted instrumentation equipment and all accessories required.

1.08 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 1 - General Requirements.
- B. Complete descriptive literature for each piece of equipment, including a list and description of all parts of each piece of equipment.
- C. Data sheets containing information relative to metering range, indicator or chart range, electrical requirements, system function, and shop drawing data.
- D. Process flow diagrams showing location of instrumentation equipment, function of each piece, and description of use of equipment as applied to this project.
- E. Equipment settings required at various flow.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1 - General Requirements.
- B. Accept unit on site on skids. Inspect for damage (do not accept damaged equipment).
- C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

PART 2 PRODUCTS

2.01 GENERAL

- A. Furnish and install the instrumentation and appurtenances required for this project.
- B. Electronic instruments shall be solid state and the manufacturer's latest design. Equipment shall use a 4-20 mA DC standard process signal unless

otherwise specified. Signals from measuring systems and analyzers with millivolt outputs shall be immediately raised and converted to 4-20 mA DC signals for transmission.

- C. All field instruments shall be of the same manufacturer and general model type.
- D. Equipment to be installed in hazardous locations shall be listed for the location. Refer to electrical drawings for area classifications.

2.02 FLOAT SWITCHES

- A. The level detecting devices shall be mechanical activated wide angle to prevent activation with surface turbulence.
- B. The float switch shall have a 20 amp rating at 120 VAC. The float switch shall close on rising level. Each float switch shall have a normally open and normally closed contact.
- C. Mounting column shall be 316 SS long enough to terminate in a field-mounted junction box with terminal strips provided for power and float switch connections.
- D. The length of the column and cabling shall be sized by the contractor.
- E. The floats shall be manufactured by SJE Pump Master or approved equal.

2.03 RADAR TYPE LEVEL DETECTOR

- A. Acceptable Manufacturers:
 - 1. Vega
 - 2. Rosemount
 - 3. or approved equal.
- B. Level Sensor:
 - 1. Measuring range up to 15 m (49.21 ft)
 - 2. Deviation ≤ 2 mm
 - 3. Beam angle 8°
 - 4. Measuring frequency W-band (80 GHz technology)
 - 5. Output signal 4 ... 20 mA/HART
 - 6. Process fitting Thread G1½, 1½ NPT, R1½
 - 7. Mounting connection Thread G1, 1 NPT, R1
 - 8. Process pressure -1 ... +3 bar (-100 ... +300 kPa/-14.5 ... +43.51 psig)
 - 9. Process temperature -40 ... +80 °C (-40 ... +176 °F)
 - 10. Ambient temperature -40 ... +80 °C (-40 ... +176 °F)
 - 11. Bluetooth standard Bluetooth 5.0

12. Bluetooth range typically 25 m (82 ft)
13. Operating voltage 12 ... 35 V DC
14. Protection rating IP66/IP68 (3 bar, 24 h) acc. to IEC 60529,
15. Type 4X/6P acc. to UL 50

C. Level Indicating Transmitter:

1. Operating voltage
 - a. Nominal voltage AC: 100 ... 230 V (-15 %, +10 %) 50/60 Hz
 - b. Nominal voltage DC: 24 ... 65 V (-15 %, +10 %)
 - c. Power consumption max: 17 VA; 6 W
2. Sensor input
 - a. Number of sensors: 1 x 4 ... 20 mA/HART
 - b. Type of input (selectable)
 - i. Active input: Sensor supply through VEGAMET 861
 - ii. Passive input: Sensor has an own voltage supply
 - c. Measured value transmission
 - i. 4 ... 20 mA analogue for 4 ... 20 mA sensors
 - ii. HART protocol digital for HART sensors (not with passive input)
3. Digital input
 - a. Quantity: 2 x digital input
 - b. Input type active
 - i. Voltage: > 14 V DC
 - ii. Current: > 3 mA
 - c. Input type passive
 - i. Switching threshold Low: -3 ... 5 V DC
 - ii. Switching threshold High: 11 ... 30 V DC
4. Relay output
 - a. Quantity 4 x operating relay, one can be configured as fail safe relay
 - b. Switching voltage: max. 250 V AC/60 V DC
 - c. Switching current: max. 1 A AC (cos phi > 0.9), 1 A DC
 - d. Breaking capacity: min. 50 mW, max. 250 VA, max. 40 W DC (with U < 40 V DC)
5. Current output
 - a. Quantity: 1 x output
 - b. Range: 0/4 ... 20 mA, 20 ... 0/4 mA
 - c. Max. load: 500 Ω
6. Bluetooth interface
 - a. Bluetooth standard: Bluetooth 5.0
7. Indicators
 - a. Measured value indication
 - b. Graphic-capable LC display, with lighting 89 x 56 mm, digital and quasianalogue display
 - c. Adjustment elements: 4 x keys for menu adjustment
8. Memory card

- a. Memory card type: microSDHC industrial
9. Ambient conditions
- a. Ambient temperature
 - i. Instrument in general: -40 ... +60 °C (-40 ... +140 °F)
 - ii. Display (readability): -20 ... +60 °C (-4 ... +140 °F)
10. Electrical protective measures
- a. Protection rating: IP66/IP67 acc. to IEC 60529, Type 4X acc.to UL 50

2.04 TRANSDUCERS

A. Voltage-To-Current (V/I) Transducers

1. Acceptable Manufacturers:
 - a. Moore Industries.
 - b. AGM.
 - c. or approved equal.
2. Voltage-to-current transducers or isolators shall change a voltage input signal to a proportional current output signal.
3. The device shall be completely solid state.
4. The device shall accept an input voltage signal and shall provide an output signal of 4-20 mA DC.
5. Accuracy: ± 0.5 percent of full scale.
6. Ambient Temperature Range: 4 to 52 degrees C.
7. Prepare unit for surface mounting or for mounting in equipment enclosures as specified.

B. Current-to-Current (I/I) Transducers (Isolators)

1. Acceptable Manufacturers:
 - a. Moore Industries.
 - b. AGM.
 - c. or approved equal.
2. Current-to-current transducers shall be an electronic type and shall convert current inputs to proportional current outputs.
3. Span: Adjustable over full scale.
4. Zero: Adjustable over full scale.
5. Accuracy: ± 0.1 percent of span.
6. Isolation: 1 kV peak to peak.

2.05 INSTRUMENT POWER

- A. Provide instruments to operate on 105-135 V RMS at 60-Hz power supplies. Provide regulators and power supplies with the instrument required for compliance. Electrical isolation shall be provided between power supplies and connected instrument systems. Equipment which requires voltage regulation of less than ± 10 percent variation shall be provided with constant voltage transformers.

- B. All panels containing solid state electronic equipment shall be equipped with line voltage surge suppressors to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharges or near by electrical devices.
- C. The surge suppressors shall be of the plugtrab sleeves as manufactured by Phoenix Contact, or approved equal, and mounted on a DIN rail.

2.06 SIGNAL LINE TRANSIENT PROTECTION

- A. All signal lines for solid-state electronic equipment shall be equipped with line voltage surge suppressors to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharges or nearby equipment.
- B. This shall include, but not be limited to digital inputs, analog inputs, analog outputs, flow transmitters and level transmitters. The signal line transient protection shall be provided on any signal lines which are outside of the building structure housing the area control panel and RTU electronic equipment.
- C. The signal line transient protection shall include gas discharge tubes, varistors, and suppressor diodes.
- D. The unit shall be Phoenix terminal block type Plugtrab Model UFBK 2/2, UFBK 2-PE, UFBK2-PE/1, or approved equal.
- E. Provide lightning protection termination for all digital and analog signal plus a minimum of 10 percent spares per panels.
- F. Terminal block shall be DIN rail type, mounted in the vertical position.

2.07 TRANSIT TIME METER – FLOW

- A. Approved Manufacturers:
 - 1. Flexim America Corporation
Edgewood, NY 11717
Phone: (631) 492-2300
salesus@flexim.com
 - 2. Approved equal.
- B. Technical Data
 - 1. Measuring principle: Transit time difference correlation principle
 - 2. Quantities of measurement: Volume flow, mass flow, flow velocity, thermal energy flow
 - 3. Transmitter processor: 32 bit or greater
 - 4. Flow velocity: 0.03 to 82 ft/s
 - 5. Repeatability: 0.15% of reading \pm 0.03 ft/s
 - 6. Calibrated transducer accuracy:
 \pm 1 % of reading \pm 0.03 ft/s with certificate of calibration

7. Gaseous and solid content: < 10 %
8. The Meter shall meet AWWA C-750-16

C. Transducers

1. Operating temperature: -30 ° F to +120 ° F
2. Built in RTDs for temperature compensation per ASME MFC 5M
3. Coupled to pipe with permanent coupling pads
4. NEMA 4X enclosure
5. Material: 316 Stainless Steel
6. Protective cap 316 Stainless Steel
7. Hazardous area classification: NA

2.08 PRESENCE/ABSENCE DETECTOR

A. Acceptable Manufacturers:

1. Princo L3545.
2. or approved equal.

B. Sensor/Transmitter:

1. Mounting: Flange – coordinate size with associated piping
2. Standard Operating Temperature: -4°F to 140°F.
3. Temperature Drift: less than 0.1 pF per 20F
4. Construction: 316SS
5. Adjustable time delay
6. Power Supply: Transmitter provides power input to sensor. Transmitter shall be 120V, 60 Hz.
7. Cable: As recommended by vendor.
8. Housing: NEMA 4X minimum
9. Cannot affect flow

2.09 MISCELLANEOUS

- A. After a power interruption, equipment shall resume normal operation without manual resetting when power is restored.
- B. Local manual operation shall be provided for emergency situations or to facilitate maintenance and repair.
- C. Signals transmitted to remote equipment and pacing signals for feeders, samplers, pumps, and similar equipment shall be provided with isolators and boosters.
- D. Special cables required to connect system components shall be supplied by the meter manufacturer.
- E. Pressure piping, including drains, air supply, and signal, shall be copper with

soldered or compression fittings sized as recommended by the meter manufacturer. Piping shall be neatly and accurately run in straight lines and concealed where possible. Piping shall slope per ISA standards where applicable.

- F. Each recording instrument shall be furnished with a 1-year supply of charts, felt tip pens, and accessories from date of acceptance. Indicator scales shall be direct reading unless stated otherwise. Counters and totalizers shall include legend plates showing the multiplier.
- G. Transmitters shall be indicating type or have local indicators with direct reading, unless stated otherwise, and shall output a 4-20 mA DC signal into a minimum 500 ohm load.
- H. Differential pressure transmitters shall have 5-valve, equalizing manifolds.
- I. Differential pressure transmitters shall be connected to high and low pressure taps on the primary device by two 1/2-inch valved copper lines.
- J. Provide square root extractors on differential pressure transmitters.
- K. Control trip alarms shall be fully adjustable by means of knobs with calibrated dials and shall have isolated contacts.
- L. Free standing instrument panels, cubicles, and consoles, unless specifically stated otherwise, shall be installed on a 4-inch thick concrete pad.
- M. Panels, cubicles, consoles, and enclosures shall be in conformance with the detailed equipment specifications. Color and finish will be selected by Engineer.
- N. Isolators shall be used for sampler, chemical pacing, and remote instrumentation signals to increase loop security and to facilitate field wiring.
- O. Desiccant used to protect equipment during shipment shall be non-corrosive.
- P. End connections for Venturi tubes, valves, and metering devices shall be as shown.
- Q. Signal wire shall conform to the equipment and manufacturer's recommendations if it exceeds the minimum requirements specified in Division 16 and shall be shielded with twisted pairs and installed in rigid galvanized steel conduit containing signal wiring only. Wiring and conduit shall be provided in accordance with Division 16.
- R. All components provided, both field and panel mounted, shall be provided with permanently mounted nametags. Panel mounted tags shall be plastic; field mounted tags shall be stamped stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify location of cabinets as shown on Plans.

3.02 INSTALLATION

- A. Install in accordance with manufacturers requirements.
- B. Install Work in accordance with standards required by authority having jurisdiction.
- C. Provide flexible conduit drip legs in power and signal connections to instruments.
- D. Touch-up minor damaged surfaces caused during installation. Replace damaged components as directed by Engineer.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Division 1 - General Requirements.
- B. Furnish a service representative of the system manufacturer to check the installation before operation and to supervise field testing.
- C. Service representative to submit 3 copies of a signed statement addressed to Owner stating that the system has been properly installed, satisfactorily tested, and is in satisfactory operating condition.
- D. Include one man-day for every eight instruments installed.

3.04 ADJUSTING

- A. Adjust work under provisions of Division 1 - General Requirements.

3.05 DEMONSTRATION

- A. Provide systems demonstration under provisions of Division 1 - General Requirements.
- B. Demonstrate and instruct Owner on unit operation. Describe unit limitations.

END OF SECTION

SECTION 409500 - PROCESS INSTRUMENTATION AND CONTROL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. P & ID Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Section 409000 – Field Instruments
- C. Division 43 - Process Equipment
- D. Division 26 - Electrical

1.02 SUMMARY

- A. All work included in this section is to be part of the General Contractor's contract. All work in this section is to be performed by the owner's preferred integrator. The owner's preferred integrator is Status, Control & Integration, Inc. of Kensington, Ohio. Refer to Division 1 specifications for direction on contacting and including Status, Control & Integration, Inc. in the base bid.
- B. The owner's preferred integrator, Status, Control & Integration, Inc., is referred to as the "Integration Contractor" throughout the drawings and specifications. Integration Contractor is also abbreviated as "IC" on the drawings.
- C. The work to be included by the Integration Contractor includes the following:
 - 1. All work shown on the "I" drawings and necessary for engineering, furnishing, adjusting, testing, documenting, and start-up the Process Instrumentation and Control (I and C) System, as a complete computer-based supervisory control and data acquisition (SCADA) system.
 - 2. Furnish design, construction, delivery, start up and programming of all plant SCADA system panels referred to as RTU's (Remote Terminal Units) and MTU's (Main Terminal Units). Panels shall be complete with I/O cards, PLC's, network interface cards, power supplies, terminal blocks, wire management, ventilation, heating, lighting, screens, panel mounted instrumentation, surge protection, UPS, etc. as shown on the drawings.
 - 4. Provide software licensing, software updating and additional software packages as specified.
 - 5. Provide all SCADA system programming, start-up, adjustment and training. SCADA system programming to be performed in order to meet the functional description of all processes as outlined in this specification section.
 - 6. Provide coordination and direction to the Electrical Contractor for termination of structured cable wiring (category 6 and fiber optic cables).

7. Provide all flat screen monitors and televisions as specified. Program displays as specified.
 8. Provide all miscellaneous network switches and media converters as shown on the drawings and specifications.
- D. The following is a list of associated work that is to be performed by the Electrical Contractor.
1. Provide incoming power conduit and wiring between the SCADA equipment and the source of power.
 2. Provide control signal conduit and wiring between the SCADA equipment, motor control centers, area control panels, analog panels, process interface units, control devices and instruments.
 3. Provide tagging of power and signal wires and structured cabling. Provide termination of power and signal wires and structured cabling system punch downs and connections. Structured cabling termination types will be as directed by the Integration Contractor
 4. Provide category 6 and fiber optic cable (structured cabling) and associated conduit.
 5. Provide point-to-point testing of power and signal wiring from SCADA terminations to the field device or power source.
 6. Install all SCADA RTU's and MTU's.
- E. Drawings and Specifications are to be considered as supplementing each other. Work specified but not shown, or shown but not specified, shall be performed or furnished as though mentioned in both Specifications and Drawings. All systems shall be complete and fully operational upon completion of the project.
- F. Contractors shall not construe any correspondence or verbal communications with or by the engineer or his representative as authorization or "extra" construction payment. All requests for additions to this contract shall be submitted in writing by the contractor to the project manager (pm) for consideration by the owner's representative. Work performed without written approval of the owner and project manager will be the contractor's sole responsibility without additional compensation.
- G. Contractor shall comply with and schedule work according to the schedule of construction specified in Division 1. All work shall be completed within these time constraints and the contractors for the work of this section shall provide all required temporary utilities and connections necessary to maintain the existing systems in full operation during the progress of this work. Sections of any systems may be taken out of service only when approved in writing by the owner.

1.03 DEFINITION OF TERMS

- A. Integration Contractor:

1. A single supplier, which shall assume complete responsibility for engineering and furnishing, technically advising on and certifying and correctness of installation, adjusting, documenting, testing, and starting-up the complete I and C system.
2. Integration Contractor must utilize full-time, permanent employees to provide the following services:
 - a. Program/Project Management
 - b. Training
 - c. Quality Assurance
 - d. SCADA/PLC Programming
 - e. High Level Systems and Applications Programming
 - f. Network Design, Installation, Testing and Validation

B. Responsibility for Complete Systems:

1. The Integration Contractor shall be ultimately responsible and shall provide for the supply, installation certification, adjustment, and start-up of a complete coordinated system which shall reliably perform the specified functions.
2. The Integration Contractor shall obtain from the General and Electrical Contractors the required information on those primary elements, valves, valve actuators, Variable Frequency Drives, Motor Starters, Vendor Control Panels, and other control equipment or devices that are required to be interfaced with, but that are not provided under this section. In particular, any major equipment items furnished by other Contracts but installed under this Contract.

C. Coordination Meetings:

1. In order to ensure timely performance of the Contract and the system's conformance with these Specifications, coordination meetings shall be held at the Engineer's Mentor, Ohio office periodically during the course of the project. The Electrical Contractor and Integration Contractor shall provide for their attendance at a minimum of 5 such meetings in his quotation.

1.04 HARDWARE SUBMITTAL

- A. Before any components are fabricated, and/or integrated into assemblies, or shipped to the site, furnish to the Engineer, in accordance with the approved Submittal/Payment Schedule, and receive his review of five copies of full details, shop drawings, catalog cuts, and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these Specifications. The decision of the Engineer upon the acceptability of any submittal shall be final. Catalog information shall be submitted for all equipment.
- B. Specifically, the following materials, where applicable shall be submitted:
 1. Catalog information, descriptive literature, wiring diagrams and shop drawings on all controllers, panel instruments, SCADA Panels, Desktop PC's, printers and all other components of the System.

2. Panel elementary ladder logic diagrams of prewired panels. Diagrams shall be similar to those diagrams shown on the drawings, but with the addition of all switched analog signals and all ancillary devices such as additional relays, alarms, fuses, lights, fans, heaters, etc.
3. Interconnecting wiring diagrams, showing all component and panel terminal board identification numbers. This diagram shall be coordinated with the Electrical Contractor and shall bear his mark showing that this has been done. Diagrams, device designations, and symbols shall be in accordance with NEMA ICS 1-101.
4. Symbology for software logic functions should utilize the following methods.
 - a. Ladder diagram format: This method may be used for programmable controllers only. The use of the ladder diagrams to show logic in computer or microprocessor that cannot be programmed in ladder logic is not acceptable.
 - b. Structured logic format (scripts): This method shall utilize structured logic statements: if-and, and-or, etc.
5. Color schedule with color samples for the control panels.
6. Power requirement and heat dissipation summary for all control panels. Power requirements shall state required voltages, currents, and phases (s). Heat dissipations shall be maximums and shall be given in Btu/hr. Summary shall be supplemented with calculations.

1.05 SYSTEM SOFTWARE SUBMITTAL

- A. The Software Functional Design submittal shall provide a complete description of the system on a functional level. The software shall be organized into functional subsystems. The intent of the Software Functional Design submittals shall be to describe, in detail, what functions are to be performed by each subsystem. It is not the intent of this documentation to describe the individual programs that support these functions.

1.06 QUALITY ASSURANCE

- A. Maintain quality in both design and workmanship as well as materials used in the manufacture of the equipment. Use new equipment and materials.

1.07 SPARES AND EXPENDABLES RECOMMENDATIONS

- A. A list of recommended spares and expendable items in sufficient quantities to sustain the Process Instrumentation and Control System for a period of 1 year after acceptance shall be provided. A total purchase cost for the recommended list shall be provided in addition to the unit cost for each item.

1.08 DOCUMENTATION

- A. Documentation for the complete Process Instrumentation and Control System shall be provided. This documentation shall include Record Drawings.
- B. The Integration Contractor shall furnish clear, typewritten, easy-to-understand, tightly bound, hard cover instruction manuals for daily operation and maintenance of system. Specifically, the manuals shall contain explicit instructions and well-diagrammed procedures for process operations, loop tuning, and systems maintenance. The instruction manuals shall include as a minimum the following information.
 - 1. Photographs and data sheets of major system components.
 - 2. Input/Output terminal diagrams.
 - 3. Logic and block diagrams.
 - 4. Manufacturer published operation and maintenance instructions on all equipment.
 - 5. Description of systems operation.
 - 6. Configuration language description.
 - 7. Names, addresses, and telephone numbers of local equipment manufacturer representatives for each device in the system.
 - 8. Listing of expendable materials by form, stock, or model number (e.g. paper, magnetic discs, ribbons, etc.).

1.09 TESTS

- A. All elements of the Instrumentation and Control System shall be tested to demonstrate that the total system satisfies all of the requirements of this Specification.
- B. All special testing materials and equipment shall be provided. Where it is not practical to test with real process variables, other suitable means of simulation shall be provided. These simulation techniques shall be subject to the approval of the Engineer.

1.10 TEST PROCEDURE DEVELOPMENT AND TEST DOCUMENTATION

- A. Within 12 months after award of the Contract, a detailed description of the proposed test procedures to be performed to demonstrate conformance of the complete system of instrumentation and controls to this Specification shall be prepared and submitted to the Engineer for review. The decision of the Engineer upon the acceptability of the test procedures shall be final.
- B. It is recommended that test procedures be in two steps by first submitting general descriptions and outlines of the tests and then, upon receipt of approval, submit the required detailed procedures and forms.
- C. It is required that this be a two-step submittal, outlines first followed by specific test descriptions. Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.

1.11 OPERATIONAL ACCEPTANCE TESTS

- A. Prepare check-off sheet (s) for each loop and an instrument calibration sheet for each active I and C element (except simple hand switches, lights, etc.) These check-off and data sheets shall

form the basis for these operational tests and this documentation. The engineer shall be present when tests are performed.

1.12 ON-SITE SUPERVISION

- A. Provide an on-site resident engineer to supervise and coordinate installation, adjustment, testing, and start-up of the Process Instrumentation and Control System. The resident engineer shall be present during the total period required to effect a complete and operating system.
- B. Provide a minimum of 2 weeks system start-up assistance by engineering personnel. One (1) week of start-up assistance shall constitute 40 hours of on-site work. During this start-up period, the Integration Contractor's personnel are to thoroughly check all of the equipment and perform the on-site tests specified above.

1.13 TRAINING

- A. Prior to the on-site demonstrations, provide training in the operation and maintenance of the System for two (2) of the Owner's personnel.
- B. Training shall be provided by Integration Contractor's employees involved in the installation, design, implementation and start-up of this project. The exception will be training provided by Equipment Manufacturers or authorized Factory trainers.
- C. Provide a single, in-house Training Administrator that has experience in on-site industrial O & M training. All facility (in house) training shall be recorded and shall reside on the SCADA System for future use.

1.14 DEFINITION OF ACCEPTANCE

- A. System acceptance shall be defined as that point in time when the following requirements have been fulfilled:
 - 1. All submittals and documentation have been submitted, reviewed and marked by the Engineer to the effect that resubmittal is not required.
 - 2. The complete system of instrumentation and controls has successfully completed all testing requirements cited herein.
 - 3. All Owner's staff personnel training programs have been completed.

1.15 QUALITY ASSURANCE

- A. Codes and Standards. Perform all work in compliance with applicable requirements of governing agencies having jurisdiction and in accordance with the plans and as specified herein.
 - 1. National Electrical Manufacturers Association (NEMA) Compliance.
 - 2. National Electric Code (NEC) Compliance.
 - 3. Instrument Society of America (ISA).
 - 4. Institute of Electrical and Electronic Engineers (IEEE).

5. Underwriters' Laboratories, Inc. (UL) Compliance and Labeling. Comply with provisions of UL safety standards pertaining to process controller equipment. Provide products and components which have been UL listed and labeled.

1.16 EXPANDABILITY

- A. The system proposed shall be configurable to provide for minor changes and additions during manufacturing, installation, and commissioning phases, and on-site by the Owner's operating personnel.

Functional Description Starts Here

1.17 FUNCTIONAL DESCRIPTION

The following set of control descriptions shall be incorporated in the Plant SCADA System designed and provided by the Integration Contractor. The following descriptions have been prepared based on specified equipment. The Integration Contractor shall modify this document as required to accommodate actual approved equipment shop drawings.

GENERAL REQUIREMENT FOR AUTOMATIC / REMOTE / LOCAL CONTROL SWITCHES, INDICATING LIGHTS AND TRENDING

The requirements listed here shall be adhered to for all motor operated devices controlled by the SCADA System unless specifically stated otherwise elsewhere in this specification. Motor operated devices shall be equipped with locally mounted switches that provide "HAND-OFF-AUTO" capability. The "AUTO" position shall allow operation through SCADA or the associated control panel PLC. The "HAND" position shall allow local operation of the device. The "OFF" position shall disable all operation of the device. Additional local controls such as "FORWARD-REVERSE", if required, will be identified with the control requirements of the specific device.

All devices controlled by SCADA shall have locally mounted indicating lights that identify the status of the device such as open-closed or on-off.

All devices controlled by SCADA shall have their status recorded, and total run time or total elapsed time shall be trended. The SCADA shall allow totalizing of trended data.

A. WET WELL AND EQUALIZATION TANK LEVEL CONTROL

A system will be provided to control the fluid level in the wet well using four tank submersible influent pumps and a modulating equalization tank gate valve. The system integrator shall provide a system to measure, indicate, control, log and trend the wet well level control process.

Under normal operation, the pump station is dry and each of the gate valves is normally open. In a surge event, influent will begin to flow from the interceptor and fill the wet well. This will be detected by the wet well level sensor. Back-up float switches will also be used in case the wet well level sensor fails. Once the presence of influent in the wet well is sensed and rises to approximately 1 to 2 feet, the equalization tank gate valve will be closed.

Next, the influent tank pumps will be started one at a time to begin moving influent from the wet well to the equalization tank. Each of the four pumps will be cycled through in order to maintain maximum life from each pump. The control variable will be the wet well level. A maximum level will be operator selectable. This maximum wet well level will be maintained by modulating the speed and operation of the four tank influent pumps which are each VFD controlled.

The influent tank pumps will continue to run until the wet well level is satisfied and ceases to rise indicating that the surge event is complete. If level begins to rise again, the pumps will restart and continue to maintain the maximum wet well level as before. Once the surge event is complete, the process of draining the equalization tank will be next and this will only start upon manual initiation made by plant personnel.

In the event that the wet well level continues to hold steady while the pumps are in operation and the maximum level in the equalization tank is reached, then the pumps will be shut down and an alarm signal sent to the main plant via the telemetry equipment.

Draining of the equalization tank will be initiated manually by the plant. It can be initiated once the wet well level is low enough. Both a low level signal from the wet well and manual plant permission will be necessary to initiate equalization tank draining.

The first step of drainage will be opening the equalization tank gate valve to drain the equalization tank. The valve position will be modulated by the SCADA system in order to maintain an operator set flow rate for draining the equalization tank. This flow rate will be measured by the flow meter installed on the interconnecting line between the equalization tank and the wet well.

Once the tank is emptied, the gate valve will be set to full open and the pumping station will return to normal dry operation.

Manual override of all equipment will be possible locally. Each pump will have a local HOA and emergency stop control station. Each tank valve will also have a local HOA and manual open/close control station. Each of the level sensors and flow meters will have a local transmitter that also indicates the variable being measured.

High level alarms shall be programmed into the SCADA system for both the wet well and equalization tanks. These alarms will annunciate locally at the pump station as well as at the plant.

The SCADA System shall indicate, control and trend the following:

- Tank Influent Pump #1 Running
- Tank Influent Pump #1 Speed
- Tank Influent Pump #1 in Auto status
- Tank Influent Pump #1 Fail
- Tank Influent Pump #2 Running
- Tank Influent Pump #2 Speed
- Tank Influent Pump #2 in Auto status
- Tank Influent Pump #2 Fail
- Tank Influent Pump #3 Running
- Tank Influent Pump #3 Speed
- Tank Influent Pump #3 in Auto status
- Tank Influent Pump #3 Fail
- Tank Influent Pump #4 Running
- Tank Influent Pump #4 Speed
- Tank Influent Pump #4 in Auto status
- Tank Influent Pump #4 Fail

- Wet Well #1 Level
- Wet Well #1 High Level Alarm
- Wet Well #1 Pump #1 Run
- Wet Well #1 Pump #2 Run
- Wet Well #1 Pumps stop signal

- Wet Well #1 Low Level Alarm
- Wet Well #2 Level
- Wet Well #2 High Level Alarm
- Wet Well #2 Pump #3 Run
- Wet Well #2 Pump #4 Run
- Wet Well #2 Pumps stop signal
- Wet Well #2 Low Level Alarm
- Equalization Tank Level
- Equalization Tank High Level Alarm (from radar sensor)

- Equalization Tank Gate Valve Position Control Signal
- Equalization Tank Gate Valve % open indication

- EQ Tank Effluent Flow Signal

B. ODOR CONTROL FAN CONTROL

A system will be provided to control the operation of the odor control fans.

The SCADA system shall simply work to interlock the operation of the constant speed odor control fans with the operation of any of the tank influent pumps. If any single pump is in operation at any speed, the odor control fans shall both be interlocked to run.

Manual override of the fans will be possible locally. Each fan will have a local HOA and emergency stop control station.

Fan failure alarms shall be programmed into the SCADA system for both of the fan starters. These alarms will annunciate locally at the pump station as well as at the plant.

The SCADA System shall indicate, control and trend the following:

- Odor Control Fan #1 Run Signal
- Odor Control Fan #1 Alarm
- Odor Control Fan #2 Run Signal
- Odor Control Fan #2 Alarm

End of Functional Description

PART 2 PRODUCTS

2.01 MATERIAL FUNCTIONAL REQUIREMENTS

A. General:

1. The system shall provide all of the functions described hereinafter and as indicated in specifications and drawings, furnish all items of equipment, whether indicated or not, that are necessary to effect the required performance.

2.02 SIGNAL CHARACTERISTICS

- A. All process variable (Analog) signals shall be 4-20 mAdc. Transmitters shall have a load resistance capability conforming to Class L. Transmitters and receivers shall be fully isolated.
- B. Discrete signals are two-state logic signals (on/off) signals shall utilize 120V ac sources and interposing relays to provide dry contacts to the I/O system.

2.03 ENVIRONMENTAL CONDITIONS

- A. Unless otherwise noted, equipment shall be suitable for the following environmental conditions:

1. Conditioned Air Environment (Electrical Room / Office):

- a. Temperature: 40 to 105 degrees Fahrenheit
- b. Relative Humidity 10 to 80 percent
- c. Enclosure Rating: NEMA Type 12
- d. Classification Nonhazardous

2. Corrosive Air Environment (Process Area):

- a. Temperature: 40 to 105 degrees Fahrenheit
- b. Relative Humidity 10 to 100 percent
- c. Enclosure Rating: NEMA Type 4X
- d. Atmosphere: Corrosive (H₂S and salt spray)
- e. Classification Nonhazardous

3. Rated Area Environment:

- a. Temperature: 40 to 105 degrees Fahrenheit
- b. Relative Humidity 10 to 100 percent
- c. Enclosure Rating: NEMA 7
- d. Classification Class 1, Division 1 or 2

2.04 SCADA SYSTEM

- A. This section details the functional attributes of the pump station control/SCADA System including all remote terminal units and necessary peripheral equipment for the monitoring and automatic operation of specified equipment. The Integration Contractor shall provide all equipment, functions and services detailed in this specification. Minimal functional requirements are:
 1. Automatic collection of operating data from remote and local sensors in a continuous polling mode of communications.

2. Execution of manual and automatic control commands, Alarm/Event detection, annunciation and recording, operating on a network utilizing distributed system and database concepts using an operator P.C. based system.
 3. Provide intelligent operation interface with multi-user security levels, performing multi-tasking functions in a real-time environment.
 4. Display system information via a color graphic display.
 5. Trending and logging of requested data for historical records.
 6. Download on-line control functions and database configuration.
- B. The primary task of this system shall be to gather data, and to control equipment responsible for liquid levels, pressures and flows. It shall be the means by which operators monitor the remote and local facilities and are alerted to equipment failures, power outages, and other emergencies. The computer system shall be able to monitor the operation and provide capability to control the entire system. It shall provide color graphic displays of operational status and printed logs and reports of all digital information of varying types from different sites, both remote and local, and supply control output signals when required. It shall provide the ability to record data and provide access to that data in real-time as well as historical fashion.
- C. The computer system shall also be able to support a remote operator station with communications to the central system over an Ethernet - TCP/IP plant wide local work area. This allows an operator to have the same interface and functions (such as alarming, eventing, trending, historical searches and supervisory control) at a remote location.
- The remote operator station shall obtain display and trend data from the central system database in a transparent mode without affecting the operating programs or devices running on the central system.
- Security, in the form of usernames and passwords, shall be in the same format as the central system. The remote operator station will have central system files, disk, programs and devices at the local location.
- Diagnostics shall be incorporated in the design to support data link statistics via an on-line display or utility program to flag any communication errors.
- D. The system shall utilize standard, modular, software to be fully debugged and provided with certified operational status. Software shall be the "off-the-shelf" variety with no special programming necessary. All software shall be stored on the included hard drives provided for the highest level of performance and security. All data base modifications, additional and control set points shall be easily modified in the field by the operator and downloaded on-line to the system when revisions or expansions are required with minimum interruption to data acquisition. User level commands shall be available to provide necessary system backup and archiving of data files.
- E. Operator Stations (HMI)

One human machine interface station shall be provided for this project and it will be located in the control room as shown on plan.

F. Software

1. Provide software for the new SCADA node that is the same as the existing plant software. Include all necessary licensing for a minimum period of 2 years.

G. HMI Screen Programming

1. The following screens shall be configured at the HMI operator stations:
 - a. Main menu.
 - b. One screen for each process. Described in the "Functional Description" portion of this specification. The screens shall include information specified in the Functional Description.
 - c. Screens for all process set points.
 - d. Screens for last 24-hour alarms.
 - e. Help screen.

2.05 PROGRAMMABLE LOGIC CONTROLLER

A. Acceptable Manufacturers:

1. Schneider – M340 platform

B. Description: Provide programmable controllers that are compatible to the existing operating system with input/output modules, power supplies, cable connectors, mounting racks, and appurtenant equipment.

C. Service Conditions:

1. Temperature: (Operating) 32 to 140 degrees F, 0 to 60 degrees C.
2. Humidity: 5 to 95% without condensation.

D. Configuration:

1. Processor Unit: Include processor, power supply, random access erasable-programmable read only memory, input/output modules and all required hardware and software for a complete and functioning system. Memory size and operating speeds shall be best available at shop drawing submittal.
2. Remote Input/Output Unit: Include input/output modules, interface module and power supply for system inputs and outputs.

E. Power Supply:

1. Input Voltage: 120 volts, 60-Hz.
2. Surge Protection: Provide a transient voltage surge suppression system (TVSS) as sized by equipment manufacturer.

F. Application Software:

1. The Integration Contractor shall be responsible for all application logic development and programming.

G. Communication

1. The PLC's shall be configured to communicate (via Cat 6 and fiber optic cables) with all other PLC's, RTU's and OS's, printers and other peripheral equipment on the system's Ethernet. Communication shall be Ethernet (TCP/IP) (1000 Base-T).
2. Ethernet switches shall be unmanaged for this application, manufactured by:
 - a. Phoenix Contact
 - b. Wago
3. I/O status, alarm status and register data may be exchanged between PLC's and outputs of one PLC may be controlled by another PLC.
4. Provide modem for external communication with main plant. Modem shall be Red Lion DA50.

H. Input/Output Units

1. Digital Input Characteristics: 24-120 volts, dry contact from interposing relay.
2. Analog Input Characteristics: 4-20 milliamperes DC.
3. Digital Output Characteristics: 24-120 volts, dry contact from interposing relay.
4. Analog Output Characteristics: 4-20 millamperes DC.
5. Remote Input Output Communications Unit: Ethernet (TCP/IP) (1000 Base-T)
6. I/O point quantity:
 - a. Digital Inputs: As required, plus 20 percent spare.
 - b. Analog Inputs: As required, plus 20 percent spare.
 - c. Digital Outputs: As required, plus 20 percent spare.
 - d. Analog Outputs: As required, plus 20 percent spare.
7. Rack Assemblies
 - a. Racks shall be sized such that at each different location, there is 20% spare register and I/O slots.

2.06 STRUCTURED CABLING SYSTEM

- A. The Electrical Contractor is responsible for the structured cabling system cable and terminations.
- B. The Integration Contractor shall coordinate the installation and termination types with the Electrical Contractor.

2.07 PANEL-MOUNTED INSTRUMENTATION

- A. Type:

1. All instrumentation supplied shall be of the manufacturer's latest design and shall produce or be activated by signals which are established standards from the water and wastewater industries.
2. All electronic instrumentation shall be of the solid-state type and shall utilize linear transmission signals of 4 to 20 mA_{dc} (milliampere direct current).
3. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed.
4. Equipment installed in a hazardous area shall meet class, group and division as shown on the contract electrical drawings, to comply with the National Electric Code.
5. All indicators and recorder readouts shall be linear in process units, unless otherwise noted.
6. Electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and suitably coated to prevent contamination by dust, moisture and fungus. Solid state components shall be conservatively rated for their purpose, to assure optimum long term performance and dependability over ambient atmosphere fluctuations and 0 to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid and slightly corrosive service conditions.
7. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single manufacturer, insofar as possible, and shall consist of equipment models which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.
8. The field mounted equipment and system components shall be designed for installation in dusty, humid and slightly corrosive service conditions. Field cabinets and enclosures shall be suitable for environment or as a minimum, a NEMA 4x gasketed with multi-purpose latching doors and shall be provided with thermostatically controlled strip heaters to prevent condensation.

B. Electrical:

1. All equipment shall be designed to operate on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10%, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument. All power supplies shall have TVSS protection.
2. All analog transmitter and controller outputs shall be 4-20 milliamps.
3. All switches shall have double-pole double-throw contacts rated at a minimum of 600 VA, unless specifically noted otherwise.

4. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.
5. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.

2.08 PANEL CONSTRUCTION (APPLIES TO SCADA RTU'S, RTU'S, MTU'S AND CONTROL PANELS SHOWN ON THE DRAWINGS):

A. Control Panels:

1. Panels shall be completely fabricated, instruments installed, and wired in the manufacturer's factory. All wiring shall be completed and tested prior to shipment. All external connections shall be by way of numbered terminal blocks.

B. Freestanding Panel Construction:

1. Freestanding panels shall be provided with switched fluorescent back-of-panel lights. One light shall be provided for every 4 feet of panel width and shall be mounted inside and in the top of the back-of-panel area.
2. Freestanding panels shall be provided with a 20-amp, 120-volt, duplex receptacle within the back-of-panel area. One duplex receptacle shall be provided for every three feet of panel width and spaced evenly along the back-of-panel area.
3. All panels shall be designed to permit continuous operation of all components mounted therein with panel ambient temperatures of up to 105 degrees Fahrenheit. Panels shall be provided with louvers and/or forced ventilation as required to prevent temperature build-up due to electrical devices mounted in or on the panel. Except for panels mounted with their back directly adjacent to a wall, louvers shall be in the rear of the panels, top and bottom and shall be stamped sheet metal construction. For panels mounted with their backs directly adjacent to a wall, louvers shall be on the sides. Forced ventilation fans, where used, shall be provided with washable or replaceable filters. Fan motors shall operate on 120-volt, 60-Hz power.
4. In addition to all NEMA standards, the smaller panels shall conform to the following requirements:
 - a. Minimum metal thickness shall be 14-gauge.
 - b. All doors shall be rubber-gasketed with continuous hinge.
 - c. Wherever practical, enclosures shall be a manufactured item, Hoffman, or approved equal.
 - d. All panels manufactured or fabricated shall be summarized, and the summary together with catalog cuts and/or shop drawings shall be submitted to the Engineer for review and marked by the Engineer to the effect that resubmittal is not required prior to purchase or fabrication.

- e. Smaller panels shall be so sized as to adequately dissipate heat generated by equipment mounted in or on the panel.
- f. Where panels are mounted outside or in unheated areas, they shall be provided with thermostatically controlled heaters that will maintain their inside temperature above 40 F.
- g. Provide a door switch controlled, fluorescent light and a breaker protected, 120 V 15A amp duplex receptacle within each panel.

C. Control Panel Electrical:

1. Power Distribution Within Panels:

- a. Each panel will be provided with a 120V ac, 60-Hz feeder circuit from the associated circuit breaker distribution panel provided under Electrical. On each panel, make provisions for feeder circuit conduit entry and provide a terminal board for termination of the wires. Panel shall have TVSS protection.
- b. Provide master circuit breaker and a circuit breaker on each individual circuit distributed from the panel as shown. The circuit breakers shall be grouped on a single subpanel. Provide subpanel placement so that there is a clear view of and access to the breakers when the door is open. Opening the main breaker will interrupt all 120 VAC circuits (there shall be no 120 VAC on terminal blocks from remote devices).

D. Wiring:

- 1. All electrical wiring shall be in accordance with the applicable requirements of the NEC. Wires shall be 600-volt class, PVC insulated stranded copper and shall be of the sizes required for the current to be carried, but not below 12 AWG enclosed in either sheet metal raceway or plastic wiring duct. Wiring for 4 to 20 mA signal circuits shall be twisted shielded pairs not smaller than No. 16 AWG, and be separated at least 6 inches from any power wiring.
- 2. All interconnecting wires between panel mounted equipment and external equipment shall be terminated at numbered terminal blocks.
- 3. All wires shall be identified per the requirements of Electrical section.

E. Terminal Blocks:

- 1. Terminal blocks shall be one-piece molded plastic blocks with screw type terminals and barriers rated for 300 volts. Terminals shall be double sided and supplied with removable covers to prevent accidental contact with live circuits. Terminals shall have permanent, legible identification, clearly visible with the protective cover removed.

2. Wires shall be terminated at the terminal blocks with crimp type, preinsulated, ring-tongue lugs. Lugs shall be of the appropriate size for the terminal block screws and for the number and size of the wires terminated.
3. Terminal blocks shall be Allen-Bradely Bulletin 1492, Style CD-3 or approved equal.

F. Relays:

1. Signal circuit switching shall be accomplished with analog signal switching relays shall be provided to switch either 4 to 20 mA dc signals. Units shall have double-throw dry circuit contacts in a break-before-make configuration rated for 10 amps at 120 volts minimum. The number of poles and coil energization voltage shall be as required. Signal switching relays shall be sealed to prevent entry of contamination in the form of dust, dirt or moisture.
2. Control circuit switching shall be accomplished with relays. These relays, for interfacing and control applications, shall be the compact general-purpose plug-in type having low coil inrush and holding current characteristics. Contact arrangements shall be as shown, and shall be rated for not less than 10 amperes at 120 Vac. Coil voltage shall be as shown. Nonlatching relays shall have a single coil. Latching relays shall have two coils, unlatching being accomplished by energizing one coil, and latching being accomplished by energizing the other coil. Relays shall have plain plastic dust covers, test buttons, and mounting sockets with screw terminals and hold-down springs. Relays shall be Allen-Bradley Bulletin 700, Square "D" Class 8501, Cutler-Hammer General Purpose or approved equivalent.
3. Time delay functions shall be accomplished with time delay relays. Units shall be adjustable time delay relays with the number of contacts and contact arrangements as shown. Contacts shall be rated for 10 amperes at 120V Ac. Integral knob with calibrated scale shall be provided for adjustment of time delay. Initial setting shall be as shown with time delay range approximately three items the initial setting. Time delay responsibility shall be at least ten to one. Operating voltage shall be 120V ac, plus 10 percent, minus 15 percent at 60 Hz. Operating temperature shall be minus 20 F to 165 F. Repeat timing accuracy shall be plus or minus 10 percent over the operating range. Units shall be Allen-Bradley Bulletin 700, Square "D" Class 9050 or Cutler-Hammer; Eagle Signal controls; or equivalent.
4. All relays shall have a screw terminal interface with the wiring. Terminals shall have a permanent, legible identification Relays shall be mounted such that the terminal identifications are clearly visible and the terminals are readily accessible.

G. Panel Touch Screens:

1. Screens shall be 12" color.
2. Screens shall have Ethernet communication compatibility.
3. Screens shall be 120V AC.
4. Screens shall be Schneider Magellis HMI.

2.09 NAMEPLATES, NAME TAGS, AND SERVICE LEGENDS

- A. All components provided under this section shall be provided with permanently mounted name tags bearing the entire ISA tag number of the component. Panel mounted tags shall be plastic.
- B. The panel drawings refer to nameplates and service legends; nameplates are defined as inscribed laminated plastic plates mounted under or near a panel face mounted instrument. Service legends are defined as inscribed laminated plastic integrally mounted on a panel face mounted instrument.
- C. Service legends and nameplates shall be engraved, rigid, laminated plastic type with adhesive back. Unless otherwise noted, color shall be black with white letters and letter height shall be 3/16-inch.
- D. Each panel shall be provided with a face mounted laminated nameplate as specified above. Unless otherwise noted, color shall be black with white letters 1/2-inch high.
- E. Standard Light Colors and Inscriptions.

Unless otherwise noted in the individual Loop Specifications, the following color code and inscriptions shall be followed for the lenses of all indicating lights:

1. <u>TAG</u>	<u>INSCRIPTIONS</u>	<u>COLOR</u>
ON	ON	RED
OFF	OFF	GREEN
CLOSED	CLOSED	RED
OPEN	OPEN	RED
LOW	LOW	RED
FAIL	FAIL	RED
HIGH	HIGH	AMBER
AUTOMATIC	AUTO	WHITE
MANUAL	MAN	BLUE
LOCAL	LOCAL	WHITE
REMOTE	REMOTE	AMBER

- 2. Lettering shall be black on white, yellow and amber lenses. Lettering shall be white on red and green lenses.

- F. Unless otherwise noted in the individual Loop Specifications, the following color code and inscriptions shall be followed for all pushbuttons:

1. <u>TAG</u>	<u>INSCRIPTIONS</u>	<u>COLOR</u>
OO	ON	RED
	OFF	GREEN
OC	OPEN	RED
	CLOSE	GREEN
OCA	OPEN	RED
	CLOSE	GREEN

	AUTO	WHITE
HOA	HAND OFF AUTO	RED GREEN WHITE
MA	MANUAL AUTO	YELLOW WHITE
SS	START STOP	RED GREEN
RESET	RESET	BLACK

2. All unused or noninscribed buttons shall be black. Lettering shall be black on white for yellow buttons. Lettering shall be white on black for red and green buttons.
3. All push buttons, pilot lights, selector switches shall be 30.5 mm, watertight/oiltight, or as indicated, as manufactured by Allen-Bradley Bulletin 800T or approved equal.

G. Electrical Transient Protection:

1. All control equipment mounted outside of protective structures (field mounted equipment) shall be equipped with suitable surge-arresting devices to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharges or nearby electrical devices. Protective devices used on 120 Vac inputs to field mounted equipment shall be secondary valve surge protectors conforming to the requirements of IEEE Standard 28-1972 (ANSI C62.-1-1971).

2.10 UNINTERRUPTIBLE POWER SYSTEM (UPS)

A. All desktop PC's, RTU's and MTU's shall be protected electrically by an on-line UPS. The UPS shall have (as a minimum) the following features:

1. During normal operation the UPS shall convert line power into clean, regulated, on-line, computer grade power. When line power is unacceptable or gone completely, the UPS shall create pure sine wave power with no interruptions to the computer. UPS shall be provided by Liebert or approved equal.
2. The UPS shall conform to the following specifications:
 - a. Lightning and surge protection: shall meet ANSI/IEEE C62.41 Cat A & B
 - b. Input: 0-138 Vac
 - c. Output: 120 Vac
 - d. Output waveform less than 5% THD
 - e. UL listed

- f. Warranty: one full year
- B. UPS's shall be manufactured by Phoenix Contact or Wago.

2.11 DC LOOP POWER SUPPLIES

- A. Each power supply shall be enclosed in a NEMA type 1 enclosure, vertical surface mounting type, with surface barrier screw terminals for load connection. Each power supply shall be equipped with a power on/off circuit breaker.
- B. Power supplies shall meet the following specifications:
 - 1. Input Power: 115 V AC \pm 10 percent, 60 Hz.
 - 2. Output Voltage: 24 V DC.
 - 3. Output Voltage Adjustment: 5 percent.
 - 4. Line Regulation: 0.05 percent for 10 percent line change.
 - 5. Load Regulation: 0.15 percent to no load to full load.
 - 6. Ripple: less than 3 millivolt RMS.
 - 7. Operating Temperature: 32-140 degrees F.
- C. Size power supplies to accommodate present load plus 25 percent spare capacity.
- D. Provide a relay contact to indicate the on/off status of the power supply.
- E. Provide power supply output overvoltage and overcurrent protective devices to protect the instruments from damage due to power supply failure and to protect the power supply from damage due to external failures.
- F. Mount power supplies such that dissipated heat does not adversely affect other components.

2.12 PANEL INSTRUMENTS

- A. Indicators
 - 1. Acceptable Manufacturers:
 - a. Dixson, Inc.
 - b. or approved equal.
 - 2. Indicator, Electronic, Bar Graph
 - a. Function: Receive a process variable signal and display the value in engineering units, both digitally and in a vertical bar graph.
 - b. Type: Single-station, panel-mounted, liquid crystal display (LCD) digital/bar-graph indicator.
 - 3. Performance
 - a. Scale Range: As noted.
 - b. Accuracy: 0.1 percent \pm 1 count on digital indicator.
 - c. Resolution:

- 1) Bar-Graph (101 Segments): 1.0 per full scale.
- 2) Digital (Three Digits, 0.2 Inch High): 0.1 percent of full scale.
- d. Linearity: 0.1 percent of full scale.
- e. Operating Temperature: 0-60 degrees C.
4. Features
 - a. LCD bar-graph and three-digit display.
 - b. Electroluminescent backlighting.
 - c. End-zero bar graph.
 - d. Vertical orientation.
 - e. Under and over range indication.
5. Signal Interface
 - a. Hardwired Analog Input Signal: 4-20 mA, isolated input.
 - b. Detachable screw terminal connector.
6. Enclosure
 - a. Type: Integral metallic DIN-sized housing.
 - b. Mounting: Front panel.
 - c. Dimensions: 1.5 inch by 6 inch face by 6 inches deep.
7. Power
 - a. Voltage: 120V AC, 60-Hz.

2.13 DIGITAL PAPERLESS RECORDING STATION

- A. The recorder shall be microprocessor based providing continuous trending for up to four inputs. The unit shall contain an integrally mounted alphanumeric display for sequential or continuous indication of recorder values. The unit shall be field configurable via an integral multi-function keypad. Configuration and calibration information shall be password protected and stored in nonvolatile memory.
- B. Recording shall be continuous. Speed shall be configurable from 1 to 4096 hours per revolution.
- C. The recorder shall accept a 4-20 mA dc input signal with field configurable ranges. Input and display resolution shall be 0.01% of full scale. Display and recording accuracy shall be +/-0.1% and +/-0.25% full scale, respectively. Repeatability shall be 0.02% of span. Output accuracy shall +/-0.1% of engineering unit span.
- D. The unit shall be provided with the capability to totalize up to four (4) configured channels. The totalizer shall be configurable as a nonresettable or resettable totalizer, with continuous, preset up, of preset down capabilities. Contact outputs shall be available for remote totalization of the selected channels.
- E. The recorder shall be powered by 120 V ac, 60 Hz. Unit shall provide isolated 28 V dc, 22mA power for up to four remote-mounted, 2-wire transmitters.
- F. The recorder shall be suitable for surface mounting as required. The enclosure shall be of stainless steel, NEMA 4X, with locking door, tamper evident feature and shatterproof glass window.

- G. The Digital Recorder shall be as manufactured by Eurotherm, Honeywell, the Foxboro Company, or approved equal.

2.14 ALARM INDICATION LIGHTS

- A. The alarm indication light shall be a red, LED, 100,000 hour, strobe light capable of providing 80 high-intensity flashes per minute. The housing shall be UL listed, NEMA 4X, watertight and corrosion resistant, suitable for outdoor use and IP65 rated.
- B. The alarm indicating light shall operate on 120 VAC and shall incorporate a voltage in-rush limiting printed circuit board.
- C. The alarm indicating light shall use a 1/2 inch pipe mount and bracket as required to mount indicating light 3 feet above building.
- D. The alarm lights shall be manufactured by Federal Signal Corporation, Edwards-Signals, Square D, or approved equal.

2.15 ALARM INDICATION HORNS

- A. The alarm horn shall be a heavy-duty, high volume, 30 watt, 110 db minimum, industrial signaling device capable of producing volume controlled, high-decibel tones. The horn shall use a microprocessor circuit to create 20 different tones. A single tone shall be selectable using an integral selector switch. Provide a list of tones to the plant operator for selection and set tones in field.
- B. The alarm horn shall operate from a field-wired, normally open contact on a 120 VAC external voltage source.
- C. The alarm horn shall be UL listed for outdoor use and as a minimum be NEMA 3R and IP44 rated. Mount speaker to bracket system 3 feet above building, rotate speaker in direction as directed in field.
- D. The alarm horn shall be manufactured by Federal Signal Corporation, Edwards-Signals, Square D, or approved equal.

2.16 ANNUNCIATOR

- A. Power Supply: 120 V.
- B. Internal Supply Voltage: 24-48 V DC.
- C. Illuminated Indicators and nameplates for 18 alarm points.
- D. Module for power on and pushbuttons for alarm acknowledge, test, and reset.
- E. Panel mount modular configuration with 2 high by five wide. Modules shall accommodate two lenses each.
- F. Integral alarm horn with on/off selector switch.
- G. Integral reflash relay.
- H. Annunciator shall include all necessary equipment to interface with the PLC and transmit area alarm conditions to the main OS.

2.17 ACCESSORIES

A. Plastic Raceway

1. Carlon, Hoffman Engineering Co., or approved equal.
2. Description: Open slot wiring duct.
 - a. Rigid vinyl (PVC) bodies.
 - b. Smooth edges with side holes opposite each other.
 - c. Hi-impact rigid vinyl snap-on covers.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. General:

1. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance.
2. Coordinate I and C work with the Owner, the General Contractor and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the plant during construction.
3. Provide a qualified Field Service Engineer (FSE) to guide and assist in the handling, placement, installation and checkout and to be on-site whenever any equipment is being installed.
4. Cooperate with the Electrical Contractor to provide a complete exchange of information as necessary to install equipment provided.
5. Forward copies of correspondence between you and the Electrical Contractor to the project manager.

B. Protection during Construction:

1. Throughout this Contract, provide protection for materials and equipment against loss or damage and the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Specific storage requirements shall be in accordance with the Engineer-reviewed I and C Subcontractor's recommendations.

C. Material and Equipment Installation:

1. Follow manufacturer's installation instructions explicitly. Wherever any conflict arises between manufacturer's instructions, and these Contract Documents, verify with manufacturer the proper way to install the equipment. Shop drawings shall be considered as means and methods of installation. Keep copy of manufacturer's installation instructions on the jobsite available for review at all times.

D. Removal or Relocation of Materials and Equipment:

1. Where existing materials and equipment are removed or relocated, remove and deliver to the Owner all materials no longer used unless otherwise directed by the project manager. Repair affected surfaces to conform to the type, quality, and finish of the surrounding surface in a neat and workmanlike manner. Follow any specific instructions given by the project manager.

E. Equipment Finish:

1. Provide materials and equipment with manufacturer's standard finish system in accordance with Painting Specifications. Provide manufacturer's standard finish color, except where specific color is indicated. If manufacturer's has no standard color, finish equipment with light gray color.

F. Cleaning and Touch-up Painting:

1. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch-up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish.

G. Panels and Panel-Mounted Equipment:

1. Panels and panel-mounted equipment shall be assembled as far as possible at the Integration Contractor's plant. No work, other than correction of minor defects of minor transit damage, shall be done on the panels at the jobsite.

H. Equipment Furnished by Integration Contractor and Installed by Electrical/General Contractor:

1. I and C Supplier shall observe and advise on the installation, to the extent required to certify in writing that the equipment will perform as required.

3.02 CONTROL VALVES

- A. Verify correctness of installation. Calibrate and adjust all positioners and I/P transducers and verify correct control action. Adjust limit switch settings. Adjust opening and closing speeds and travel stops.

3.03 ELECTRICAL POWER AND SIGNAL WIRING

- A. Control and signal wiring external to the control panels and all power wiring shall be by the Electrical Contractor. Parallel runs of Power (120 Vac) and signal (4-20 mA) shall be separated by 2 feet.
- B. Control and signal wiring in control panels shall be restrained by plastic ties or ducts. Hinge wiring shall be secured at each end so that any bending or twisting will be around the longitudinal axis of the wire and the bend area shall be protected with a sleeve.

- C. Arrange wiring neatly, cut to proper length, and remove surplus wire. Provide abrasion protection for any wire bundles which pass through holes or across edges of sheet metal.
- E. Use manufacturer's recommended tool with the proper sized anvil, for all crimp terminations. No more than one wire may be terminated in a single crimp lug and no more than two lugs may be installed on a single screw terminal. Wiring shall not be spliced or tapped except at device terminals or terminal blocks.
- E. All signal wiring shields shall be grounded at control panel only.

3.04 INSPECTIONS

- A. All materials, equipment, and workmanship shall be subject to inspection at any time by the Engineer or his representatives. Correct any work, materials, or equipment not in accordance with these Contract Documents or found to be deficient or defective in a matter satisfactory to the Engineer at no additional cost to the Owner.
- B. Perform the following inspections of the installed equipment:
 - 1. Certify in writing that the equipment has been installed per drawings and recommended installation procedures. Report any discrepancies.
 - 2. Certify in writing that the equipment power and grounding requirements have been satisfied. Report any discrepancies.
 - 3. Certify in writing that terminations to the equipment are properly installed. Report any discrepancies.
 - 4. Certify that the system is ready for field testing.
- C. In addition to installation assistance required by the Electrical Contractor, provide other on-site services for:
 - 1. Process meetings
 - 2. Pre-shipment site visits
 - 3. Field testing
 - 4. Training
 - 5. Operational availability demonstration
 - 6. Time to repair or correct shipping defects and additional trips as a result of shipping problems.

END OF SECTION

SECTION 430000 - SUBMERSIBLE WASTEWATER PUMPS FOR DUPLEX WETWELL INSTALLATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work in this section shall include furnishing and placing into operation 2 submersible pumps, with discharge connections, lifting chains and guide bars as specified herein and as indicated on the drawings. The complete pump station shall be submersible up to 65 feet above the inlet pipe level.

1.2 RELATED SECTIONS

- A. Division 26 Electrical

1.3 REFERENCES

- A. American Society for testing and material (ASTM) International.
 - 1. A 48: Standard Specification for Gray Iron Castings.
 - 2. A743: Standard Specification Iron-Chromium Nickel, Corrosion Resistant.
- B. American National Standards Institute (ANSI):
 - 1. B16.1: Standard for Cast Iron Pipe Flanges and Flanged Fittings, 125 lb.
- C. Hydraulic Institute: Current Standards.
 - 1. HI 14.6: Hydrodynamic Pumps for Hydraulic Performance Acceptance Tests.
 - 2. HI 11.6: Submersible Pump Tests.

1.4 SUBMITTALS

- A. Submittal data shall be provided to show compliance with these specifications, plans or other specifications that will influence the proper operation of the pump(s).
- B. Standard submittal data for approval must consist of:
 - 1. Pump Performance Curves.
 - 2. Pump Outline Drawing.
 - 3. Station Drawing for Accessories.
 - 4. Electrical Motor Data.
 - 5. Typical Installation Guides.
 - 6. Technical Manuals and Parts List.
 - 7. Printed Warranty.
 - 8. Management system certificate ISO 9001.
 - 9. Manufacturer's Equipment Storage Recommendations.

10. Manufacturer's Standard Recommended Start-Up Report Form.

C. Lack of the above requested submittal data is cause for rejection.

1.5 QUALIFICATION REQUIREMENTS

A. Allowable manufactures:

- a. Flygt
- b. Haywood Gordon
- c. Sulzer
- d. Grundfos
- e. Approved equivalent

B. After installation, a pump station start-up shall be performed by the installing contractor under the supervision of the manufacture's authorized representative. 8 hours of field service shall be provided by an authorized, factory trained representative of the pump manufacturer. Services shall include, but not be limited to, inspection of the completed pump station installation to ensure that it has been performed in accordance with the manufacturer's instructions and recommendations, supervision of all field-testing and activation of the Pump Manufacturer's Warranty. The test shall demonstrate to the satisfaction of the Owner that the equipment meets all specified performance criteria, is properly installed and anchored, and operates smoothly without exceeding the full load amperage rating of the motor. The Contractor shall be responsible for coordinating the required field services with the Pump Manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products to site under provisions of Section 016600.

1.7 OPERATIONAL REQUIREMENTS AND WARRANTY

A. The contractor shall supply and install 4 submersible sewage pumps with discharge connections, discharge pipes, guide bars, cable holder lifting chains.

B. The pumps shall be warrantied per 013325.

C. The manufacturer shall guarantee clog-free operation for a period of 24 months from the date of start-up of the pumps by the local authorized factory representative. A certificate shall be provided to the Owner on the day of start up with the local contact information and effective date. If the impeller clogs with typical solids or modern trash debris normally found in domestic wastewater during this period, an authorized representative shall travel to the jobsite, remove the pump, clear the obstruction and reinstall the pump at no cost for the Owner. A written report shall be provided to the Owner detailing the service call with pictures for verification purposes.

PART 2 - PRODUCTS

2.1 SUBMERSIBLE SEWAGE PUMPS

- A. Each station shall be equipped with 2 submersible, close-coupled wastewater pumps, total of 4 pumps.
- B. Each pump shall be equipped with a 25 HP submersible electric motor, capable to operate on a 460 volt, 3 phases, 60 hertz voltage supply.
- C. Each pump shall be capable of 2,316 US gpm at a total dynamic head of 17 feet.
- D. The hydraulic efficiency in this duty point shall be not less than 75 % and approved according to HI 11.6:2012 Grade 2B.
- E. The hydraulic of the pump shall be capable of handling raw domestic wastewater and storm water with fibrous materials like wet wipes.
- F. The impellers shall be multi vane self-cleaning designed to transport wastewater with fibrous materials like wet wipes.
- G. . The clearance between the insert ring and the impeller leading edges shall be adjustable.
- H. The impeller shall be wear-resistant and made of heavy duty cast iron.
- I. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output HP and efficiency. This chart shall also include data on starting and no-load characteristics
- J. The impeller shall be mounted on the motor shaft. Couplings shall not be accepted.
- K. The pump motor shall be submersible explosionproof according FM CLASS 1. DIV 1 "C" & "D"and inverter duty rated.
- L. The motor shall be provided with an integral motor cooling system. A stainless steel cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket.
- M. The pump shall be capable of operating in a continuous condition in a liquid with a temperature up to 104°F even when the motor is not submerged.
- N. The motor shall be capable of no less than 15 evenly spaced starts per hour and be able to operate throughout the entire pump performance curve from shut-off through run-out.
- O. The stator windings shall be insulated with moisture resistant Class H insulation rated for 356°F.

- P. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact.
- Q. It shall be possible to lift and lower the pumps on parallel guide bars and connect them to wet well mounted discharge connection. There shall be no need for personal to enter the wet well when removing or reinstalling the pumps.
- R. The pump housing shall be prepared for the assembling of a wet well mixing valve. The discharge flange of the pump housing shall be 10”.
- S. The junction chamber containing the terminal board shall be hermetically sealed from the motor by a compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts.
- T. The motor shall be protected by thermal switches embedded in the stator set to open at 285°F (140°C) and one leakage sensor floating type located in the stator chamber. The sensor and the switches shall be connected to the control panel which shall stop the motor and send an alarm when the sensors are activated.
- U. The cable entry shall be completely sealed and watertight.
- V. The pump shaft shall rotate on two bearings, upper and lower. Motor bearings shall be permanently grease lubricated and have a nominal L10 lifetime of 50.000 hours. The bearings shall compensate for axial thrust and radial forces.
- W. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two seal sets.
- X. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The seal system shall not rely upon the pumped media for lubrication. Seal lubricant shall be non-hazardous.
- Y. The Materials of construction shall be as follows:
 - 1. Pump volute: Cast iron ASTM A-48, Class 35B.
 - 2. Impeller and insert ring: A 532 ALLOY III A (25% Chrome).
 - 3. Cooling jacket: Stainless steel AISI 316.
 - 4. Stator housing: ASTM A-48, Class 35B.
 - 5. Shaft: ASTM A479 S43100-T.
 - 6. Shaft seal: Pump side: - Corrosion resistant Tungsten carbide WCCR.
 - 7. Shaft seal Motor side: - Corrosion resistant Tungsten carbide WCCR.
- Z. All castings must be blasted before powder coating. The total layer thickness should be at least 100 microns.
- AA. The motor shall be equipped with 50 feet of screened cable suitable for submersible pump

applications. The power cable shall be sized according to NEC and ICEA. The outer jacket of the cable shall be oil resistant. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

BB. Each completed and assembled pump/motor unit shall undergo the following factory tests at the manufacturer's plant prior to shipment. The Manufacturer shall provide on demand a copy of his quality control plan for these tests and an ISO 9001 factory certificate:

1. Minimum 3-point hydraulic performance test.
2. No-Leak seal integrity test.
3. Electrical integrity test.

2.2 EQUIPMENT FOR WET WELL INSTALLATION

- A. The pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two parallel guide bars extending from the top of the station to the wet well mounted discharge connection. The material of the guide bars shall be Stainless steel AISI 316.
- B. The length of the guide bars shall be as required and fasten at the top of the station with a guide bar holder made of Stainless steel AISI 316.
- C. For each pump the contractor shall supply and install a cable holder made with 4 hooks of Stainless steel AISI 316.
- D. Each pump shall be fitted with sufficient stainless steel lifting chain or lifting cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

2.3 SUMP MIXING VALVE

- A. One pump unit in each pump station shall be equipped with an automatically operating flush valve mounted directly to the pump volute. During the starting the valve shall redirect a portion of the pumped media into the sump to re-suspend solids and grease by the turbulent action of its discharge.
- B. The valve shall be equipped with an adjustable, wear-resistant discharge nozzle that can be used to direct flow within the sump. The valve shall operate by differential pressure across the valve and shall not require any electric or pneumatic power source to operate. The valve shall be suitable for use in Class I, Division 1 hazardous locations.
- C. The valve shall be adjustable and open at the beginning of each pumping cycle and shall automatically close.

2.4 SUBMERSIBLE CABLE CONNECTION BOX

- A. The submersible cable of the pump shall be connected to the cable from the Control panel in a floor or wall mounted cable connection box to ease the installation and disassembling of the pumps and keep the submersible cables as short as possible.
- B. The cable connection box shall be submersible and explosionproof.

PART 3 - EXECUTION

3.1 GENERAL

- A. Perform installation in accordance with Contract Documents and manufacturers specifications.

3.2 EXAMINATION

- A. A factory trained technician shall examine the work area prior to beginning work and check the following:
 - 1. The environment is safe to begin working in.
 - 2. All surfaces are ready to receive work.
 - 3. All tools are in the proper location and are in good condition.
 - 4. Grounding of the system.

3.3 FIELD QUALITY CONTROL

- A. The following field tests shall be performed by a factory trained technician
 - 1. Point to point wiring verification
 - 2. Utility power verification
 - 3. Site acceptance testing
 - 4. System demonstration
- B. Point to Point I/O Verification
 - 1. After installation of the pumps and the control panel, a factory trained technician shall prepare the I/O checklist. The checklist shall include the following:
 - a. All inputs and outputs connected to the control panel
 - b. All alarms that can be generated by the control panel
 - 2. The technician shall follow a test procedure to test all I/O and alarms.
 - a. All digital inputs shall be tested from point of origin unless it is unsafe.
 - b. All digital outputs shall be tested by running a simulation test from the controller or by simulating the fault condition.
 - c. All analog inputs shall be tested from the point of origin where possible and by use of a signal generator otherwise.
 - d. All analog outputs shall be tested by running a simulation program or by forcing the output to a value.
 - 3. The technician shall follow a test procedure to ensure the system operation parameters are met.
- C. Configuration Verification
 - 1. The factory trained technician shall document the settings using a factory provided configuration checklist. Each parameter shall be verified prior to the beginning of testing and then again after testing is completed.
 - 2. The configuration of the pump station manager as well as the IPS gateways shall be documented.

3. The pump station manager configuration shall be saved to a factory provided SD card after testing is completed.

3.4 FACTORY TRAINED SUPERVISION

- A. All tests shall be performed in the presence of a duly authorized representative of the Owner. If the presence is waived, certified results shall be provided by the Contractor.
- B. All test equipment shall be provided by the Contractor.

3.5 TRAINING

- A. Training shall be a minimum of four (4) hours and cover the complete Pumping System and related controls.
- B. Instruction material shall be provided for the trainees.

END OF SECTION 430000

SECTION 443116 - CARBON ABSORPTION UNIT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. This section includes the furnishing and installation of a carbon adsorption (odor control) unit complete with blower, piping, clamps, tubing, and electrical hookups as required to complete the system.
- B. It is the intent of this contract that the final installation shall be complete in all respects and the Contractor shall be responsible for all minor details and any necessary special construction not specifically included in the drawings or specifications.

1.3 QUALITY ASSURANCE

- A. All work performed under this section shall comply and be in accordance with all approved trade practices and manufacturer's recommendations.

1.4 SUBMITTALS

- A. The Contractor shall furnish for approval complete shop drawings showing the unit, all equipment and appurtenances as required on the plans and in the specifications.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The carbon adsorption unit manufacturer shall take total system responsibility for the proper installation, performance and warranty of the odor control systems.
- B. All equipment furnished under this section shall be suitable for installation as shown on the contract drawings and specified herein. The Contractor shall be responsible for determining any restrictions that may prevent the use of any piece of equipment as well as determining the necessary clearances required to move all equipment to its final location.

2.2 CARBON ADSORPTION UNIT

- A. Two (2) Carbon adsorption unit shall consist of a two (2) FRP canisters and 1 3 HP fan each. Canisters shall be G-3P size units with activated carbon for hydrogen sulfate absorption capacity of 0.2 gm H₂S/gm carbon.
1. Inlet 6" NPT
 2. Outlet 6" NPT with Screen
 3. Drain 3/4" Connector
 4. Carbon sample port 1"
 5. Grounding rod 1 per vessel
- B. The carbon adsorption unit shall be as manufactured by Carbtrol Corporation Model No. G-3B-1000 or equal as approved by the Engineer.

2.3 EQUIPMENT CONNECTION

- A. An aluminum flexible connection shall be provided as shown on the plans from the carbon unit to the vent transition chamber.
- B. Vent transition chamber shall be fabricated by the Contractor as specified herein and as illustrated on the plans.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Carbon adsorption unit shall be installed in a manner recommended by the unit manufacturer and as approved by the Engineer.
- B. All costs of installation including anchoring, bolts, clamps and setting of equipment shall be included in this section.
- C. Existing vent shall be cleaned and painted then tapped if necessary to accommodate the vent transition chamber as directed by the Engineer. Vent transition chamber shall be constructed of 0.063" minimum thickness aluminum and bolted to the vent flange with stainless steel bolts.
- D. Contractor shall install a manual on/off switch at the building entrance as shown on the plans and specified herein to control the carbon adsorption unit blower.
- E. Install a protective weather hood for the blower as supplied and/or recommended by the unit manufacturer.

3.2 OPERATION AND MAINTENANCE MANUALS

- A. Prior to or with the delivery of equipment, the manufacturer shall provide copies of an operation and maintenance manual including storage, installation, start-up, operating and maintenance instructions, and a complete parts list with a recommended spare parts list. The operation and maintenance manuals shall be in compliance with the General Requirements.

END OF SECTION 443116

SECTION 6
SPECIFIC PROJECT REQUIREMENTS

SPECIFIC PROJECT REQUIREMENTS

1 - CONTACT DURING BIDDING

- 1.1 All questions during bidding should be addressed to Eric Fallon P.E., who can be reached at CT Consultants, Inc., 330-607-7897

2 - INSURANCE

- 2.1 See the following Bid Set Sections for Insurance Requirements:
- A. Section 1, Instructions to Bidders, Part 10 Insurance
 - B. Section 3, General Conditions, Article 5 Bonds and Insurance (EJCDC) or Article 11 Insurance and Bonds (AIA), whichever is used in the Bid Set
 - C. Section 4, Supplemental Conditions

3 - WORKING HOURS

- 3.1 No work shall be performed between the hours of 7:30 PM and 7:30 AM nor on Saturday, Sunday, or legal Holidays, without written permission of the Owner.

4 - PROJECT COMPLETION

- 4.1 All work including restoration and clean-up shall be completed no later than the contract completion date. Failure to complete all work within the allotted time will result in assessment of liquidated damages. Upon completion of all work and written notification of same by the Contractor, the Engineer and Owner will compile a punch list. The punch list will be sent to the Contractor. All punch list work shall be completed to the satisfaction of the Engineer and the Owner within 14 days after receipt of the punch list. Failure to complete the punch list work within the allotted time will result in assessment of liquidated damages.

5 - DRUG-FREE WORKPLACE PROGRAM

- 5.1 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.

6 - OHIO ETHICS LAW

- 6.1 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.

7 - PERIODIC PAYMENTS

- 7.1 This project is expected to be funded in whole or in part by the Ohio EPA WPCLF Program. The Contractor shall comply with all requirements of this program. The periodic payments to the Contractor may be made in whole or in part through the OWDA. In paragraph 14.02 C.1. of the General Conditions, change “ten days” to “sixty days.”
- 7.2 Ohio EPA must approve all change orders prior to a change order item being paid on a pay estimate.

SECTION 7
SPECIAL REQUIREMENTS - EPA

Contract Document Provisions

The following contract requirements and forms are to be included in the construction contract documents. Completed copies of the forms are to be submitted to Ohio EPA within one week after bids are received, or sooner dependent on your individual project schedule. Bid packages for WPCLF projects should be submitted to DEFA in the central office while bid packages for WSRLA projects should be submitted to the appropriate DDAGW district office.

Equal Employment Opportunity (EEO) Requirements

The Contractor's EEO Certification Form 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.

Debarment

The Certification Regarding Debarment, Suspension, and Other Responsibility Matters 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.

Disadvantaged Business Enterprises (DBE) Utilization

The DBE Specification language and instructions to the bidders and Forms 6100-3, 6100-4 and 6100-2 must be (1) included in the contract documents and (2) referenced in the Instructions to Bidders, informing bidders that the forms must be completed and submitted with their bid.

NOTE: If the loan applicant has its own DBE requirements or if other funding programs with potentially competing DBE requirements are participating in the project funding, please contact Ohio EPA – DEFA for specific instructions regarding the DBE requirements.

Davis-Bacon wage rate requirements

The contract documents must include language that requires contractors and subcontractors to pay wages at rates not less than those prevailing on similar projects within the area as determined by the US Secretary of Labor. In addition, the loan recipient will be required to conduct wage interviews and monitor payroll for compliance.

American Iron and Steel

All treatment works projects funded by a WPCLF assistance agreement and all public water system projects funded by a WSRLA assistance agreement are required to comply with American Iron and Steel (AIS) requirements. The acknowledgement form must be included in the contract documents. The acknowledgement form should be signed by the contractor and submitted with the final bid package. It is recommended that the AIS guidance document and questions and answers document be included in the contract documents.

Bipartisan Infrastructure Law Signage Requirements

The Bipartisan Infrastructure Law (BIL) mandates that recipients of BIL funding must install a sign in compliance with the design specifications provided by the United States Environmental Protection Agency (USEPA). These signs should be placed either on the construction site or in a location that is easily visible and directly relevant to the respective construction project. BIL-specific signage is applicable to all construction projects that receive funding under BIL, including those related to Lead Service Line, Emerging Contaminants, and equivalency projects.

Equivalency projects include projects that receive funding through federal capitalization grants supporting the Water Pollution Control Loan Fund (WPCLF) and the Water Supply Revolving Loan Account (WSRLA) programs. For all BIL-funded and equivalency projects, recipients are responsible for ensuring that a sign is prominently displayed at the construction site. This sign should feature the official “Investing in America” emblem and clearly identify the project as “funded by President Biden’s Bipartisan Infrastructure Law.”

These signs must be placed in locations that are easily visible, directly associated with the ongoing work, and they should be maintained in good condition throughout the entire construction period. Signage guidelines and design specifications provided by EPA for using the official Investing in America emblem are available at: <https://www.epa.gov/invest/investing-america-signage>.

The following contract requirements are to be included in the construction contract documents but are not required to be submitted to Ohio EPA for contract endorsement.

Violating Facilities Clause

Language prohibiting this use of equipment or services from anyone on the EPA List of Violating Facilities must be included in the contract documents.

Small Businesses in Rural Areas (SBRA)

Language encouraging the participation of small businesses in rural areas should be included in the contract documents.

Prohibition on Telecommunications and Video Surveillance

Restrictions to loan recipients and subrecipients on certain telecommunications and video surveillance services or equipment due to Public Law 115-232.

[Insurance Provisions](#)

Section 3.5 of the WPCLF/WSRLA Loan Agreement contains specific requirements regarding insurance for all contractors and all subcontractors for the life of the contract. These insurance requirements must be reflected in the contract documents. Adjust the language as needed to meet the specifics of the construction project while still meeting the provisions of the Loan Agreement.

[Materials Testing](#)

In addition to the details included with specific equipment testing in the specifications, there should be an overall statement regarding testing for the project. Adjust the language as needed to meet the specifics of the construction project.

[Continuous Treatment Provisions](#)

It is important that construction activities not result in any temporary violations of Drinking Water or NPDES permit requirements (for permitted facilities). Construction activities should interrupt wastewater service to the individual resident as little as possible. For drinking water projects, it is important that construction activities not result in any disruption of service. The example language is intended for construction work occurring at an existing drinking water plant or a WWTP and must be adjusted to meet the specifics of the construction project.

[WPCLF/WSRLA Change Order Form](#)

All change orders for the construction project must be executed on the WPCLF/WSRLA change order form. The form must be (1) included in the contract documents and (2) the instructions referenced in the Contract Documents.

The following contract requirements are provided in Ohio Revised Code (ORC). Some loan applicants have local requirements that supersede ORC provisions for competitive bidding, and these local requirements can be applied instead of ORC, except for those requirements specified in the WPCLF/WSRLA loan agreements.

Bid Guarantee

The requirements for a bid guarantee (which can be a bond or a certified check, cashier's check, or letter of credit) are covered in ORC 153.54.

Payment and Performance Bonds

The requirements for a Payment and Performance Bond are covered in ORC 153.54 and Section 3.4 of the WPCLF/WSRLA Loan Agreements.

Payment Retention

The requirement for payment retainage is provided in ORC 153.12. Details on how the escrow account that holds the retainage are provided in ORC 153.13. Further details on how and when to pay for materials delivered and installed are provided in ORC 153.14.

Completion Time

The contract documents must state the length of the contract time per ORC 153.19. The dates for Initiation of Operation and Project Completion are specified in the WPCLF/WSRLA Loan Agreements and need to coincide with the specified contract time.

The following are contract provisions to consider but are not required. The language provided for each are samples only and must be adjusted to reflect the specifics of the project and local needs.

[Local Protest Procedure](#)

Some statement as to when a valid protest must be filed, in what form it must be filed and who it must be filed with should be included. ORC 153.12 has some default procedures for handling disputes. If the owner wants more control than provided in ORC, a procedure needs to be spelled out in the Contract Documents.

[Basis and Method for Award](#)

The contract documents should include some language that clearly states what the Owner will consider when determining the successful bidder and to provide a clear basis for the Owner when they have a need to reject the low bidder and go with a different bidder.

[Payment Methods](#)

To minimize uncertainty and arguments that can slow down the progress of construction it is useful to provide language stating how and when the Contractor will get paid. In addition to ORC and other local requirements, the involvement of public funding Agencies such as the WPCLF, WSRLA, Ohio Public Works Commission and Community Development Block Grant impact the process and timing for payments.

Contract Documents Review

Whenever possible, all the provisions listed above must be included in the contract documents for the project prior to advertisement for bids. Ohio EPA's review for these contract provisions will occur as part of our normal detail plans and specifications review. The bidding documents are to be submitted to Ohio EPA for review regardless of whether a Permit to Install or a Plan Approval is required for the project.

After bidding has started:

In those cases when WPCLF or WSRLA funding is being requested after advertisement for bids has started, add all missing contract provisions, forms, and requirements via addendum.

After bids have been opened but before contracts have been signed:

If the bid advertisement period is over and bids have been opened, but the construction contract have not been signed yet, provide a draft contract change order which would be used to incorporate all missing contract provisions, forms, and requirements into the contract. This should be done in consultation with local legal counsel to address any potential bid protest concerns.

Construction contracts have already been signed:

If the construction contract has already been signed, a contract change order must be executed incorporating all missing contract provisions, forms, and requirements into the contract.

A [Contract Documents Review checklist](#) is provided here to help ensure that all requirements are included and to help expedite Ohio EPA's review of your documents.

Bid Package Submittals

Certain documents must be submitted to Ohio EPA within one week after bids are received, or sooner dependent on your individual project schedule. Please [look here for a complete list](#) of the required submittals.

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.

Disadvantaged Business Enterprises (DBE) Utilization

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 <http://www.ohioucp.org> as well as the ODOT website www.dot.state.oh.us/divisions/equalopportunity/pages/dbe.aspx.

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.

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:

Florel Fraser, Ohio EPA – DEFA
P.O. Box 1049
Columbus, OH 43216-1049
E-mail address: Florel.Fraser@epa.ohio.gov
Phone: (614) 644-3636

**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 DBE¹ subcontractor² 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.

**Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form**

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	Date

ALERT

“Total Procurement” fields and “MBE/WBE Combined Procurement” fields located in section 4B of this form should include Federal funds provided under the assistance agreement, recipient matching funds, and funds from other sources that are included in the assistance agreement.

Due to process time of Paperwork Reduction Act procedures, EPA is not able to update the [EPA Form 5700-52A](#) immediately to reflect this clarification.

If EPA grant recipients have questions about [EPA Form 5700-52A](#), please work with your respective Grants Specialist or [DBE Coordinator](#).



U.S. ENVIRONMENTAL PROTECTION AGENCY MBE/WBE UTILIZATION UNDER FEDERAL GRANTS AND COOPERATIVE AGREEMENTS

This collection of information is approved by OMB under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. (OMB Control No. 2030-0020). Responses to this collection of information are required to obtain an assistance agreement (40 CFR Part 30, 40 CFR Part 31, and 40 CFR Part 33 for awards made prior to December 26, 2014, and 2 CFR 200, 2 CFR 1500, and 40 CFR Part 33 for awards made after December 26, 2014). 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. The public reporting and recordkeeping burden for this collection of information is estimated to be 1 hour per response. 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 to the Regulatory Support Division Director, U.S. Environmental Protection Agency (2821T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

1A. REPORTING PERIOD October 1, _____ – September 30, _____		1B. REPORT TYPE <input type="checkbox"/> Annual <input type="checkbox"/> Final Report (Project completed)													
1C: Revision of a Prior Year Report? <input type="radio"/> No <input type="radio"/> Yes If yes, what reporting period is being revised and briefly describe the changes made. Note: The revised report will replace the associated original report in its entirety.															
2A. RECIPIENT UNIQUE ENTITY IDENTIFIER 															
2B. RECIPIENT REPORTING CONTACT Name: Email: Phone:															
3. FEDERAL AWARD IDENTIFICATION NUMBER (FAIN) (For SRF state recipients, please include all numbers for all open assistance agreements being reported on this form.)															
4A. If NO procurements were made this reporting period (by the recipient, sub-recipient(s), loan recipient(s), and prime contractor(s)), CHECK and SKIP to Block No. 6. (Procurements are all expenditures through contract, order, purchase, lease or barter of supplies, equipment, construction, or services needed to complete Federal assistance programs.) <input type="checkbox"/>															
4B. Total Procurements & MBE/WBE Accomplishments This Reporting Period (in dollars) <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;">Construction</th> <th style="width: 20%; text-align: center;">Non-Construction</th> <th style="width: 10%; text-align: center;">Total</th> </tr> </thead> <tbody> <tr> <td>Total Procurement:</td> <td style="text-align: center;">\$ _____</td> <td style="text-align: center;">\$ _____</td> <td style="text-align: center;">\$ _____</td> </tr> <tr> <td>MBE/WBE Combined Procurement:</td> <td style="text-align: center;">\$ _____</td> <td style="text-align: center;">\$ _____</td> <td style="text-align: center;">\$ _____</td> </tr> </tbody> </table>					Construction	Non-Construction	Total	Total Procurement:	\$ _____	\$ _____	\$ _____	MBE/WBE Combined Procurement:	\$ _____	\$ _____	\$ _____
	Construction	Non-Construction	Total												
Total Procurement:	\$ _____	\$ _____	\$ _____												
MBE/WBE Combined Procurement:	\$ _____	\$ _____	\$ _____												
5A. Good Faith Efforts: If procurements were made, indicate whether your organization has followed the six Good Faith efforts found in 40 CFR Part 33, Subpart C, 40 CFR 33.501 and 2 CFR 200.321. <input type="checkbox"/> Yes, my organization has implemented and documented each of the six Good Faith Efforts on the procurements made during this reporting period. <input type="checkbox"/> No, my organization has not implemented and documented each of the six Good Faith Efforts on the procurements made during this reporting period.		5B. If procurements were made, but no MBE/WBE procurements are being reported, then check the applicable box(es) for the reason(s) why no MBE/WBE procurements were made. <input type="checkbox"/> No MBE/WBE(s) applied <input type="checkbox"/> No MBE/WBE(s) were qualified <input type="checkbox"/> Other:													
6. NAME OF RECIPIENT'S AUTHORIZED REPRESENTATIVE		TITLE													
7. SIGNATURE OF RECIPIENT'S AUTHORIZED REPRESENTATIVE		DATE													

Instructions:

A. General Instructions:

MBE/WBE utilization is based on 40 CFR Part 33 and 2 CFR Parts 200 and 1500. The reporting requirement reflects the change in the reporting threshold described in Recipient/ Applicant Information Notice-2018-G04 issued by EPA's Office of Grants and Debarment on September 7, 2018 (<https://www.epa.gov/grants/rain-2018-g04>). EPA Form 5700-52A must be completed annually by recipients of financial assistance agreements where the combined total of funds budgeted for procuring supplies, equipment, construction and services exceeds the current Simplified Acquisition Threshold as set by the Federal Acquisition Regulation at 48 CFR Subpart 2.1. This reporting requirement applies to all new and existing awards and voids all previous reporting requirements.

In determining whether the threshold is exceeded for a particular assistance agreement, the analysis must focus on funds budgeted for procurement under the supplies, equipment, construction, services or "other" categories, and include funds budgeted for procurement under sub- awards or loans.

Reporting will also be required in cases where the details of the budgets of sub-awards/loans are not clear at the time of the grant awards and the combined total of the procurement and sub-awards and/or loans exceeds the Simplified Acquisition Threshold.

For example, if the Simplified Acquisition Threshold is \$250,000, then if a recipient has \$300,000 budgeted under procurement, then completion of this report is required.

When reporting is required, all procurement actions are reportable, not just the portion which exceeds the Simplified Acquisition Threshold.

If at the time of award the budgeted funds exceed the Simplified Acquisition Threshold but actual expenditures fall below, a report is still required.

If at the time of award, the combined total of funds budgeted for procurements in any category is less than or equal to the Simplified Acquisition Threshold and is

maintained below the threshold, no DBE report is required to be submitted.

Recipients are required to report 30 days after the end of each federal fiscal year (i.e. October 30th), per the terms and conditions of the financial assistance agreement.

Final reports are due October 30th or 120 days after the end of the project period, whichever comes first.

MBE/WBE program requirements, including reporting, are material terms and conditions of the financial assistance agreement. Failure to comply may lead to termination of the financial assistance agreement which is then reported to the OMB-designated integrity and performance system accessible through SAM (currently FAPIIS) pursuant to 2 CFR 200.339(b).

B. Submission:

Recipients must submit completed forms to the point of contact associated with the awarding office for the applicable assistance agreement.

Information on specific points of contact for EPA's Headquarters and ten Regional Offices is located at:

<https://www.epa.gov/grants/frequently-asked-questions-disadvantaged-business-enterprises>

Questions regarding the completion of this form should be directed to the DBE Coordinator associated with the awarding office for the applicable assistance agreement. A list of the DBE Coordinators for each awarding office can be located here:

<https://www.epa.gov/grants/epa-dbe-program-coordinators>

c. Instructions:

1A. Specify Federal fiscal year this report covers. The Federal fiscal year runs from October 1st through September 30th (**e.g. November 29, 2020 falls within Federal fiscal year 2021**)

1B. Specify report type. Check the annual reporting box if this is an annual report. If it is a final report, check the final report box to indicate if the project is completed.

1C. Indicate if this is a revision to a previous year and provide a brief description of the revision you are making including what reporting period is being revised. The revised report will replace the associated original report in its entirety.

2A. Provide your organization's Unique Entity Identifier. More information about Unique Entity Identifier, including its meaning, can be found in 2 CFR Part 25.

2B. Identify the name and contact information for the person located within the recipient organization that can be contacted if questions arise from this report.

3. Provide the Federal Award Identification Number (FAIN) assigned by EPA. A separate report must be submitted for each Assistance Agreement.

***For SRF recipients:** In box 3 list numbers for ALL OPEN Assistance Agreements being reported on this form.

4A. Self-explanatory. **Note:** Procurement means expenditures under the supplies, equipment, construction, services or "other" categories, and include funds expended for procurement under sub-awards or loans.

****This data is requested to comply with provisions mandated by: statute or regulations (40 CFR Part 33 and/or 2 CFR Parts 200 and 1500); 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.**

4B. Provide the total dollar amount (in dollars) of **ALL** procurements awarded this reporting period by construction, non-construction, and grand total by the recipient, sub-recipients, and SRF loan recipients, **including** MBE/WBE expenditures, not just the portion which exceeds the threshold. 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).

Provide the total dollar amount (in dollars) of MBE/WBE procurements **ONLY** awarded this reporting period by construction, non-construction, and grand total by the recipient, sub-recipients, SRF loan recipients, and prime contractors not just the portion which exceeds the threshold.

***For SRF recipients only:** In 4B, please enter the total annual procurement amount 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)**

5A. Self-explanatory.

5B. If procurements were made during this reporting period, but no procurements with MBE(s) or WBE(s) are being reported, then select the reason why. If "Other" is chosen, please fill in with the reason.

6. Self-explanatory.

7. Self-explanatory.

Material Suppliers

In October 2009, OEPA/DEFA made a clarification to their DBE Policy. If a Contractor subcontracts work and cannot meet the Goals with MBE/WBE Subcontractors, the Goals may be met by supplying equipment from MBE/WBE Suppliers.

Also, Contractors that do not subcontract work do not have to comply with the MBE/WBE requirements although all Contractors are strongly encouraged to break the work into subcontracts whenever feasible.

Violating Facilities Clause

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.

Requirement For Utilization Of Small Businesses In Rural Areas (SBRA)

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.

This procurement is subject to the EPA policy of encouraging the participation of small business in rural areas (SBRAs).

WPCLF Local Protest Procedure

Protests

A protest based upon an alleged violation of the procurement requirement 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 Mayor. The OWNER shall determine the protest. The OWNER may request additional information or a hearing in order to resolve the protest.

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 nondelivery with in the required time period.

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

Continuous Treatment Provisions

It is important that construction activities not result in any temporary violations of NPDES permit requirements (for permitted facilities) and construction activities should interrupt wastewater service to the individual resident as little as possible. For drinking water projects, it is important that construction activities not result in any disruption of service. Any disruption of service must be immediately reported to the Ohio EPA, Drinking Water Section of the appropriate district office.

Continuous Treatment (wastewater projects)

Federal regulations prohibit by-passing of any sewage during construction operations. The Contractor will be responsible for providing any required temporary pumping facilities piping, etc., necessary to complete the project without any plant by-passing and continuous treatment must be provided at the same level during construction as existed prior to construction.

Unless otherwise previously or subsequently specified, the Contractor shall procure and pay for all permits, licenses, and approvals necessary for the execution of his Contract.

The Contractor shall comply with all laws, ordinances, rules, orders, and regulations relating to the performance of the work required to complete their Contract.

The following example language is a sample of what might be appropriate for construction work occurring at an existing drinking water treatment plant. The language actually incorporated into the contract documents must be adjusted to meet the specifics of the construction project.

Continuous Treatment (drinking water projects)

The Contractor will be responsible for obtaining approval from Ohio EPA for use of temporary pumping facilities, piping and other items in order to complete the project without any plant by-passing. Continuous treatment must be provided at the same level during construction as existed prior to construction.

Unless otherwise previously or subsequently specified, the Contractor shall procure and pay for all permits, licenses, and approvals necessary for the execution of his Contract.

The Contractor shall comply with all laws, ordinances, rules, orders, and regulations relating to the performance of the work required to complete their Contract.

WPCLF/WSRLA Payments

This project is funded in whole or in part by funds from the Water Pollution Control Loan Fund (WPCLF) or the Water Supply Revolving Loan Account (WSRLA) as administered by the Ohio EPA-DEFA and the Ohio Water Development Authority (OWDA). The Contractor shall comply with all requirements of these programs. The Owner shall be responsible for the progress payments to the Contractor if the Owner becomes ineligible for further payments due to circumstances which are of no fault of the Contractor. The monthly payments to vendors may be made through the Owner, the OWDA, or both as deemed by the Owner.

The time frame for payment of pay estimates by the Owner and/or Special Funding Agency(s) may be up to 60 calendar days from date of receipt of pay estimate from Engineer to Owner. Ohio EPA/DEFA must approve all change orders before the change order may be submitted for payment on a pay estimate.

State of Ohio
 WATER POLLUTION CONTROL LOAN FUND (WPCLF) /
 WATER SUPPLY REVOLVING LOAN ACCOUNT (WSRLA)

CONTRACT CHANGE ORDER

RECIPIENT _____ CHANGE ORDER NBR _____

LOAN NUMBER _____ CONTRACT _____

OWDA PROJECT No. _____ DATE _____

Description of Change:

The time provided for completion in the contract for the above items is (increased/decreased) by ____ calendar days.

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. All change orders must be submitted electronically to dedicated change order email addresses for WPCLF and WSRLA projects.

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 electronically to Ohio EPA for final review.

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 along with a PDF of the WPCLF/WSRLA Change Order form which will be signed by all parties including Ohio EPA and OWDA.

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.



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: f (Andrew D. Sawyers, Director
v) Office of Wastewater Management (4201M)
Peter C. Grevatt, Director
Office of Ground Water and Drinking Water (4601M)

C.
Handwritten signature of Peter C. Grevatt in black ink.

TO: Water Management Division Directors
Regions I - X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

Implementation

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term “iron and steel products” means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the “Administrator”) finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out

the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

1) What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

5) What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

6) What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

7) What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

8) What if a project has split funding from a non-SRF source?

Many States intend to fund projects with “split” funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A “project” consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which

case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

9) What about refinancing?

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12)

Covered Iron and Steel Products

11) What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

- Lined or unlined pipes or fittings;
- Manhole Covers;
- Municipal Castings (defined in more detail below);
- Hydrants;
- Tanks;
- Flanges;
- Pipe clamps and restraints;
- Valves;
- Structural steel (defined in more detail below);
- Reinforced precast concrete; and
- Construction materials (defined in more detail below).

12) What does the term ‘primarily iron or steel’ mean?

‘Primarily iron or steel’ places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does ‘produced in the United States’ mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components

do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of ‘municipal castings’?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

- Access Hatches;
- Ballast Screen;
- Benches (Iron or Steel);
- Bollards;
- Cast Bases;
- Cast Iron Hinged Hatches, Square and Rectangular;
- Cast Iron Riser Rings;
- Catch Basin Inlet;
- Cleanout/Monument Boxes;
- Construction Covers and Frames;
- Curb and Corner Guards;
- Curb Openings;
- Detectable Warning Plates;
- Downspout Shoes (Boot, Inlet);
- Drainage Grates, Frames and Curb Inlets;
- Inlets;
- Junction Boxes;
- Lampposts;
- Manhole Covers, Rings and Frames, Risers;

Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

20) What is ‘structural steel’?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a ‘construction material’ for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered “structural steel”. This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a ‘construction material’ for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters,

heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Compliance

25) How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer,

processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

26) How should a State ensure assistance recipients are complying with the AIS requirement?

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: <http://www.epa.gov/oig/hotline.htm>.

28) How do international trade agreements affect the implementation of the AIS requirements?

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

Reasonably Available Quantity: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process

Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to the EPA for review.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to

determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA’s website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.gov/grants_funding/aisrequirement.cfm
2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.
3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachments

Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
<p>General</p> <ul style="list-style-type: none"> • Waiver request includes the following information: <ul style="list-style-type: none"> — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor 	✓	
<p>Cost Waiver Requests</p> <ul style="list-style-type: none"> • Waiver request includes the following information: <ul style="list-style-type: none"> — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers 		
<p>Availability Waiver Requests</p> <ul style="list-style-type: none"> • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: <ul style="list-style-type: none"> — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects? 		

Appendix 2: HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
<p>Cost Waiver Requests</p> <ul style="list-style-type: none"> • Does the waiver request include the following information? <ul style="list-style-type: none"> — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market • Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%? 				
<p>Availability Waiver Requests</p> <ul style="list-style-type: none"> • Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested? <ul style="list-style-type: none"> — Supplier information or other documentation indicating availability/delivery date for materials — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials • Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers? • Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information) • Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? <p>Examples include:</p> <ul style="list-style-type: none"> — Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State — Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States — Correspondence with construction trade associations indicating the non-availability of the materials • Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits? 				

Appendix 5: Sample Certifications

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. XXXX
2. XXXX
3. XXXX

Such process took place at the following location:

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. XXXX
2. XXXX
3. XXXX

Such process took place at the following location:

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

**American Iron & Steel (AIS) Requirement of the Consolidated Appropriations Act of 2014
(Public Law 113-76)**

Q&A Part 2

PRODUCT QUESTIONS

1. Q: Do all fasteners qualify for de minimis exemption?

A: No. There is no broad exemption for fasteners from the American Iron and Steel (AIS) requirements. Significant fasteners used in SRF projects are not subject to the de minimis waiver for projects and must comply with the AIS requirements. Significant fasteners include fasteners produced to industry standards (e.g., ASTM standards) and/or project specifications, special ordered or those of high value. When bulk purchase of unknown-origin fasteners that are of incidental use and small value are used on a project, they may fall under the national de minimis waiver for projects. The list of potential items could be varied, such as big-box/hardware-store-variety screws, nails, and staples. The key characteristics of the items that may qualify for the de minimis waiver would be items that are incidental to the project purpose (such as drywall screws) and not significant in value or purpose (such as common nails or brads).

EPA also clarifies that minor components of two listed products – valves and hydrants -- may not need to meet the AIS requirements if the minor components compromise a very small quantity of minor, low-cost fasteners that are of unknown origin.

2. Q: Does PCCP pipe have to be domestically produced?

A: Yes. Pre-stressed concrete cylinder pipe (PCCP) or other similar concrete cylinder pipes would be comparable to pre-cast concrete which is specifically listed in the Consolidated Appropriations Act of 2014 as a product subject to the AIS requirement.

3. Q: If the iron or steel is made from recycled metals will the vendor/supplier have to provide a certification document certifying that the recycled metals are domestically produced?

A: No. Recycled source materials used in the production of iron and steel products do not have to come from the U.S. Iron or steel scrap, for instance, are considered raw materials that may come from anywhere. While certification is not required for the raw material, EPA does recommend that additional final processing of iron and steel be certified to have occurred in the U.S.

4. Q: Do tanks used for filtration systems, if delivered to the construction site separately and then filled with filtration media onsite, have to be domestically produced?

A: No. Tanks that are specifically designed to be filters, or as parts of a filtration system, do not have to be domestically produced because these parts are no longer simply tanks, even if the filter media has not been installed and will be installed at the project site, as is customary to do for shipping purposes. These parts have only one purpose which is to be housing for filters and cannot be used in another fashion.

5. Q: Can a recipient use non-domestic flanged pipe?

A: No. While the Consolidated Appropriations Act of 2014 does not specifically mention flanged pipe, since it does mention both pipe and flanges, both products would need to be domestically produced. Therefore, flanged pipe would also need to be domestically produced.

6. Q: Can a recipient use non-domestic couplings, expansion joints, and other similar pipe connectors?

A: No. These products would be considered specialty fittings, due to their additional functionality, but still categorized under the larger “fitting” categorization. Fittings are defined as a material that joins pipes together or connects to a pipe (AWWA, The Drinking Water Dictionary, 2000). Therefore, these products must comply with the AIS requirements and be produced domestically.

7. Q: Can a recipient use non-domestic service saddles and tapping sleeves?

A: No. These products are necessary for pipe repair, to tap a water main, or to install a service or house connection. Therefore, they are included under the larger “pipe restraint” category which is a specifically identified product subject to the domestic preference in the Consolidated Appropriations Act of 2014.

8. Q: The AIS guidance does not appear to cover reused items (i.e., existing pipe fittings, used storage tanks, reusing existing valves). How should reused items be addressed?

A: The AIS guidance does not address reuse of items. Reuse of items that would otherwise be covered by AIS is acceptable provided that the item(s) was originally purchased prior to January 17, 2014, the reused item(s) is not substantially altered from original form/function, and any restoration work that may be required does not include the replacement or addition of foreign iron or steel replacement parts. EPA recommends keeping a log of these reused items by including them on the assistance recipient’s de minimis list, and stating therein that these items are reused products. The donation of new items (such as a manufacturer waiving cost for certain delivered items because of concerns regarding the origin of a new product) is not, however, considered reuse.

9. Q: What does “time needed” mean in the AIS guidance, in reference to the definition of “Reasonably Available Quantity”?

A: For considering whether a product would meet reasonably available quantity, “time needed” is based on the construction schedule. If the item is delayed and there is substantial impact on the overall construction schedule, this would not be according to the “time needed.”

10. Q: If a product is not specifically included on the list of AIS covered products, must it comply with AIS?

A: Possibly. The AIS requirements include a list of specifically covered products, one of which is construction materials, a broad category of potential products. For construction materials, EPA’s AIS guidance includes a set of example items that it considers construction materials composed primarily of iron and steel and covered by the Act. This example list in the guidance is not an all-inclusive list of potential construction materials. However, the guidance also includes a list of items that EPA specifically does not consider construction materials, generally those of electrical or complex-mechanical nature. If a product is similar to the ones in the non-construction material list (and it is also not specifically listed by the Act), it is not a construction material. For all other items specifically included in the Act, coverage is generally self-evident.

11. Q: If a listed iron and steel product is used as a part for an assembled product that is non-domestic, do the AIS requirements apply?

A: AIS requirements only apply to the final product as delivered to the work site and incorporated into the project. Other assemblies, such as a pumping assembly or a reverse osmosis package plant, are distinct products not listed and do not need to be made in the U.S. or composed of all U.S. parts. Therefore, for the case of a non-covered product used in a larger non-domestic assembly, the components, even if specifically listed in the Consolidated Appropriations Act, do not have to be domestically produced.

12. Q: Is cast iron excluded from the AIS requirements?

A: No. Cast iron products that fall under the definition of iron and steel products must comply with the AIS requirements.

13. Q: The guidance states that “construction materials” do not include mechanical equipment, but then identifies ductwork as a construction material. Please clarify.

A: Ductwork is not mechanical equipment, therefore it is considered a “construction material” and must comply with the AIS requirements.

14. Q: Do “meters” mentioned in EPA’s guidance as non-construction materials include both flow meters and water meters?

A: Yes. “Meters” includes any type of meter, including: flow meters, wholesale meters, and water meters/service connections.

15. Q: Must coiled steel be domestic?

A: Yes. Coiled steel is an intermediate product used in the production of steel pipe and must come from a U.S. source or subject to a waiver in order to comply with the AIS requirements.

16. Q: Are pig iron, direct reduced iron (DRI), and ingot considered raw materials?

A: No. These are considered intermediate products used in the production of iron or steel and must come from a U.S. source or subject to a waiver in order to comply with the AIS requirements.

17. Q: Can assistance recipients rely on a marking that reads, “Made in the USA,” as evidence that all processes took place in the U.S.?

A: No. This designation is not consistent with our requirements that all manufacturing processes of iron and steel products must take place in the U.S.

18. Q: When determining what constitutes a product made “primarily” of iron or steel, who makes this determination?

A: The manufacturer will show if its product qualifies as primarily made of iron or steel. The recipient should expect the manufacturer to provide documentation/ certification that its product is AIS compliant.

19. Q: Do aerators need to be produced domestically in order to comply with AIS?

A: No. Aerators, similar to pumps, are mechanical equipment that do not need to meet the AIS requirements. “Blowers/aeration equipment, compressors” are listed in EPA’s guidance as non-construction materials.

20. Q: Are Sluice and Slide Gates considered valves?

A: No. Valves are products that are generally encased / enclosed with a body, bonnet, and stem. Examples include enclosed butterfly, ball, globe, piston, check, wedge, and gate valves. Furthermore, “gates” (meaning sluice, slide or weir gates) are listed in EPA’s guidance as non-construction materials.

AIS PROCESS QUESTIONS

21. Q: Will notices of waiver applications be published in the federal register?

A: No. Applications for waivers will be published on EPA’s website (http://water.epa.gov/grants_funding/aisrequirement.cfm). EPA will provide 15 days for open public comment, as noted on the website.

22. Q: Will states be collecting the step certification paper trail, as presented in the AIS guidance?

A. No. Assistance recipients must maintain documentation of compliance with AIS. EPA recommends use of the step certification process. This process is a best practice and traces all manufacturing of iron and steel products to the U.S. If the process is used, the state does not have to collect the documentation. The documents must be kept by the assistance recipient and reviewed by the state during project reviews.

23. Q: Why is it considered a best practice for states to conduct site visits, when it is the assistance recipient's responsibility to meet the AIS requirements?

A: It is both the assistance recipient's and the state's responsibility to ensure compliance with the AIS requirements. The state is the recipient of a federal grant and must comply with all grant conditions, including a condition requiring that the AIS requirements be adhered to. Therefore, it is recommended that states conduct site visits of projects during construction and review documentation demonstrating the assistance recipient's proof of compliance.

24. Q: Please further define the state's role in the waiver process.

A: The state's role in the waiver process is to review any waiver requests submitted to the state in order to ensure that all necessary information has been provided by the assistance recipient prior to forwarding the request to EPA. If a state finds the request lacking, the state should work with the assistance recipient to help obtain complete information.

25. Q: How much time does EPA have to evaluate the waiver during the evaluation step?

A: At a minimum, EPA is required to provide 15 days for open public comment. There is no specific deadline or time limit for EPA to review waiver requests. Each waiver request will come with its own specific details and circumstances and may require a different amount of time for review and analysis. For example, public interest waivers in general may take longer to review than availability waivers which are typically more straightforward. However, EPA understands that construction may be delayed while waiting for a waiver and will make every effort to review and issue decisions on waiver requests in a timely manner.

PROJECT QUESTIONS

26. Q: What if a project is funded by another funding entity (i.e., United States Department of Agriculture – Rural Development) where AIS is not required and begins construction after January 17, 2014 but then applies to the SRF to refinance the project? Are they ineligible?

A: The project is not ineligible. AIS requirements will apply to any construction that occurs after the assistance agreement is signed, through the end of construction. If construction is complete, there is no retroactive application of the AIS requirements.

27. Q: If the assistance recipient can demonstrate through market research that the AIS requirement will exceed the 25 percent cost threshold, is the entire project exempt from the AIS requirement?

A: If the waiver application shows that the inclusion of American iron and steel products causes the entire cost of the project to increase by more the 25 percent, a waiver may be granted for the entirety of the project.

28. Q: Can the recipient use non-SRF funds to pay for the non-compliant item.

A: No. It is not an acceptable to use non-SRF funds to pay for a non-compliant item. The Consolidated Appropriations Act of 2014 requires that all iron and steel products, no matter the source of funding, must be made in the U.S. if SRF funds are used in the project.

29. Q: What constitutes “satisfactory quality” as defined in the AIS guidance, in reference to the availability waiver process.

A: “Satisfactory quality” means the product meets the project design specifications. A waiver may be granted if a recipient determines that the project plans and design would be compromised because there are no American made products available that meet the project design specifications.

30. Q: The guidance states that the AIS requirement applies to any project “funded in whole or in part” by an SRF. Where is this in the Act?

A: The Act states that, “None of the funds made available by a ... [State SRF program] ... shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.” This sentence clearly states that no SRF program may use its funds for a project unless all of the iron and steel products used in the project are made in the U.S. This is true even if only \$1 of SRF funding is used in the project.

31. Q: There is always an expectation on the part of an assistance recipient that the construction phase of a planning and/or design only loan will be funded through the SRF. If the original planning and/or design only loan was executed prior to a January 17, 2014, does this mean the entire project will be exempt from the AIS requirement?

A: If the original loan includes construction, and was executed prior to January 17, 2014, then the AIS provision does not apply to the project. If the original loan was only for planning and/or design, then a written commitment or documented “expectation” is needed to show exemption from the

requirements. Appearance on a priority list in an Intended Use Plan along with written reasonable assurance from the state that the recipient will receive SRF funding for project construction could provide sufficient evidence of “expectation of funding”.

32. Q: What if there has been a change order or redesign requiring new plans and specifications to be approved and they were approved after January 17, 2014: does the project now have to comply with AIS?

A: In most cases, no. Change orders are typically small enough changes that the original plan and specification date will still hold true. For example, if a pipe alignment has to be changed for a block or two due to unforeseen conditions, but new plans and specifications had to be submitted for this section of the project, then that could be considered a minor change. However, if there has been a major redesign, perhaps the whole project had to be redesigned starting from scratch, then the new plans and specification approval date would apply.

33. Q: What if the bids on a project with plans and specifications approved before January 17, 2014 but the loan is signed after January 17, 2014 come in low, and there is significant funding remaining in the loan agreement, so the community designs a second project with the remaining funds: does that project have to comply with the AIS requirements?

A: If the second project is closely related in purpose, place and time to the first project, then the second project would be exempt from the AIS requirements. It is the assistance recipient’s responsibility (with state oversight) to show that a project is closely related, or not, in purpose, place and time.

34. Q: What if the assistance agreement was signed after January 17, 2014, state approval of plans for the first phase of the project was in place prior to January 17, 2014, but state approval of the plans for the second phase of the project was received after January 17, 2014?

A: In such a case, the AIS provision would not apply to the first phase of the project. If the second phase of the project is considered the same project as the first phase, due to its close relation in purpose, place and time, the entire project may be exempt. It is the assistance recipient’s responsibility (with state oversight) to show that phases of a project is closely related, or not, in purpose, place and time.

35. Q: Do products purchased through procurement-only contracts have to be comply with AIS?

A: Yes. For projects funded by SRF, the products procured under any form of contract must comply with AIS. A procurement-only contract generally involves the bulk purchase of common items (such as pipe, concrete, and/or pumps) of independent timing from a set of planned projects. If products which are purchased through a procurement-only contract are being installed under another contract, the procurement-only contract would probably not be considered a separate project in purpose, place and time; and therefore, would have to comply with the AIS requirements.

March 2015

American Iron & Steel Requirement for the Clean Water and Drinking Water State Revolving Funds

Q&A Part 3

*For CWSRF and DWSRF: On **January 17, 2014**, Public Law 113-76, the "Consolidated Appropriations Act, 2014," was enacted and included an American Iron and Steel requirement for the Clean Water and Drinking Water State Revolving Fund programs through the end of fiscal year 2014. Since then, the AIS requirement has continued for both programs, but through different statutes, with a few changes as described in the questions and answers provided below.*

*For CWSRF: On **June 10, 2014**, the Water Resources Reform and Development Act amended the Clean Water Act to include permanent requirements for the use of AIS products in CWSRF assistance agreements. Section 608 of the CWA now contains requirements for AIS that repeat those of the Consolidated Appropriations Act, 2014. All CWSRF assistance agreements must comply with Section 608 of the CWA for implementation of the permanent AIS requirement.*

*For DWSRF: On **December 16, 2014**, the President signed Public Law 113- 235, the "Consolidated and Further Continuing Appropriations Act, 2015," which provides fiscal year 2015 full-year appropriations through September 30, 2015. This law continues the requirement for the use of AIS products in DWSRF assistance agreements through September 30, 2015.*

CWSRF PROGRAM

- 1. Q: The Water Resources Reform and Development Act amended the Clean Water Act to include permanent requirements for the use of AIS for CWSRF funded assistance agreements. Does the CWA include an exemption for plans and specifications approved prior to the enactment of the legislation similar to the exemption included in the Consolidated Appropriations Act (CAA) 2014?**

A: Yes. The WRRDA amendment to the CWA, which included AIS requirements, included a similar exemption as the CAA 2014. For any CWSRF assistance agreement signed on or after October 1, 2014, if the plans and specifications were approved prior to June 10, 2014 (the enactment of WRRDA), then the project is exempt from AIS requirements. For assistance agreements signed prior to October 1, 2014, the previous dates in the CAA 2014 apply (see March 20, 2014, AIS guidance document).

If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of this exemption in Section 608 (f).

The following table summarizes AIS exemptions based on the plans and specifications approval date for CWSRF funded projects.

3/16/2015

CWSRF AIS Project Exemption Based on Plans and Specifications Approval Date		
<u>Assistance Agreement Signed:</u>	<u>Exempt from AIS if Plans and Specifications Were Approved Before:</u>	<u>Basis for Exemption:</u>
1/17/2014 through 9/30/2014	4/15/2014	<ul style="list-style-type: none"> • Consolidated Appropriations Act 2014 • National waiver signed 4/15/2014*
On or after 10/1/2014	6/10/2014	<ul style="list-style-type: none"> • Clean Water Act Section 608

** To be covered by the national waiver, the plans and specifications had to be submitted to the state prior to 1/17/2014*

2. Q: Does the AIS requirement apply to refinanced CWSRF projects?

A: Yes, in some cases. If a project began construction, financed from a non-CWSRF source prior to June 10, 2014, but is refinanced through a CWSRF assistance agreement executed on or after October 1, 2014, AIS requirements will apply to all construction that occurs on or after June 10, 2014, through completion of construction, unless engineering plans and specifications were approved by the responsible state agency prior to June 10, 2014. For CWSRF projects funded on or after October 1, 2014, there is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to June 10, 2014.

DWSRF PROGRAM

3. Q: The Consolidated and Further Continuing Appropriations Act 2015 continues the AIS requirements for DWSRF funded assistance agreements. Does the Act include an exemption for plans and specifications approved prior to the enactment of the legislation, similar to the exemption included in the Consolidated Appropriations Act (CAA) 2014?

A: Yes. The Consolidated and Further Continuing Appropriations Act 2015 includes a similar exemption as the CAA 2014. For any assistance agreement signed on or after December 16, 2014 (the enactment of the Act), if the plans and specifications were approved prior to December 16, 2014, then the project is exempt from the AIS requirements. For assistance agreements signed prior to December 16, 2014, the previous dates in the CAA 2014 apply (see March 20, 2014 AIS guidance document).

If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of the exemption in Section 424(f).

3/16/2015

4. Q: Do DWSRF assistance agreements signed during the time period between September 30, 2014, and December 16, 2014, still have to comply with the AIS requirements?

A: Yes. The Continuing Appropriations Resolution 2015 was signed on September 19, 2014, which extended funding for the DWSRF with the same conditions that were made applicable by the language in the Fiscal Year 2014 appropriations, including the requirement for the use of American Iron and Steel products in projects receiving financial assistance from the DWSRF. Therefore, all assistance agreements starting October 1, 2014, through the enactment of the Consolidated and Further Continuing Appropriations Act 2015 (signed December 16, 2014), must include the AIS requirements. However, if the plans and specifications for any of these projects were approved prior to April 15, 2014 (the date the national waiver was signed), then the project is exempt from the AIS requirements.

The following table summarizes AIS exemptions based on the plans and specifications approval date for DWSRF funded projects.

DWSRF AIS Project Exemption Based on Plans and Specifications Approval Date		
<u>Assistance Agreement Signed:</u>	<u>Exempt from AIS if Plans and Specifications Were Approved Before:</u>	<u>Basis for Exemption:</u>
1/17/2014 through 9/30/2014	4/15/2014	<ul style="list-style-type: none"> Consolidated Appropriations Act 2014 National waiver signed 4/15/2014*
10/1/2014 through 12/15/2014	4/15/2014	<ul style="list-style-type: none"> Continuing Appropriations Resolution 2015 (continued CAA 2014 requirements)** National waiver signed 4/15/2014*
12/16/2014 through 9/30/2015	12/16/2014	<ul style="list-style-type: none"> Consolidated and Further Continuing Appropriations Act 2015

* To be covered by the national waiver, the plans and specifications had to be submitted to the state prior to 1/17/2014

** Following the first continuing resolution, there were two additional CRs to fill the gap between 12/11/2014 and 12/16/2014

5. Q: Does the AIS requirement apply to refinanced DWSRF projects?

A: Yes, in some cases. If a project began construction, financed from a non-DWSRF source prior to December 16, 2014, but is refinanced through a DWSRF assistance agreement executed on or after December 16, 2014, AIS requirements will apply to all construction that occurs on or after December 16, 2014, through completion of construction, unless engineering plans and

3/16/2015

specifications were approved by the responsible state agency prior to December 16, 2014. For DWSRF projects funded on or after December 16, 2014, there is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to December 16, 2014.

BOTH CWSRF AND DWSRF PROGRAMS

6. **Q: If a coating is applied to the external surface of a domestic iron or steel component, and the application takes place outside of the United States, would the product be compliant under the AIS requirements?**

A: Yes. The product would still be considered a compliant product under AIS requirements. Any coating processes that are applied to the external surface of iron and steel components that would otherwise be AIS compliant would not disqualify the product from meeting the AIS requirements regardless of where the coating processes occur, provided that final assembly of the product occurs in the United States.

The exemption above only applies to coatings on the *external surface* of iron and steel components. It does not apply to coatings or linings on internal surfaces of iron and steel products, such as the lining of lined pipes. All manufacturing processes for lined pipes, including the application of pipe lining, must occur in the United States for the product to be compliant with AIS requirements.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: De Minimis Waiver of Section 436 of P.L. 113-76, Consolidated Appropriations Act (CAA), 2014

FROM: Nancy K. Stoner
Acting Assistant Administrator

The EPA is hereby granting a nationwide waiver pursuant to the "American Iron and Steel (AIS)" requirements of P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), section 436 under the authority of Section 436(b)(1) (public interest waiver) for de minimis incidental components of eligible water infrastructure projects. This action permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the materials used in and incorporated into a project.

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel" (AIS) requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Fiscal Year 2014, unless the agency determines it necessary to waive this requirement based on findings set forth in Section 436(b). The Act states, "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency...finds that- (1) applying subsection (a) would be inconsistent with the public interest" 436(b)(1).

In implementing section 436 of the Act, the EPA must ensure that the section's requirements are applied consistent with congressional intent in adopting this section and in the broader context of the purposes, objectives, and other provisions applicable to projects funded under the SRF. Water infrastructure projects typically contain a relatively small number of high-cost components incorporated into the project. In bid solicitations for a project, these high-cost components are generally described in detail via project specific technical specifications. For these major components, utility owners and their contractors are generally familiar with the conditions of availability, the potential alternatives for each detailed specification, the approximate cost, and the country of manufacture of the available components.

Every water infrastructure project also involves the use of thousands of miscellaneous, generally low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. For many of these incidental components, the country of manufacture and the availability of alternatives is not always readily or reasonably identifiable prior to procurement in the normal course of business; for other incidental components, the country of manufacture may be known but the miscellaneous character in conjunction with the low cost, individually and (in total) as typically procured in bulk, mark them as properly incidental. Examples of incidental components could include small washers, screws, fasteners (i.e., nuts and bolts), miscellaneous wire, corner bead, ancillary tube, etc. Examples of items that are clearly not incidental include significant process fittings (i.e., tees, elbows, flanges, and brackets), distribution system fittings and valves, force main valves, pipes for sewer collection and/or water distribution, treatment and storage tanks, large structural support structures, etc.

The EPA undertook multiple inquiries to identify the approximate scope of de minimis incidental components within water infrastructure projects during the implementation of the American Reinvestment and Recovery Act (ARRA) and its requirements (Buy American provisions, specifically). The inquiries and research conducted in 2009 applies suitably for the case today. In 2009, the EPA consulted informally with many major associations representing equipment manufacturers and suppliers, construction contractors, consulting engineers, and water and wastewater utilities, and performed targeted interviews with several well-established water infrastructure contractors and firms who work in a variety of project sizes, and regional and demographic settings to ask the following questions:

- What percentage of total project costs were consumables or incidental costs?
- What percentage of materials costs were consumables or incidental costs?
- Did these percentages vary by type of project (drinking water vs. wastewater treatment plant vs. pipe)?

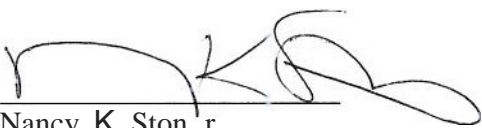
The responses were consistent across the variety of settings and project types, and indicated that the percentage of total costs for drinking water or wastewater infrastructure projects represented by these incidental components is generally not in excess of 5 percent of the total cost of the materials used in and incorporated into a project. In drafting this waiver, the EPA has considered the de minimis proportion of project costs generally represented by each individual type of these incidental components within the many types of such components comprising those percentages, the fact that these types of incidental components are obtained by contractors in many different ways from many different sources, and the disproportionate cost and delay that would be imposed on projects if the EPA did not issue this waiver.

Assistance recipients who wish to use this waiver should in consultation with their contractors determine the items to be covered by this waiver and must retain relevant documentation (i.e., invoices) as to those items in their project files.

If you have any questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at connor.timothy@epa.gov or (202) 566-1059 or Kirsten Anderer, Environmental Engineer, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

A?R t5 2014

Issued on: _____

Approved by: 

Nancy K. Stoner
Acting Assistant Administrator

Prohibition on Telecommunications and Video Surveillance

§ 200.216 Prohibition on certain telecommunications and video surveillance services or equipment.

- (a) Recipients and subrecipients are prohibited from obligating or expending loan or grant funds to:
 - (1) Procure or obtain;
 - (2) Extend or renew a contract to procure or obtain; or
 - (3) Enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in [Public Law 115–232](#), section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
 - (i) For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
 - (ii) Telecommunications or video surveillance services provided by such entities or using such equipment.
 - (iii) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.
- (b) In implementing the prohibition under [Public Law 115–232](#), section 889, subsection (f), paragraph (1), heads of executive agencies administering loan, grant, or subsidy programs shall prioritize available funding and technical support to assist affected businesses, institutions and organizations as is reasonably necessary for those affected entities to transition from covered communications equipment and services, to procure replacement equipment and services, and to ensure that communications service to users and customers is sustained.
- (c) See [Public Law 115–232](#), section 889 for additional information.
- (d) See also [§ 200.471](#).

Resources:

[2 CRF 200.216](#)

FAQ's: [Sec. 889 of 2019 NDAA FAQ 20201124.pdf \(performance.gov\)](#)

[Public Law 115-232, Section 889](#)

[§ 200.471](#)

SECTION 8
PREVAILING WAGE RATES

Davis-Bacon Wage Rate Requirements

(required contract provision)

Background and Applicability

On October 30, 2009, P.L. 111-88, "Making appropriations for the Department of the Interior, environment, and related agencies for the fiscal year ending September 30, 2010, and for other purposes," was enacted. This law provides appropriations for both the Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF) for Fiscal Year 2010, while adding new requirements to these already existing programs. One new requirement requires the application of Davis-Bacon Act requirements.

Application of the Davis-Bacon Act requirements extend not only to assistance agreements funded with Fiscal Year 2010 appropriations, but to all assistance agreements executed on or after October 30, 2009, whether the source of the funding is prior year's appropriations, state match, bond proceeds, interest earnings, principal repayments, or any other source of funding so long as the project is financed by an SRF assistance agreement. If a project began construction prior to October 30, 2009 but is financed or refinanced through an assistance agreement executed on or after October 30, 2009, Davis-Bacon Act requirements will apply to all construction that occurs on or after October 30, 2009, through completion of construction.

Ohio EPA Responsibilities

With respect to the Water Pollution Control Loan Fund (WPCLF) and Water Supply Revolving Loan Account (WSRLA) revolving funds, EPA provides capitalization grants to each State which in turn provides funding assistance to eligible recipients within the State. Typically, the assistance recipients are municipal or other local governmental entities that manage the funds. Occasionally, the assistance recipients may be a private for profit or not for profit entity. Although EPA and the State are responsible for ensuring assistance recipients incorporate the wage rate requirements set forth herein as part of contracts for WPCLF and WSRLA funding, the assistance recipient has the primary responsibility to maintain payroll records and for compliance with Davis-Bacon Act requirements as described below.

Municipal Or Other Local Governmental Entities Recipient's Responsibilities

The following is intended to help assistance recipients understand and meet their obligations related to Davis-Bacon (DB). Each assistance recipients should, however, review the contract/subcontract requirements that are set forth later in this document for a more full understanding of DB obligations.

Prior to advertising for bids:

- > Obtain the wage determination for the locality in which a covered activity subject to DB will take place from the Department of Labor (DOL) at www.wdol.gov.
- > Incorporate these wage determinations into the request for bids.
- > Include the required contract provisions (see below) into the contract documents.
- > Require prime contracts to include provisions that subcontractors follow the wage determination incorporated into the prime contract.

During the advertisement period:

- > Monitor www.wdol.gov on a weekly basis to ensure that the wage determination contained in the request for bids remains current.
- > If DOL modifies the DB wage determination more than 10 days prior to the bid opening, issue an addendum reflecting the modification.
- > If DOL modifies or supersedes the DB wage determination less than 10 days prior to bid opening and you cannot issue an addendum for the change, you must request a finding from Ohio EPA that there is not reasonable time to notify interested contractors of the modification of the wage determination. The Ohio EPA will give you a report of its findings.

After opening bids:

- > If the contract(s) aren't awarded within 90 days of the bid opening you must monitor www.wdol.gov on a weekly basis to ensure that wage determinations used in the bids remain current.
- > If the contract(s) aren't awarded within 90 days of the bid opening, any modifications or supersedes that DOL makes to the wage determination must be incorporated into the contract unless (1) you request an extension from Ohio EPA AND (2) Ohio EPA obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv).

After contracts are signed and during construction:

- > Review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.
- > DOL may issue a revised wage determination applicable to one or all of your contracts after the award of the contract or execution of the change order which incorporated DB requirements into the contract if DOL determines that you have failed to incorporate a wage determination or have used a wage determination that clearly does not apply to the contract. If this occurs, you shall either terminate the contract or change order and rebid the contract OR incorporate DOL's wage determination retroactive to the beginning of the contract by change order. The contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.
- > Periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. You must use Standard Form 1445 or equivalent documentation to memorialize the interviews.
- > Establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, you must:
 - conduct all interviews in confidence.
 - conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract.
 - conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB.
 - immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements.
- > Periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. You must:
 - establish and follow a spot check schedule based on your assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract.
 - spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract at a minimum.
 - conduct more frequent spot checks if the initial spot check or other information indicates that there

is a risk that the contractor or subcontractor is not complying with DB.

- during the examinations, verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

> Periodically review contractors' and subcontractors' use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the DOL or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews.

> Immediately report potential violations of the DB prevailing wage requirements to Andrew Lausted at EPA Region V at 312-886-0189 and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/esa/contacts/whd/america2.htm>.

If contracts have already been signed and DB requirements need to be incorporated:

> If contracts have already been signed prior to WPCLF/WSRLA funding being provided, you must issue a change order, task order, work assignment or similar legally binding instrument and incorporate the appropriate DOL wage determination from www.wdol.gov as well as the required contract provisions into the contract(s).

> Initiate the contractor and subcontractor review and wage interview requirements as described above and provided in the **Contract And Subcontract Provisions**.

**Private For Profit Or Not For Profit (Non-Governmental) Entities
Recipient's Responsibilities**

The requirements, responsibilities and contract provisions for Private For Profit or Not For Profit Entities (Non-Governmental Entities) is exactly the same as for Municipal Or Other Local Governmental Entities EXCEPT for the following:

Prior to advertising for bids:

> Obtain the proposed wage determinations for specific localities from www.wdol.gov.

> Submit the wage determination to Ohio EPA for approval prior to inserting the wage determination into the solicitation unless subsequently directed otherwise by Ohio EPA.

Contract And Subcontract Provisions For Contracts In Excess Of \$2,000

The following language must be included in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part with WPCLF or WSRLA funds and which is subject to the labor standards provisions of any of the acts listed in §5.1:

NOTE: Modify the first sentence to include the name of the WPCLF/WSRLA funding recipient prior to including these provisions in the contract documents.

Wage Rate Requirements

As used in these provisions "subrecipient" means _____ (fill in WPCLF/WSRLA funding recipient name here).

(a) The following applies to any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public

work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1.

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.wdol.gov.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The EPA award official shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the subrecipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department

of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the questions, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

(2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the

plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the subgrant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

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

(4) Apprentices and trainees --

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

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

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

Contract Provision For Contracts In Excess Of \$100,000 And Subject To The Overtime Provisions Of The Contract Work Hours And Safety Standards Act

The following language must be included in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These provisions are to be included in addition to the provisions for contracts in excess of \$2,000. As used in these paragraphs, the terms laborers and mechanics include watchmen and guards.

(b) Contract Work Hours and Safety Standards Act. The following applies to any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. As used in these paragraphs, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

Contract Provision For Contracts In Excess Of \$100,000 Subject ONLY To The Contract Work Hours And Safety Standards Act

In addition to the provisions for contracts in excess of \$2,000, for any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, you must insert clauses requiring:

(c) The following applies to any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1.

The contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid.

The records shall be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Ohio EPA, EPA and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

How to Correctly Fill Out a WH-347 Payroll Form

The completion of the WH-347 Payroll Form is optional; contractors may utilize their own payroll system as long as it conforms to the WH-347 Payroll Form and contains all the necessary information. If you utilize WH-347 Payroll Form as a pdf, saving it electronically aids in making any needed corrections.

Check one of the boxes and list name of contractor or subcontractor

The last day of the payroll period.

Fill out completely with contractor or subcontractor address

U.S. Department of Labor
Employment Standards Administration
Wage and Hour Division

PAYROLL
(For Contractor's Optional Use; See instructions at www.dol.gov/esa/whd/forms/wh347instr.htm)
Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

WHD
U.S. Wage and Hour Division
Rev. Dec. 2008

NAME OF CONTRACTOR OR SUBCONTRACTOR
Sample Construction Company

ADDRESS 385 West Drive, Madison WI 53703

OMB No.: 1215-0149
Expires: 12/31/2011

PROJECT OR CONTRACT NO.
3000

PAYROLL NO. 8	NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g. LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER Alex Driver - ###	SNOW BLOWING OR PLOWING 2	FOR WEEK ENDING 04/24/2010	(4) DAY AND DATE							(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS			(9) NET WAGES FOR WEEK		
				Sun	Mon	Tue	Wed	Thur	Frid	Sat				State withholding tax	Medicare	OTHER DEDUCTIONS			
				18	19	20	21	22	23	24	2.00	\$62.83	\$1422.84	\$185.15	\$156.97	\$50.31	\$85.00	\$24.43	\$1,374.03
				8.00	9.00	5.00	6.00				27.50	\$1,132.1665	\$2,012.46						

Indicate the days and dates of the pay period. (should match week ending directly above)

The name and location of project.

The prime contractor should include the project number as listed in the loan

Payrolls must be numbered sequentially and should be based on the weeks worked under a contract.
Type the word "Final" when the last payroll is submitted for the project.

List each worker's name.

Only laborers and mechanics performing construction work under the contract should be listed.

Please note: Business Owners need only include their name, work classification including "owner" and the daily total hours worked.

Specify the job classification located in the contract wage decision and/or the corresponding job title.

List hourly wage rate and fringes paid in cash (not those paid to plans)

(For Contractors' Optional Use) See instructions at www.doi.gov/esa/whd/forms/wh347instr.htm

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.



Specify the net amount paid to the employee for the pay

Specify the total overtime and straight time hours worked on the project.

Must accurately reflect overtime and straight time hours worked under the contract.

Specify the gross earnings for the hours worked under the contract.

NAME AND INDIVIDUAL IDENTIFYING NUMBER (6, 9, LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER OF WORKER)	WORK CLASSIFICATION	(4) DAY AND DATE							TOTAL HOURS	RATE OF PAY	GROSS AMOUNT EARNED	FICA	MEDICAID	DEDUCTIONS	TOTAL DEDUCTIONS	NET WAGES PAID FOR WEEK
		Sun	Mon	Tue	Wed	Thurs	Frid	Sat								
Alex Driver - ####	Power Equipment Operator Bull Dozer Group 2							2.00	\$62.83	\$1,422.84	\$161.00			\$538.43	\$1,374.03	
Jason Worker - ####	General Laborer							4.00	\$45.20	\$1,702.78	\$136.06			\$1,233.07		
Shawn Worker - ####	Carpenter							1.50	\$60.19	\$1,064.72	\$85.18	\$121.00	\$47.19	\$1,406.18		
Roy Wrench - ####	Apprentice Carpenter 1st 6 mo. at 40%							40.00	\$32.72	\$1,064.72	\$85.18	\$90.50	\$26.62	\$307.71	\$757.01	
Bart Turner - ####	Plumber							20.00	\$67.88	\$1,004.80	\$163.46	\$147.11	\$51.08	\$480.16	\$1,563.04	
	Steamfitter							20.00	\$69.13	\$1,038.40	\$163.46	\$147.11	\$51.08	\$480.16	\$1,563.04	
	Power Equipment Operator Rotary Drill Group 4							24.00	\$60.80	\$719.28	\$115.93	\$142.48	\$35.98	\$415.93	\$1,023.27	

While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to furnish weekly a statement with respect to the wages paid each worker on the project. Contractors and subcontractors performing work on Federally financed or assisted construction contracts to furnish weekly a statement with respect to the wages paid each worker on the project. Contractors and subcontractors performing work on Federally financed or assisted construction contracts to furnish weekly a statement with respect to the wages paid each worker on the project. Contractors and subcontractors performing work on Federally financed or assisted construction contracts to furnish weekly a statement with respect to the wages paid each worker on the project.

Public Burden Statement

If part of a worker's weekly wage was earned on projects other than the project described on this payroll, enter the gross amount earned on this contract in the top half of column 7. Enter the gross amount earned during the week for all projects in the bottom half.

Alex Driver worked 29.5 hours on this contract and 12.5 hours on another contract. The gross wages earned on this project, \$1,422.84, is entered in the top half of column 7. The gross wages earned on all projects, \$2,012.46, is entered in the

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER OF WORKER)	(2) JOB IDENTIFYING NUMBER	(3) WORK CLASSIFICATION	(4) DAY AND DATE							TOTAL HOURS	RATE OF PAY	GROSS AMOUNT EARNED	DEDUCTIONS				NET WAGES PAID FOR WEEK		
			HOURS WORKED EACH DAY										FICA	WITHHOLDING TAX	State with- holding tax	Medicare		OTHER	TOTAL DEDUCTIONS
			Sun	Mon	Tue	Wed	Thu	Fri	Sat										
Alex Driver - ####	2	Power Equipment Bull Dozer Group 2							2.00	\$62.83	\$1,422.84	\$61.00	\$156.97	\$50.31	\$85.00	\$638.43	\$1,374.03		
Jason Worker - ####	2	General Laborer							4.00	\$40.70	\$2,012.46	\$35.06	\$132.66	\$42.52	\$467.71	\$1,233.07			
Sharon Wood - ####	3	Carpenter							1.50	\$60.19	\$1,700.78	\$151.00	\$154.77	\$47.19	\$481.31	\$1,406.18			
Reggie Tree - ####	1	Apprentice Carpenter 1st 6 mo. at 40%							40.00	\$32.72	\$1,064.72	\$85.18	\$105.41	\$90.50	\$307.71	\$757.01			
Roy Wrench - ####	5	Plumber							20.00	\$67.88	\$1,004.80	\$163.46	\$147.11	\$51.08	\$480.16	\$1,563.04			
Roy Wrench - ####	5	Steamfitter							20.00	\$69.13	\$1,038.40	\$115.41	\$142.48	\$35.98	\$415.53	\$1,023.27			
Bart Turner - ####	1	Power Equipment Rotary Drill Group 4							24.00	\$60.80	\$719.28	\$115.41	\$142.48	\$35.98	\$415.53	\$1,023.27			

If an employee performs multiple work classifications under the contract, use two or more lines to distinguish the different job classifications, hours worked, and hourly wage earned for each.

Combine the two classifications when recording the gross amount earned for this pay period, deductions, and net wages.

CONTRACTOR FRINGE BENEFIT STATEMENT

Contract # /Project Name:	Contract Location:	Today's Date:
Contractor / Subcontractor Name:		Business Address:

In order that the proper Fringe Benefit rates can be verified when checking payrolls on the above contract, the hourly rates for fringe benefits, subsistence and/or travel allowance payment made for employees by the employer on the various classes of work are tabulated below. **Please Include Apprentice Rates.**

	Classification:	Effective Date:	Subsistence or Travel Pay: \$ _____
EMPLOYER PAID FRINGE BENEFITS	Health & Welfare \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____
	Pension \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____
	Vacation/Holiday \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____
	Training \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____
	Other \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____

	Classification:	Effective Date:	Subsistence or Travel Pay: \$ _____
EMPLOYER PAID FRINGE BENEFITS	Health & Welfare \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____
	Pension \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____
	Vacation/Holiday \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____
	Training \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____
	Other \$ _____ hr	Paid To: Name of Plan/Fund/Program: _____ Address: _____	_____

Supplemental statements must be submitted during the progress of the work should there be an increase or change in rates. Use additional sheets as necessary. (Attach a copy of your most recent premium transmittal (including copy of check submitted) into each of the above plans/funds/programs or a letter from the above plans/funds/programs reflecting current payment status).

I certify under penalty of perjury that fringe benefits are paid to the approved plans, funds or programs as listed above.

Name and Title	Signature and Date (Wet Signature Required)
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PREVAILING WAGE NOTIFICATION TO EMPLOYEE

Project Name:		Job Number:	
Contractor:			
Project Location:			
Jobsite posting of prevailing wage rates located:			
Prevailing Wage Coordinator		Employee	
Name:		Name:	
Street:		Street:	
City:		City:	
State / Zip:		State / Zip:	
Phone:		Phone:	
<p>You will be performing work on this project that falls under these classifications. You will be paid the appropriate rate for the type of work you are performing.</p>			
Classification	Prevailing Wage Rate Total Package	Minus Your Fringe Benefits	Your Hourly Base Rate
Hourly fringe benefits paid on your behalf by this company.			
Fringe	Amount	Fringe	Amount
Health Insurance		Vacation	
Life Insurance		Holiday	
Pension		Sick Pay	
Bonus		Training	
Other		TOTAL HOURLY FRINGES	
Contractor's Signature:			Date:
Employee's Signature:			Date:

"General Decision Number: OH20240001 09/06/2024

Superseded General Decision Number: OH20230001

State: Ohio

Construction Types: Heavy and Highway

Counties: Ohio Statewide.

Heavy and Highway Construction Projects

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024
1	01/26/2024
2	03/08/2024
3	04/05/2024
4	07/05/2024
5	07/26/2024

6	08/23/2024
7	09/06/2024
8	09/06/2024

BROH0001-001 06/01/2023

DEFIANCE, FULTON (Excluding Fulton, Amboy & Swan Creek Townships), HENRY (Excluding Monroe, Bartlow, Liberty, Washington, Richfield, Marion, Damascus & Townships & that part of Harrison Township outside corporate limits of city of Napoleon), PAULDING, PUTNAM and WILLIAMS COUNTIES

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0001-004 06/01/2023

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 32.40	19.30

BROH0003-002 06/01/2023

FULTON (Townships of Amboy, Swan Creek & Fulton), HENRY (Townships of Washington, Damascus, Richfield, Bartlow, Liberty, Harrison, Monroe, & Marion), LUCAS and WOOD (Townships of Perrysburg, Ross, Lake, Troy, Freedom, Montgomery, Webster, Center, Portage, Middleton, Plain, Liberty, Henry, Washington, Weston, Milton, Jackson & Grand Rapids) COUNTIES

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0005-003 06/01/2020

CUYAHOGA, LORAIN & MEDINA (Hinckley, Granger, Brunswick, Liverpool, Montville, York, Homer, Harrisville, Chatham, Litchfield & Spencer Townships and the city of Medina)

	Rates	Fringes
BRICKLAYER		
BRICKLAYERS; CAULKERS;		
CLEANERS; POINTERS; &		
STONEMASONS.....	\$ 36.64	17.13
SANDBLASTERS.....	\$ 36.39	17.13
SEWER BRICKLAYERS & STACK		
BUILDERS.....	\$ 36.64	17.13
SWING SCAFFOLDS.....	\$ 37.14	17.13

BROH0006-005 06/01/2023

CARROLL, COLUMBIANA (Knox, Butler, West & Hanover Townships), STARK & TUSCARAWAS

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0007-002 06/01/2023

LAWRENCE

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0007-005 06/01/2023		

PORTAGE & SUMMIT

	Rates	Fringes
BRICKLAYER.....	\$ 32.40	19.30

BROH0007-010 06/01/2023		

PORTAGE & SUMMIT

	Rates	Fringes
MASON - STONE.....	\$ 32.40	19.30

BROH0008-001 06/01/2023		

COLUMBIANA (Salem, Perry, Fairfield, Center, Elk Run, Middleton, & Unity Townships and the city of New Waterford), MAHONING & TRUMBULL

	Rates	Fringes
BRICKLAYER.....	\$ 32.40	19.30

BROH0009-002 06/01/2023		

BELMONT & MONROE COUNTIES and the Townships of Warren & Mt. Pleasant and the Village of Dillonvale in JEFFERSON COUNTY

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30
Refractory.....	\$ 31.45	19.01

BROH0010-002 06/01/2023		

COLUMBIANA (St. Clair, Madison, Wayne, Franklin, Washington, Yellow Creek & Liverpool Townships) & JEFFERSON (Brush Creek & Saline Townships)

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0014-002 06/01/2023		

HARRISON & JEFFERSON (Except Mt. Pleasant, Warren, Brush Creek, Saline & Salineville Townships & the Village of Dillonvale)

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0016-002 06/01/2023		

ASHTABULA, GEAUGA, and LAKE COUNTIES

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0018-002 06/01/2023		

BROWN, BUTLER, CLERMONT, HAMILTON, PREBLE (Gasper, Dixon, Israel, Lanier, Somers & Gratis Townships) & WARREN COUNTIES:

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0022-004 06/01/2023		

CHAMPAIGN, CLARK, CLINTON, DARKE, GREENE, HIGHLAND, LOGAN, MIAMI, MONTGOMERY, PREBLE (Jackson, Monroe, Harrison, Twin, Jefferson & Washington Townships) and SHELBY COUNTIES

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0032-001 06/01/2023		

GALLIA & MEIGS

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0035-002 06/01/2023		

ALLEN, AUGLAIZE, MERCER and VAN WERT COUNTIES

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0039-002 06/01/2023		

ADAMS & SCIOTO

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

BROH0040-003 06/01/2023		

ASHLAND, CRAWFORD, HARDIN, HOLMES, MARION, MORROW, RICHLAND, WAYNE and WYANDOT (Except Crawford, Ridge, Richland & Tymochtee Townships) COUNTIES

	Rates	Fringes
Bricklayer, Stonemason.....	\$ 32.40	19.30

FOOTNOTE: Layout Man and Sawman rate: \$1.00 per hour above journeyman rate.
 Free standing stack work ground level to top of stack;
 Sandblasting and laying of carbon masonry material in swing stage and/or scaffold; Ramming and spading of plastics and gunniting: \$1.50 per hour above journeyman rate.
 ""Hot"" work: \$2.50 above journeyman rate.

BROH0044-002 06/01/2023

Rates Fringes

Bricklayer, Stonemason
COSHOCOTON, FAIRFIELD,
GUERNSEY, HOCKING, KNOX,
KICKING, MORGAN,
MUSKINGUM, NOBLE (Beaver,
Buffalo, Seneca & Wayne
Townships) & PERRY
COUNTIES:.....\$ 32.40 19.30

BROH0045-002 06/01/2023

FAYETTE, JACKSON, PIKE, ROSS and VINTON COUNTIES

Rates Fringes

Bricklayer, Stonemason.....\$ 35.39 17.47

BROH0046-002 06/01/2023

ERIE, HANCOCK, HURON, OTTAWA, SANDUSKY, SENECA, WOOD (Perry &
Bloom Townships) and WYANDOT (Tymochtee, Crawford, Ridge &
Richland Townships) COUNTIES & the Islands of Lake Erie north
of Sandusky

Rates Fringes

Bricklayer, Stonemason.....\$ 32.40 19.30

FOOTNOTE: Layout Man and Sawman rate: \$1.00 per hour above
journeyman rate.
Free standing stack work ground level to top of stack;
Sandblasting and laying of carbon masonry material in swing
stage and/or scaffold; Ramming and spading of plastics and
gunniting: \$1.50 per hour above journeyman rate.
""Hot"" work: \$2.50 above journeyman rate.

BROH0052-001 06/01/2023

ATHENS COUNTY

Rates Fringes

Bricklayer, Stonemason.....\$ 32.40 19.30

BROH0052-003 06/01/2023

NOBLE (Brookfield, Noble, Center, Sharon, Olive, Enoch, Stock,
Jackson, Jefferson & Elk Townships) and WASHINGTON COUNTIES

Rates Fringes

Bricklayer, Stonemason.....\$ 32.40 19.30

BROH0055-003 06/01/2023

DELAWARE, FRANKLIN, MADISON, PICKAWAY and UNION COUNTIES

Rates Fringes

Bricklayer, Stonemason.....\$ 32.40 19.30

CARP0003-004 05/01/2017

MAHONING & TRUMBULL

	Rates	Fringes
CARPENTER.....	\$ 26.20	17.42

CARP0069-003 05/01/2017

CARROLL, STARK, TUSCARAWAS & WAYNE

	Rates	Fringes
CARPENTER.....	\$ 25.98	15.98

CARP0069-006 05/01/2017

COSHOCTON, HOLMES, KNOX & MORROW

	Rates	Fringes
CARPENTER.....	\$ 24.04	15.29

CARP0171-002 05/01/2024

BELMONT, COLUMBIANA, HARRISON, JEFFERSON & MONROE

	Rates	Fringes
CARPENTER.....	\$ 31.82	25.11

CARP0200-002 05/01/2024

ADAMS, ATHENS, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, GALLIA,
GUERNSEY, HIGHLAND, HOCKING, JACKSON, LAWRENCE, LICKING,
MADISON, MARION, MEIGS, MORGAN, MUSKINGUM, NOBLE, PERRY,
PICKAWAY, PIKE, ROSS, SCIOTO, UNION, VINTON and WASHINGTON
COUNTIES

	Rates	Fringes
CARPENTER.....	\$ 33.15	22.43
Diver.....	\$ 39.41	10.40
PILEDRIVERMAN.....	\$ 33.15	22.43

CARP0248-005 07/01/2008

LUCAS & WOOD

	Rates	Fringes
CARPENTER.....	\$ 27.27	14.58

CARP0248-008 07/01/2008

	Rates	Fringes
CARPENTER DEFIANCE, FULTON, HANCOCK, HENRY, PAULDING & WILLIAMS COUNTIES.....	\$ 23.71	13.28

CARP0254-002 05/01/2017

ASHTABULA, CUYAHOGA, GEAUGA & LAKE

	Rates	Fringes
CARPENTER.....	\$ 32.40	16.97

CARP0372-002 05/01/2024

ALLEN, AUGLAIZE, HARDIN, MERCER, PUTNAM & VAN WERT

	Rates	Fringes
CARPENTER.....	\$ 30.73	25.09

CARP0639-003 05/01/2017

MEDINA, PORTAGE & SUMMIT

	Rates	Fringes
CARPENTER.....	\$ 30.42	16.99

CARP0735-002 05/01/2024

ASHLAND, ERIE, HURON, LORAIN & RICHLAND

	Rates	Fringes
CARPENTER.....	\$ 33.43	22.31

CARP1311-001 05/01/2017

BROWN, BUTLER, CHAMPAIGN, CLARK, CLERMONT, CLINTON, DARKE,
GREENE, HAMILTON, LOGAN, MIAMI, MONTGOMERY, PREBLE, SHELBY &
WARREN

	Rates	Fringes
Carpenter & Piledrivermen.....	\$ 29.34	15.95
Diver.....	\$ 40.58	9.69

CARP1393-002 05/01/2024

CRAWFORD, DEFIANCE, FULTON, HANCOCK, HENRY, LUCAS, OTTAWA,
PAULDING, SANDUSKY, SENECA, WILLIAMS & WOOD

	Rates	Fringes
Piledrivermen & Diver's Tender...	\$ 36.84	27.72

DIVERS - \$250.00 per day

CARP1393-003 05/01/2024

ALLEN, AUGLAIZE, HARDIN, MERCER, PUTNAM, VAN WERT & WYANDOT

	Rates	Fringes
Piledrivermen & Diver's Tender...	\$ 34.68	27.60

DIVERS - \$250.00 per day

CARP1871-006 05/01/2017

BELMONT, HARRISON, & MONROE

	Rates	Fringes
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Diver, Wet.....	\$ 48.11	17.33
Piledrivermen; Diver, Dry.....	\$ 32.07	17.33

CARP1871-008 05/01/2017

ASHLAND, ASHTABULA, CUYAHOGA, ERIE, GEAUGA, HURON, LAKE,
LORAIN, MEDINA, PORTAGE, RICHLAND & SUMMIT

	Rates	Fringes
Diver, Wet.....	\$ 45.80	18.84
Piledrivermen; Diver, Dry.....	\$ 30.53	18.84

CARP1871-014 05/01/2017

CARROLL, STARK, TUSCARAWAS & WAYNE

	Rates	Fringes
Diver, Wet.....	\$ 38.34	16.95
Piledrivermen; Diver, Dry.....	\$ 25.56	16.95

CARP1871-015 05/01/2017

COSHOCTON, HOLMES, KNOX & MORROW

	Rates	Fringes
Diver, Wet.....	\$ 37.34	16.07
Piledrivermen; Diver, Dry.....	\$ 24.89	16.07

CARP1871-017 05/01/2017

MAHONING & TRUMBULL

	Rates	Fringes
Diver, Wet.....	\$ 40.65	17.62
Piledrivermen; Diver, Dry.....	\$ 27.10	17.62

CARP2235-012 01/01/2014

COLUMBIANA & JEFFERSON

	Rates	Fringes
PILEDRIVERMAN.....	\$ 31.74	16.41

CARP2239-001 07/01/2008

CRAWFORD, OTTAWA, SANDUSKY, SENECA & WYANDOT

	Rates	Fringes
CARPENTER.....	\$ 23.71	13.28

ELEC0008-002 05/29/2023

DEFIANCE, FULTON, HANCOCK, HENRY, LUCAS, OTTAWA, PAULDING,
PUTNAM, SANDUSKY, SENECA, WILLIAMS & WOOD

	Rates	Fringes
CABLE SPLICER.....	\$ 38.98	18.96
ELECTRICIAN.....	\$ 46.38	4.5%+21.96

ELEC0032-003 06/01/2024

ALLEN, AUGLAIZE, HARDIN, LOGAN, MERCER, SHELBY, VAN WERT &
WYANDOT (Crawford, Jackson, Marseilles, Mifflin, Ridgeland,
Ridge & Salem Townships)

	Rates	Fringes
ELECTRICIAN.....	\$ 35.17	22.92

ELEC0038-002 04/29/2024

CUYAHOGA, GEAUGA (Bainbridge, Chester & Russell Townships) &
LORAIN (Columbia Township)

	Rates	Fringes
ELECTRICIAN Excluding Sound & Communications Work.....	\$ 45.23	23.88

FOOTNOTES;
a. 6 Paid Holidays: New Year's Day; Memorial Day; July 4th;
Labor Day; Thanksgiving Day; & Christmas Day
b. 1 week's paid vacation for 1 year's service; 2 weeks' paid
vacation for 2 or more years' service

ELEC0038-008 04/24/2023

CUYAHOGA, GEAUGA (Bainbridge, Chester & Russell Townships) &
LORAIN (Columbia Township)

	Rates	Fringes
Sound & Communication Technician Communications Technician...	\$ 29.80	13.80
Installer Technician.....	\$ 28.55	13.76

FOOTNOTES;
a. 6 Paid Holidays: New Year's Day; Memorial Day; July 4th;
Labor Day; Thanksgiving Day; & Christmas Day
b. 1 week's paid vacation for 1 year's service; 2 weeks' paid
vacation for 2 or more years' service

ELEC0064-003 11/27/2023

COLUMBIANA (Butler, Fairfield, Perry, Salem & Unity Townships)
MAHONING (Austintown, Beaver, Berlin, Boardman, Canfield,
Ellsworth, Coitsville, Goshen, Green, Jackson, Poland,
Springfield & Youngstown Townships), & TRUMBULL (Hubbard &
Liberty Townships)

	Rates	Fringes
ELECTRICIAN.....	\$ 37.90	20.08

ELEC0071-001 01/01/2024

ASHLAND, CHAMPAIGN, CLARK, COSHOCTON, CRAWFORD, DELAWARE,
FAIRFIELD, FAYETTE, FRANKLIN, GUERNSEY, HIGHLAND, HOCKING,

JACKSON (Coal, Jackson, Liberty, Milton, Washington & Wellston Townships), KNOX, LICKING, MADISON, MARION, MONROE, MORGAN, MORROW, MUSKINGUM, NOBLE, PERRY, PICKAWAY, PIKE (Beaver, Benton, Jackson, Mifflin, Pebble, Peepee, Perry & Seal Townships), RICHLAND, ROSS, TUSCARAWAS (Auburn, Bucks, Clay, Jefferson, Oxford, Perry, Salem, Rush, Washington & York Townships), UNION, VINTON (Clinton, Eagle, Elk, Harrison, Jackson, Richland & Swan Townships), and WASHINGTON COUNTIES

Rates Fringes

Line Construction		
Equipment Operators.....	\$ 39.11	17.14
Groundmen.....	\$ 25.90	13.97
Linemen & Cable Splicers....	\$ 44.52	18.43

ELEC0071-004 01/01/2024

AUGLAIZE, CLINTON, DARKE, GREENE, LOGAN, MERCER, MIAMI, MONTGOMERY, PREBLE, and SHELBY COUNTIES

Rates Fringes

Line Construction		
Equipment Operator.....	\$ 39.11	17.14
Groundman.....	\$ 25.90	13.97
Lineman & Cable Splicers....	\$ 44.52	18.43

ELEC0071-005 01/01/2024

ASHTABULA, CUYAHOGA, GEAUGA, LAKE & LORAIN

Rates Fringes

LINE CONSTRUCTION: Equipment Operator		
DOT/Traffic Signal & Highway Lighting Projects...	\$ 37.43	26%+7.75
Municipal Power/Transit Projects.....	\$ 47.86	27%+7.65
LINE CONSTRUCTION: Groundman		
DOT/Traffic Signal & Highway Lighting Projects...	\$ 25.63	26%+7.75
Municipal Power/Transit Projects.....	\$ 31.91	27%+7.65
LINE CONSTRUCTION: Linemen/Cable Splicer		
DOT/Traffic Signal & Highway Lighting Projects...	\$ 42.20	26%+7.75
Municipal Power/Transit Projects.....	\$ 53.18	27%+7.65

ELEC0071-008 01/01/2024

COLUMBIANA, MAHONING, and TRUMBULL COUNTIES

Rates Fringes

Line Construction		
Equipment Operator.....	\$ 39.11	17.14
Groundman.....	\$ 25.90	13.97
Lineman & Cable Splicers....	\$ 44.52	18.43

ELEC0071-010 01/01/2024

Rates Fringes

Line Construction		
Equipment Operator.....	\$ 39.11	17.14
Groundman.....	\$ 25.90	13.97
Lineman & Cable Splicers....	\$ 44.52	18.43

ELEC0071-013 01/01/2024

BROWN, BUTLER, CLERMONT, HAMILTON, and WARREN COUNTIES

	Rates	Fringes
Line Construction		
Equipment Operator.....	\$ 39.11	17.14
Groundman.....	\$ 25.90	13.97
Lineman & Cable Splicers....	\$ 44.52	18.43

ELEC0071-014 01/01/2024

ADAMS, ATHENS, GALLIA, JACKSON (Bloomfield, Franklin, Hamilton, Lick, Jefferson, Scioto & Madison Townships), LAWRENCE, MEIGS, PIKE (Camp Creek, Marion, Newton, Scioto, Sunfish & Union Townships), SCIOTO & VINTON (Brown, Knox, Madison, Vinton & Wilkesville Townships)

	Rates	Fringes
Line Construction		
Equipment Operator.....	\$ 39.11	17.14
Groundman.....	\$ 25.90	13.97
Lineman & Cable Splicers....	\$ 44.52	18.43

ELEC0082-002 12/04/2023

CLINTON, DARKE, GREENE, MIAMI, MONTGOMERY, PREBLE & WARREN (Wayne, Clear Creek & Franklin Townships)

	Rates	Fringes
ELECTRICIAN.....	\$ 36.00	21.99

* ELEC0082-006 11/28/2022

CLINTON, DARKE, GREENE, MIAMI, MONTGOMERY, PREBLE & WARREN (Wayne, Clear Creek & Franklin Townships)

	Rates	Fringes
Sound & Communication Technician		
Cable Puller.....	\$ 13.10 **	4.76
Installer/Technician.....	\$ 26.20	13.89

ELEC0129-003 02/26/2024

LORAIN (Except Columbia Township) & MEDINA (Litchfield & Liverpool Townships)

	Rates	Fringes
ELECTRICIAN.....	\$ 41.40	18.36

ELEC0129-004 02/26/2024

ERIE & HURON (Lyme, Ridgefield, Norwalk, Townsend, Wakeman, Sherman, Peru, Bronson, Hartland, Clarksfield, Norwich, Greenfield, Fairfield, Fitchville & New London Townships)

	Rates	Fringes
ELECTRICIAN.....	\$ 41.40	18.36

ELEC0141-003 06/02/2024

BELMONT COUNTY

	Rates	Fringes
CABLE SPLICER.....	\$ 42.94	27.74
ELECTRICIAN.....	\$ 39.04	27.62

ELEC0212-003 11/26/2018

BROWN, CLERMONT & HAMILTON

	Rates	Fringes
Sound & Communication Technician.....	\$ 24.35	10.99

ELEC0212-005 06/03/2024

BROWN, CLERMONT, and HAMILTON COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 35.43	22.05

ELEC0245-001 08/29/2022

ALLEN, HARDIN, VAN WERT & WYANDOT (Crawford, Jackson, Marseilles, Mifflin, Richland, Ridge & Salem Townships)

	Rates	Fringes
Line Construction		
Equipment Operator.....	\$ 32.37	26.5%+7.25
Groundman Truck Driver.....	\$ 19.35	7.00+27.25%
Lineman.....	\$ 44.22	7.00+27.25%

FOOTNOTE: a. Half day's Paid Holiday: The last 4 hours of the workday prior to Christmas or New Year's Day

ELEC0245-003 01/01/2024

DEFIANCE, FULTON, HANCOCK, HENRY, HURON, LUCAS, OTTAWA, PAULDING, PUTNAM, SANDUSKY, SENECA, WILLIAMS, and WOOD COUNTIES

	Rates	Fringes
Line Construction		
Cable Splicer.....	\$ 52.53	7.75+27%
Groundman/Truck Driver.....	\$ 19.99	7.75+27%
Heli-arc Welding.....	\$ 45.98	7.75+27%
Lineman.....	\$ 45.68	7.75+27%
Operator - Class 1.....	\$ 36.54	7.75+27%
Operator - Class 2.....	\$ 31.98	7.75+27%
Traffic Signal & Lighting		

Technician.....\$ 41.11 7.75+27%

FOOTNOTE: a. 6 Observed Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; & Christmas Day. Employees who work on a holiday shall be paid at a rate of double their applicable classified straight-time rates for the work performed on such holiday.

ELEC0245-004 08/28/2023

ERIE COUNTY

	Rates	Fringes
Line Construction		
Cable Splicer.....	\$ 49.14	26.75%+6.75
Cablesplicer.....	\$ 52.76	27%+7.50
Groundman/Truck Driver.....	\$ 20.07	27%+7.50
Lineman.....	\$ 45.88	27%+7.50
Operator - Class 1.....	\$ 36.70	27%+7.50
Operator - Class 2.....	\$ 32.12	27%+7.50

FOOTNOTE: a. 6 Observed Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; & Christmas Day. Employees who work on a holiday shall be paid at a rate of double their applicable classified straight-time rates for the work performed on such holiday.

ELEC0246-001 10/30/2023

	Rates	Fringes
ELECTRICIAN.....	\$ 42.50	55%+13.88

FOOTNOTE: a. 1 1/2 Paid Holidays: The last scheduled workday prior to Christmas & 4 hours on Good Friday.

ELEC0306-005 05/27/2024

MEDINA (Brunswick, Chatham, Granger, Guilford, Harrisville, Hinckley, Homer, Lafayette, Medina, Montville, Sharon, Spencer, Wadsworth, Westfield & York Townships), PORTAGE (Atwater, Aurora, Brimfield, Deerfield, Franklin, Mantua, Randolph, Ravenna, Rootstown, Shalersville, Streetsboro & Suffield Townships), SUMMIT & WAYNE (Baughman, Canaan, Chester, Chippewa, Congress, Green, Milton, & Wayne Townships)

	Rates	Fringes
CABLE SPLICER.....	\$ 36.87	16.56
ELECTRICIAN.....	\$ 42.55	5.25%+20.95

ELEC0317-002 05/29/2023

GALLIA & LAWRENCE

	Rates	Fringes
CABLE SPLICER.....	\$ 32.68	18.13
ELECTRICIAN.....	\$ 37.15	28.48

ELEC0540-005 01/01/2024

CARROLL (Northern half, including Fox, Harrison, Rose &

Washington Townships), COLUMBIANA (Knox Township), HOLMES, MAHONING (Smith Township), STARK, TUSCARAWAS (North of Auburn, Clay, Rush & York Townships), and WAYNE (South of Baughman, Chester, Green & Wayne Townships) COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 36.96	28.18

ELEC0573-003 05/27/2024

ASHTABULA (Colebrook, Wayne, Williamsfield, Orwell & Windsor Townships), GEAUGA (Auburn, Middlefield, Parkman & Troy Townships), MAHONING (Milton Township), PORTAGE (Charlestown, Edinburg, Freedom, Hiram, Nelson, Palmyra, Paris & Windham Townships), and TRUMBULL (Except Liberty & Hubbard Townships)

	Rates	Fringes
ELECTRICIAN.....	\$ 40.40	22.20

ELEC0575-001 05/29/2023

ADAMS, FAYETTE, HIGHLAND, HOCKING, JACKSON (Bloomfield, Franklin, Hamilton, Jefferson, Lick, Madison, Scioto, Coal, Jackson, Liberty, Milton & Washington Townships), PICKAWAY (Deer Creek, Perry, Pickaway, Salt Creek & Wayne Townships), PIKE (Beaver, Benton, Jackson, Mifflin, Pebble, PeePee, Perry, Seal, Camp Creek, Newton, Scioto, Sunfish, Union & Marion Townships), ROSS, SCIOTO & VINTON (Clinton, Eagle, Elk, Harrison, Jackson, Richland & Swan Townships)

	Rates	Fringes
ELECTRICIAN.....	\$ 37.00	22.26

ELEC0648-001 08/29/2023

BUTLER and WARREN COUNTIES (Deerfield, Hamilton, Harlan, Massie, Salem, Turtle Creek, Union & Washington Townships)

	Rates	Fringes
CABLE SPLICER.....	\$ 30.50	18.23
ELECTRICIAN.....	\$ 34.00	21.98

ELEC0673-004 05/27/2024

ASHTABULA (Excluding Orwell, Colebrook, Williamsfield, Wayne & Windsor Townships), GEAUGA (Burton, Chardon, Claridon, Hambden, Huntsburg, Montville, Munson, Newbury & Thompson Townships) and LAKE COUNTIES

	Rates	Fringes
CABLE SPLICER.....	\$ 33.81	21.47
ELECTRICIAN.....	\$ 39.64	23.86

ELEC0683-002 05/29/2023

CHAMPAIGN, CLARK, DELAWARE, FAIRFIELD, FRANKLIN, MADISON, PICKAWAY (Circleville, Darby, Harrison, Jackson, Madison, Monroe, Muhlenberg, Scioto, Walnut & Washington Townships), and

UNION COUNTIES

	Rates	Fringes
CABLE SPLICER.....	\$ 38.75	24.19
ELECTRICIAN.....	\$ 37.75	24.16

ELEC0688-003 05/30/2022

ASHLAND, CRAWFORD, HURON (Richmond, New Haven, Ripley & Greenwich Townships), KNOX (Liberty, Clinton, Union, Howard, Monroe, Middleberry, Morris, Wayne, Berlin, Pike, Brown & Jefferson Townships), MARION, MORROW, RICHLAND and WYANDOT (Sycamore, Crane, Eden, Pitt, Antrim & Tymochtee Townships) COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 32.30	21.83

ELEC0972-002 06/01/2023

ATHENS, MEIGS, MONROE, MORGAN, NOBLE, VINTON (Brown, Knox, Madison, Vinton & Wilkesville Townships), and WASHINGTON COUNTIES

	Rates	Fringes
CABLE SPLICER.....	\$ 35.70	30.26
ELECTRICIAN.....	\$ 35.45	30.25

ELEC1105-001 05/29/2023

COSHOCTON, GUERNSEY, KNOX (Jackson, Clay, Morgan, Miller, Milford, Hilliar, Butler, Harrison, Pleasant & College Townships), LICKING, MUSKINGUM, PERRY, and TUSCARAWAS (Auburn, York, Clay, Jefferson, Rush, Oxford, Washington, Salem, Perry & Bucks Townships) COUNTIES

	Rates	Fringes
ELECTRICIAN.....	\$ 36.45	24.22

ENGI0018-003 05/01/2024

ASHTABULA, CUYAHOGA, ERIE, GEauga, LAKE, LORAIN, MEDINA, PORTAGE, and SUMMIT COUNTIES

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 45.63	16.41
GROUP 2.....	\$ 45.53	16.41
GROUP 3.....	\$ 44.49	16.41
GROUP 4.....	\$ 43.27	16.41
GROUP 5.....	\$ 37.98	16.41
GROUP 6.....	\$ 46.63	16.41
GROUP 7.....	\$ 46.63	16.41

OPERATING ENGINEER CLASSIFICATIONS

GROUP 1 - Air Compressor on Steel Erection; Barrier Moving Machine; Boiler Operator on Compressor or Generator when

mounted on a Rig; Cableway; Combination Concrete Mixer & Tower; Concrete Plant (over 4 yd. Capacity); Concrete Pump; Crane (All Types, Including Boom Truck, Cherry Picker); Crane-Compact, Track or Rubber over 4,000 lbs. capacity; Cranes-Self Erecting, Stationary, Track or Truck (All Configurations); Derrick; Dragline; Dredge (Dipper, Clam or Suction); Elevating Grader or Euclid Loader; Floating Equipment (All Types); Gradall; Helicopter Crew (Operator-Hoist or Winch); Hoe (all types); Hoisting Engine on Shaft or Tunnel Work; Hydraulic Gantry (Lifting System); Industrial-Type Tractor; Jet Engine Dryer (D8 or D9) Diesel Tractor; Locomotive (Standard Gauge); Maintenance Operator Class A; Mixer, Paving (Single or Double Drum); Mucking Machine; Multiple Scraper; Piledriving Machine (All Types); Power Shovel; Prentice Loader; Quad 9 (Double Pusher); Rail Tamper (with auto lifting & aligning device); Refrigerating Machine (Freezer Operation); Rotary Drill, on Caisson work; Rough Terrain Fork Lift with Winch/Hoist; Side-Boom; Slip-Form Paver; Tower Derrick; Tree Shredder; Trench Machine (Over 24" wide); Truck Mounted Concrete Pump; Tug Boat; Tunnel Machine and/or Mining Machine; Wheel Excavator; and Asphalt Plant Engineer (Cleveland District Only).

GROUP 2 - Asphalt Paver; Automatic Subgrader Machine, Self-Propelled (CMI Type); Bobcat Type and/or Skid Steer Loader with Hoe Attachment Greater than 7,000 lbs.; Boring Machine More than 48"; Bulldozer; Endloader; Horizontal Directional Drill (Over 50,000 ft lbs thrust); Hydro Milling Machine; Kolman-type Loader (production type-Dirt); Lead Greaseman; Lighting & Traffic Signal Installation Equipment (includes all groups or classifications); Material Transfer Equipment (Shuttle Buggy) Asphalt; Pettibone-Rail Equipment; Power Grader; Power Scraper; Push Cat; Rotomill (all), Grinders & Planers of All types; Trench Machine (24" wide & under); Vermeer type Concrete Saw; and Maintenance Operators (Portage and Summit Counties Only).

GROUP 3 - A-Frame; Air Compressor on Tunnel Work (low pressure); Asphalt Plant Engineer (Portage and Summit Counties Only); Bobcat-type and/or Skid Steer Loader with or without Attachments; Highway Drills (all types); Locomotive (narrow gauge); Material Hoist/Elevator; Mixer, Concrete (more than one bag capacity); Mixer, one bag capacity (Side Loader); Power Boiler (Over 15 lbs. Pressure) Pump Operator installing & operating Well Points; Pump (4" & over discharge); Roller, Asphalt; Rotovator (lime soil stabilizer); Switch & Tie Tampers (without lifting & aligning device); Utility Operator (Small equipment); Welding Machines; and Railroad Tie Inserter/Remover; Articulating/straight bed end dumps if assigned (minus \$4.00 per hour).

GROUP 4 - Backfiller; Ballast Re-locator; Bars, Joint & Mesh Installing Machine; Batch Plant; Boring Machine Operator (48" or less); Bull Floats; Burlap & Curing Machine; Concrete Plant (capacity 4 yd. & under); Concrete Saw (Multiple); Conveyor (Highway); Crusher; Deckhand; Farm-type Tractor with attachments (highway); Finishing Machine; Fireperson, Floating Equipment (all types); Forklift; Form Trencher; Hydro Hammer expect masonry; Hydro Seeder; Pavement Breaker; Plant Mixer; Post Driver; Post Hole Digger (Power Auger); Power Brush Burner; Power Form Handling Equipment; Road Widening Trencher; Roller (Brick, Grade & Macadam); Self-Propelled Power Spreader; Self-Propelled Power Subgrader; Steam Fireperson; Tractor (Pulling Sheepfoot, Roller or Grader); and Vibratory

Compactor with Integral Power.

GROUP 5 - Compressor (Portable, Sewer, Heavy & Highway); Drum Fireperson (Asphalt Plant); Generator; Masonry Fork Lift; Inboard-Outboard Motor Boat Launch; Oil Heater (asphalt plant); Oiler/Helper; Power Driven Heater; Power Sweeper & Scrubber; Pump (under 4" discharge); Signalperson; Tire Repairperson; VAC/ALLS; Cranes - Compact, track or rubber under 4,000 pound capacity; fueling and greasing; and Chainmen.

GROUP 6 - Master Mechanic & Boom from 150 to 180.

GROUP 7 - Boom from 180 and over.

ENGI0018-004 05/01/2024

ADAMS, ALLEN, ASHLAND, ATHENS, AUGLAIZE, BELMONT, BROWN, BUTLER, CARROLL, CHAMPAIGN, CLARK, CLERMONT, CLINTON, COSHOCTON, CRAWFORD, DARKE, DEFIANCE, DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, FULTON, GALLIA, GREENE, GUERNSEY, HAMILTON, HANCOCK, HARDIN, HARRISON, HENRY, HIGHLAND, HOCKING, HOLMES, HURON, JACKSON, JEFFERSON, KNOX, LAWRENCE, LICKING, LOGAN, LUCAS, MADISON, MARION, MEIGS, MERCER, MIAMI, MONROE, MONTGOMERY, MORGAN, MORROW, MUSKINGUM, NOBLE, OTTAWA, PAULDING, PERRY, PICKAWAY, PIKE, PREBLE, PUTNAM, RICHLAND, ROSS, SANDUSKY, SCIOTO, SENECA, SHELBY, STARK, TUSCARAWAS, UNION, VAN WERT, VINTON, WARREN, WASHINGTON, WAYNE, WILLIAMS, WOOD, and YANDOT COUNTIES

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 44.14	16.41
GROUP 2.....	\$ 44.02	16.41
GROUP 3.....	\$ 42.98	16.41
GROUP 4.....	\$ 41.80	16.41
GROUP 5.....	\$ 36.34	16.41
GROUP 6.....	\$ 45.14	16.41
GROUP 7.....	\$ 45.14	16.41

OPERATING ENGINEER CLASSIFICATIONS

GROUP 1 - Air Compressor on Steel Erection; Barrier Moving Machine; Boiler Operator on Compressor or Generator when mounted on a Rig; Cableway; Combination Concrete Mixer & Tower; Concrete Plant (over 4 yd. Capacity); Concrete Pump; Crane (All Types, Including Boom Truck, Cherry Picker); Crane-Compact, Track or Rubber over 4,000 lbs. capacity; Cranes-Self Erecting, Stationary, Track or Truck (All Configurations); Derrick; Dragline; Dredge (Dipper, Clam or Suction); Elevating Grader or Euclid Loader; Floating Equipment (All Types); Gradall; Helicopter Crew (Operator-Hoist or Winch); Hoe (all types); Hoisting Engine on Shaft or Tunnel Work; Hydraulic Gantry (Lifting System); Industrial-Type Tractor; Jet Engine Dryer (D8 or D9) Diesel Tractor; Locomotive (Standard Gauge); Maintenance Operator Class A; Mixer, Paving (Single or Double Drum); Mucking Machine; Multiple Scraper; Piledriving Machine (All Types); Power Shovel; Prentice Loader; Quad 9 (Double Pusher); Rail Tamper (with auto lifting & aligning device); Refrigerating Machine (Freezer Operation); Rotary Drill, on Caisson work; Rough Terrain Fork Lift with Winch/Hoist; Side-Boom; Slip-Form Paver; Tower Derrick; Tree Shredder; Trench Machine (Over 24" wide); Truck Mounted Concrete Pump; Tug Boat; Tunnel

Machine and/or Mining Machine; and Wheel Excavator.

GROUP 2 - Asphalt Paver; Automatic Subgrader Machine, Self-Propelled (CMI Type); Bobcat Type and/or Skid Steer Loader with Hoe Attachment Greater than 7,000 lbs.; Boring Machine More than 48"; Bulldozer; Endloader; Hydro Milling Machine; Horizontal Directional Drill (over 50,000 ft. lbs. thrust);Kolman-type Loader (production type-Dirt); Lead Greaseman; Lighting & Traffic Signal Installation Equipment (includes all groups or classifications); Material Transfer Equipment (Shuttle Buggy) Asphalt; Pettibone-Rail Equipment; Power Grader; Power Scraper; Push Cat; Rotomill (all), Grinders & Planers of All types; Trench Machine (24" wide & under); and Vermeer type Concrete Saw.

GROUP 3 - A-Frame; Air Compressor on Tunnel Work (low pressure); Asphalt Plant Engineer; Bobcat-type and/or Skid Steer Loader with or without Attachments; Highway Drills (all types); Locomotive (narrow gauge); Material Hoist/Elevator; Mixer, Concrete (more than one bag capacity); Mixer, one bag capacity (Side Loader); Power Boiler (Over 15 lbs. Pressure) Pump Operator installing & operating Well Points; Pump (4" & over discharge); Railroad Tie Inserter/Remover; Roller, Asphalt; Rotovator (lime soil stabilizer); Switch & Tie Tampers (without lifting & aligning device); Utility Operator (Small equipment); and Welding Machines; Artiaculating/straight bed end dumps if assigned (minus \$4.00 per hour.

GROUP 4 - Backfiller; Ballast Re-locator; Bars, Joint & Mesh Installing Machine; Batch Plant; Boring Machine Operator (48" or less); Bull Floats; Burlap & Curing Machine; Concrete Plant (capacity 4 yd. & under); Concrete Saw (Multiple); Conveyor (Highway); Crusher; Deckhand; Farm-type Tractor with attachments (highway); Finishing Machine; Fireperson, Floating Equipment (all types); Fork Lift; Form Trencher; Hydro Hammer expect masonry; Hydro Seeder; Pavement Breaker; Plant Mixer; Post Driver; Post Hole Digger (Power Auger); Power Brush Burner; Power Form Handling Equipment; Road Widening Trencher; Roller (Brick, Grade & Macadam); Self-Propelled Power Spreader; Self-Propelled Power Subgrader; Steam Fireperson; Tractor (Pulling Sheepfoot, Roller or Grader); and Vibratory Compactor with Integral Power.

GROUP 5 - Compressor (Portable, Sewer, Heavy & Highway); Drum Fireperson (Asphalt Plant); Generator; Masonary Forklift; Inboard-Outboard Motor Boat Launch; Oil Heater (asphalt plant); Oiler/Helper; Power Driven Heater; Power Sweeper & Scrubber; Pump (under 4" discharge); Signalperson; Tire Repairperson; VAC/ALLS; Cranes - Compact, track or rubber under 4,000 pound capacity; fueling and greasing; and Chainmen.

GROUP 6 - Master Mechanic & Boom from 150 to 180.

GROUP 7 - Boom from 180 and over.

ENGI0066-023 06/01/2023

COLUMBIANA, MAHONING & TRUMBULL COUNTIES

Rates Fringes

POWER EQUIPMENT OPERATOR
ASBESTOS; HAZARDOUS/TOXIC
WASTE PROJECTS

GROUP 1 - A & B.....\$ 44.63	24.30
ASBESTOS; HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 2 - A & B.....\$ 44.30	24.30
ASBESTOS; HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 3 - A & B.....\$ 38.47	24.30
ASBESTOS; HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 4 - A & B.....\$ 34.52	24.30
ASBESTOS; HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 5 - A & B.....\$ 31.13	24.30
HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 1 - C & D.....\$ 40.91	24.30
HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 2 - C & D.....\$ 40.61	24.30
HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 3 - C & D.....\$ 35.27	24.30
HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 4 - C & D.....\$ 31.65	24.30
HAZARDOUS/TOXIC WASTE PROJECTS	
GROUP 5 - C & D.....\$ 28.53	24.30
ALL OTHER WORK	
GROUP 1.....\$ 37.19	24.30
ALL OTHER WORK	
GROUP 2.....\$ 36.92	24.30
ALL OTHER WORK	
GROUP 3.....\$ 32.06	24.30
ALL OTHER WORK	
GROUP 4.....\$ 28.77	24.30
ALL OTHER WORK	
GROUP 5.....\$ 25.94	24.30

GROUP 1 - Rig, Pile Driver or Caisson Type; & Rig, Pile Hydraulic Unit Attached

GROUP 2 - Asphalt Heater Planer; Backfiller with Drag Attachment; Backhoe; Backhoe with Shear attached; Backhoe-Rear Pivotal Swing; Batch Plant-Central Mix Concrete; Batch Plant, Portable concrete; Berm Builder-Automatic; Boat Derrick; Boat-Tug; Boring Machine Attached to Tractor; Bullclam; Bulldozer; C.M.I. Road Builder & Similar Type; Cable Placer & Layer; Carrier-Straddle; Carryall-Scraper or Scoop; Chicago Boom; Compactor with Blade Attached; Concrete Saw (Vermeer or similar type); Concrete Spreader Finisher; Combination, Bidwell Machine; Crane; Crane-Electric Overhead; Crane-Rough Terrain; Crane-Side Boom; Crane-Truck; Crane-Tower; Derrick-Boom; Derrick-Car; Digger-Wheel (Not trencher or road widener); Double Nine; Drag Line; Dredge; Drill-Kenny or Similar Type; Easy Pour Median Barrier Machine (or similar type); Electromatic; Frankie Pile; Gradall; Grader; Gurry; Self-Propelled; Heavy Equipment Robotics Operator/Mechanic; Hoist-Monorail; Hoist-Stationary & Mobile Tractor; Hoist, 2 or 3 drum; Horizontal Directional Drill Operator; Jackall; Jumbo Machine; Kocal & Kuhlman; Land-Seagoing Vehicle; Loader, Elevating; Loader, Front End; Loader, Skid Steer; Locomotive; Mechanic/Welder; Metro Chip Harvester with Boom; Mucking Machine; Paver-Asphalt Finishing Machine; Paver-Road Concrete; Paver-Slip Form (C.M.I. or similar); Place Crete Machine with Boom; Post Driver (Carrier

mounted); Power Driven Hydraulic Pump & Jack (When used in Slip Form or Lift Slab Construction); Pump Crete Machine; Regulator-Ballast; Hydraulic Power Unit not attached to Rig for Pile Drillings; Rigs-Drilling; Roto Mill or similar Full Lane (8' Wide & Over); Roto Mill or similar type (Under 8'); Shovel; Slip Form Curb Machine; Speedwing; Spikemaster; Stonecrusher; Tie Puller & Loader; Tie Tamper; Tractor-Double Boom; Tractor with Attachments; Truck-Boom; Truck-Tire; Trench Machine; Tunnel Machine (Mark 21 Java or similar); & Whirley (or similar type)

GROUP 3 - Asphalt Plant; Bending Machine (Pipeline or similar type); Boring machine, Motor Driven; Chip Harvester without Boom; Cleaning Machine, Pipeline Type; Coating Machine, Pipeline Type; Compactor; Concrete Belt Placer; Concrete Finisher; Concrete Planer or Asphalt; Concrete Spreader; Elevator; Fork Lift (Home building only); Fork lift & Lulls; Fork Lift Walk Behind (Hoisting over 1 buck high); Form Line Machine; Grease Truck operator; Grout Pump; Gunnite Machine; Horizontal Directional Drill Locator; Single Drum Hoist with or without Tower; Huck Bolting Machine; Hydraulic Scaffold (Hoisting building materials); Paving Breaker (Self-propelled or Ridden); Pipe Dream; Pot Fireperson (Power Agitated); Refrigeration Plant; Road Widener; Roller; Sasgen Derrick; Seeding Machine; Soil Stabilizer (Pump type); Spray Cure Machine, Self-Propelled; Straw Blower Machine; Sub-Grader; Tube Finisher or Broom C.M.I. or similar type; & Tugger Hoist

GROUP 4 - Air Curtain Destructor & Similar Type; Batch Plant-Job Related; Boiler Operator; Compressor; Conveyor; Curb Builder, self-propelled; Drill Wagon; Generator Set; Generator-Steam; Heater-Portable Power; Hydraulic Manipulator Crane; Jack-Hydraulic Power driven; Jack-Hydraulic (Railroad); Ladavator; Minor Machine Operator; Mixer-Concrete; Mulching Machine; Pin Puller; Power Broom; Pulverizer; Pump; Road Finishing Machine (Pull Type); Saw-Concrete-Self-Propelled (Highway Work); Signal Person; Spray Cure Machine-Motor Powered; Stump Cutter; Tractor; Trencher Form; Water Blaster; Steam Jenny; Syphon; Vibrator-Gasoline; & Welding Machine

GROUP 5 - Brakeperson; Fireperson; & Oiler

IRON0017-002 05/01/2024

ASHTABULA (North of Route 6, starting at the Geauga County Line, proceeding east to State Route 45), CUYAHOGA, ERIE (Eastern 2/3), GEAUGA, HURON (East of a line drawn from the north border through Monroeville & Willard), LAKE, LORAIN, MEDINA (North of Old Rte. #224), PORTAGE (West of a line from Middlefield to Shalersville to Deerfield), and SUMMIT (North of Old Rte. #224, including city limits of Barberton) COUNTIES

Rates Fringes

IRONWORKER

Ornamental, Reinforcing, &
Structural.....\$ 36.83 29.01

IRON0017-010 05/01/2024

ASHTABULA (Eastern part from Lake Erie on the north to route #322 on the south to include Conneaut, Kingsville, Sheffield, Denmark, Dorset, Cherry Valley, Wayne, Monroe, Pierpont, Richmond, Andover & Williamsfield Townships)

Rates Fringes

IRONWORKER

Structural, including metal building erection & Reinforcing.....	\$ 36.83	29.01
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IRON0044-001 06/01/2022

ADAMS (Western Part), BROWN, BUTLER (Southern Part), CLERMONT, CLINTON (South of a line drawn from Blanchester to Lynchburg), HAMILTON, HIGHLAND (Excluding eastern one-fifth & portion of county inside lines drawn from Marshall to Lynchburg from the northern county line through E. Monroe to Marshall) and WARREN (South of a line drawn from Blanchester through Morrow to the west county line) COUNTIES

Rates Fringes

IRONWORKER, REINFORCING.....	\$ 32.37	22.30
Beyond 30-mile radius of Hamilton County Courthouse..	\$ 28.67	21.20
Up to & including 30-mile radius of Hamilton County Courthouse.....	\$ 27.60	20.70

IRON0044-002 06/01/2024

CLINTON (South of a line drawn from Blanchester to Lynchburg), HAMILTON, HIGHLAND (Excluding eastern one-fifth & portion of county inside lines drawn from Marshall to Lynchburg from the northern county line through E. Monroe to Marshall) & WARREN (South of a line drawn from Blanchester through Morrow to the west county line)

Rates Fringes

IRONWORKER

Fence Erector.....	\$ 33.60	23.00
Ornamental; Structural.....	\$ 35.37	23.00

IRON0055-003 07/01/2024

CRAWFORD (Area Between lines drawn from where Hwy #598 & #30 meet through N. Liberty to the northern border & from said Hwy junction point due west to the border), DEFIANCE (S. of a line drawn from where Rte. #66 meets the northern line through Independence to the eastern county border), ERIE (Western 1/3), FULTON, HANCOCK, HARDIN (North of a line drawn from Maysville to a point 4 miles south of the northern line on the eastern line), HENRY, HURON (West of a line drawn from the northern border through Monroeville & Willard), LUCAS, OTTAWA, PUTNAM (East of a line drawn from the northern border down through Miller City to where #696 meets the southern border), SANDUSKY, SENECA, WILLIAMS (East of a line drawn from Pioneer through Stryker to the southern border), WOOD & WYANDOT (North of Rte. #30)

Rates Fringes

IRONWORKER

Fence Erector.....	\$ 26.40	24.62
Flat Road Mesh.....	\$ 29.77	21.30

Tunnels & Caissons Under		
Pressure.....	\$ 29.77	21.30
All Other Work.....	\$ 35.50	29.20

IRON0147-002 06/01/2024

ALLEN (Northern half), DEFIANCE (Northern part, excluding south of a line drawn from where Rte. #66 meets the northern line through Independence to the eastern county border), MERCER (Northern half), PAULDING, PUTNAM (Western part, excluding east of a line drawn from the northern border down through Miller City to where #696 meets the southern border), VAN WERT, and WILLIAMS (Western part, excluding east of a line drawn from Pioneer through Stryker to the southern border) COUNTIES

	Rates	Fringes
IRONWORKER.....	\$ 34.20	26.39

IRON0172-002 06/01/2024

CHAMPAIGN (Eastern one-third), CLARK (Eastern one-fourth), COSHOCTON (West of a line beginning at the northwestern county line going through Walhonding & Tunnel Hill to the southern county line), CRAWFORD (South of Rte. #30), DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, HARDIN (Excluding a line drawn from Roundhead to Maysville), HIGHLAND (Eastern one-fifth), HOCKING, JACKSON (Northern half), KNOX, LICKING, LOGAN (Eastern one-third), MADISON, MARION, MORROW, MUSKINGUM (West of a line starting at Adams Mill going to Adamsville & going from Adamsville through Blue Rock to the southern border), PERRY, PICKAWAY, PIKE (Northern half), ROSS, UNION, VINTON and WYANDOT (South of Rte. #30) COUNTIES

	Rates	Fringes
IRONWORKER.....	\$ 36.77	22.85

IRON0207-004 06/01/2024

ASHTABULA (Southern part starting at the Geauga County line), COLUMBIANA (E. of a line from Damascus to Highlandtown), MAHONING (N. of Old Route #224), PORTAGE (E. of a line from Middlefield to Shalersville to Deerfield) & TRUMBULL

	Rates	Fringes
IRONWORKER		
Layout; Sheeter.....	\$ 35.83	27.41
Ornamental; Reinforcing;		
Structural.....	\$ 34.83	27.41
Ornamental; Reinforcing.....	\$ 28.92	25.61

IRON0290-002 06/01/2024

ALLEN (Southern half), AUGLAIZE, BUTLER (North of a line drawn from east to the west county line going through Oxford, Darrtown & Woodsdale), CHAMPAIGN (Excluding east of a line drawn from Catawla to the point where #68 intersects the northern county line), CLARK (Western two-thirds), CLINTON (Excluding south of a line drawn from Blanchester to Lynchburg), DARKE, GREENE, HIGHLAND (Inside lines drawn from Marshall to Lynchburg & from the northern county line through East Monroe to Marshall), LOGAN (West of a line drawn from West Liberty to where the northern county line meets the

western county line of Hardin), MERCER (Southern half), MIAMI, MONTGOMERY, PREBLE, SHELBY & WARREN (Excluding south of a line drawn from Blanchester through Morrow to the western county line) COUNTIES

	Rates	Fringes
IRONWORKER.....	\$ 35.39	24.35

IRON0549-003 12/01/2022

BELMONT, GUERNSEY, HARRISON, JEFFERSON, MONROE & MUSKINGUM (Excluding portion west of a line starting at Adams Mill going to Adamsville and going from Adamsville through Blue Rock to the south border)

	Rates	Fringes
IRONWORKER.....	\$ 35.19	25.66

IRON0550-004 05/01/2024

ASHLAND, CARROLL, COLUMBIANA (W. of a line from Damascus to Highlandtown), COSHOCTON (E. of a line beginning at NW Co. line going through Walhonding & Tunnel Hill to the South Co. line), HOLMES, HURON (S. of Old Rte. #224), MAHONING (S. of Old Rte. #224), MEDINA (S. of Old Rte. #224), PORTAGE (S. of Old Rte. #224), RICHLAND, STARK, SUMMIT (S. of Old Rte. #224, Excluding city limits of Barberton), TUSCARAWAS, & WAYNE

	Rates	Fringes
Ironworkers:Structural, Ornamental and Reinforcing.....	\$ 34.70	22.88

IRON0769-004 06/01/2024

ADAMS (Eastern Half), GALLIA, JACKSON (Southern Half), LAWRENCE & SCIOTO

	Rates	Fringes
IRONWORKER.....	\$ 37.66	29.24

IRON0787-003 06/01/2024

ATHENS, MEIGS, MORGAN, NOBLE, and WASHINGTON COUNTIES

	Rates	Fringes
IRONWORKER.....	\$ 33.00	24.25

LAB00265-008 05/01/2024

	Rates	Fringes
LABORER		
ASHTABULA, ERIE, HURON, LORAIN, LUCAS, MAHONING, MEDINA, OTTAWA, PORTAGE, SANDUSKY, STARK, SUMMIT, TRUMBULL & WOOD COUNTIES		
GROUP 1.....	\$ 35.05	13.70
GROUP 2.....	\$ 35.22	13.70

GROUP 3.....	\$ 35.55	13.70
GROUP 4.....	\$ 36.00	13.70
CUYAHOGA AND GEAUGA COUNTIES ONLY: SEWAGE PLANTS, WASTE PLANTS, WATER TREATMENT FACILITIES, PUMPING STATIONS, & ETHANOL PLANTS CONSTRUCTION.....		
	\$ 37.66	13.70
CUYAHOGA, GEAUGA & LAKE COUNTIES		
GROUP 1.....	\$ 36.28	13.70
GROUP 2.....	\$ 36.45	13.70
GROUP 3.....	\$ 36.78	13.70
GROUP 4.....	\$ 37.23	13.70
REMAINING COUNTIES OF OHIO		
GROUP 1.....	\$ 35.52	14.45
GROUP 2.....	\$ 35.69	14.45
GROUP 3.....	\$ 36.02	14.45
GROUP 4.....	\$ 36.47	14.45

LABORER CLASSIFICATIONS

GROUP 1 - Asphalt Laborer; Carpenter Tender; Concrete Curing Applicator; Dump Man (Batch Truck); Guardrail and Fence Installer; Joint Setter; Laborer (Construction); Landscape Laborer; Mesh Handlers & Placer; Right-of-way Laborer; Riprap Laborer & Grouter; Scaffold Erector; Seal Coating; Surface Treatment or Road Mix Laborer; Sign Installer; Slurry Seal; Utility Man; Bridge Man; Handyman; Waterproofing Laborer; Flagperson; Hazardous Waste (level D); Diver Tender; Zone Person & Traffic Control

GROUP 2 - Asphalt Raker; Concrete Puddler; Kettle Man Pipeline); Machine Driven Tools (Gas, Electric, Air); Mason Tender; Brick Paver; Mortar Mixer; Power Buggy or Power Wheelbarrow; Paint Striper; Sheeting & Shoring Man; Surface Grinder Man; Plastic Fusing Machine Operator; Pug Mill Operator; & Vacuum Devices (wet or dry); Rodding Machine Operator; Diver; Screwman or Paver; Screed Person; Water Blast, Hand Held Wand; Pumps 4" & Under (Gas, Air or Electric) & Hazardous Waste (level C); Air Track and Wagon Drill; Bottom Person; Cofferdam (below 25 ft. deep); Concrete Saw Person; Cutting with Burning Torch; Form Setter; Hand Spiker (Railroad); Pipelayer; Tunnel Laborer (without air) & Caisson; Underground Person (working in Sewer and Waterline, Cleaning, Repairing & Reconditioning); Sandblaster Nozzle Person; & Hazardous Waste (level B)

GROUP 3 - Blaster; Mucker; Powder Person; Top Lander; Wrencher (Mechanical Joints & Utility Pipeline); Yarner; Hazardous Waste (level A); Concrete Specialist; Concrete Crew in Tunnels (With Air-pressurized - \$1.00 premium); Curb Setter & Cutter; Grade Checker; Utility Pipeline Tapper; Waterline; and Caulker

GROUP 4 - Miner (With Air-pressurized - \$1.00 premium); & Gunite Nozzle Person

TUNNEL LABORER WITH AIR-PRESSURIZED ADD \$1.00 TO BASE RATE

SIGNAL PERSON WILL RECEIVE THE RATE EQUAL TO THE RATE PAID THE LABORER CLASSIFICATION FOR WHICH HE OR SHE IS SIGNALING.

PAIN006-002 05/01/2023

ASHTABULA, CUYAHOGA, GEAUGA, LAKE, LORAIN, PORTAGE (N. of the

East-West Turnpike) & SUMMIT (N. of the East-West Turnpike)

Rates Fringes

PAINTER

COMMERCIAL NEW WORK;

REMODELING; & RENOVATIONS

GROUP 1.....	\$ 30.75	18.95
GROUP 2.....	\$ 31.15	18.95
GROUP 3.....	\$ 31.45	18.95
GROUP 4.....	\$ 37.01	18.95

COMMERCIAL REPAINT

GROUP 1.....	\$ 29.25	18.95
GROUP 2.....	\$ 29.65	18.95
GROUP 3.....	\$ 29.95	18.95

PAINTER CLASSIFICATIONS - COMMERCIAL NEW WORK; REMODELING; & RENOVATIONS

GROUP 1 - Brush; & Roller

GROUP 2 - Sandblasting & Buffing

GROUP 3 - Spray Painting; Closed Steel Above 55 feet; Bridges & Open Structural Steel; Tanks - Water Towers; Bridge Painters; Bridge Riggers; Containment Builders

GROUP 4 - Bridge Blaster

PAINTER CLASSIFICATIONS - COMMERCIAL REPAINT

GROUP 1 - Brush; & Roller

GROUP 2 - Sandblasting & Buffing

GROUP 3 - Spray Painting

PAIN007-002 07/01/2024

FULTON, HENRY, LUCAS, OTTAWA (Excluding Allen, Bay, Bono, Catawba Island, Clay Center, Curtice, Danbury, Eagle Beach, Elliston, Elmore, Erie, Fishback, Gem Beach & Genova) & WOOD

Rates Fringes

PAINTER

NEW COMMERCIAL WORK

GROUP 1.....	\$ 31.84	20.79
GROUP 2.....	\$ 32.84	20.79
GROUP 3.....	\$ 32.84	20.79
GROUP 4.....	\$ 32.84	20.79
GROUP 5.....	\$ 32.84	20.79
GROUP 6.....	\$ 32.84	20.79
GROUP 7.....	\$ 32.84	20.79
GROUP 8.....	\$ 32.84	20.79
GROUP 9.....	\$ 32.84	20.79

REPAINT IS 90% OF JR

PAINTER CLASSIFICATIONS

GROUP 1 - Brush; Spray & Sandblasting Pot Tender

GROUP 2 - Refineries & Refinery Tanks; Surfaces 30 ft. or over where material is applied to or labor performed on

above ground level (exterior), floor level (interior)

GROUP 3 - Swing Stage & Chair

GROUP 4 - Lead Abatement

GROUP 5 - All Methods of Spray

GROUP 6 - Solvent-Based Catalized Epoxy Materials of 2 or More Component Materials, to include Solvent-Based Conversion Varnish (excluding water based)

GROUP 7 - Spray Solvent Based Material; Sand & Abrasive Blasting

GROUP 8 - Towers; Tanks; Bridges; Stacks Over 30 Feet

GROUP 9 - Epoxy Spray (excluding water based)

PAIN0012-008 05/01/2019

BUTLER COUNTY

	Rates	Fringes
PAINTER		
GROUP 1.....	\$ 21.95	10.20
GROUP 2.....	\$ 25.30	10.20
GROUP 3.....	\$ 25.80	10.20
GROUP 4.....	\$ 26.05	10.20
GROUP 5.....	\$ 26.30	10.20

PAINTER CLASSIFICATIONS

GROUP 1: Bridge Equipment Tender; Bridge/Containment Builder

GROUP 2: Brush & Roller

GROUP 3: Spray

GROUP 4: Sandblasting; & Waterblasting

GROUP 5: Elevated Tanks; Steeplejack Work; Bridge; & Lead Abatement

PAIN0012-010 05/01/2019

BROWN, CLERMONT, CLINTON, HAMILTON & WARREN

	Rates	Fringes
PAINTER		
HEAVY & HIGHWAY BRIDGES- GUARDRAILS-LIGHTPOLES- STRIPING		
Bridge Equipment Tender and Containment Builder....	\$ 21.95	10.20
Bridges when highest point of clearance is 60 feet or more; & Lead Abatement Projects.....	\$ 26.30	10.20
Brush & Roller.....	\$ 25.30	10.20
Sandblasting & Hopper Tender; Water Blasting.....	\$ 26.05	10.20
Spray.....	\$ 25.80	10.20

PAIN0093-001 12/01/2023

ATHENS, GUERNSEY, HOCKING, MONROE, MORGAN, NOBLE and
WASHINGTON COUNTIES

	Rates	Fringes
PAINTER		
Bridges; Locks; Dams; Tension Towers; & Energized Substations.....	\$ 35.45	23.69
Power Generating Facilities.	\$ 32.30	23.69

PAIN0249-002 05/01/2024

CLARK, DARKE, GREENE, MIAMI, MONTGOMERY & PREBLE

	Rates	Fringes
PAINTER		
GROUP 1 - Brush & Roller....	\$ 27.15	13.64
GROUP 2 - Swing, Scaffold Bridges; Structural Steel; Open Acid Tank; High Tension Electrical Equipment; & Hot Pipes.....	\$ 27.15	13.64
GROUP 3 - Spray; Sandblast; Steamclean; Lead Abatement.....	\$ 27.90	13.64
GROUP 4 - Steeplejack Work..	\$ 28.10	13.64
GROUP 5 - Coal Tar.....	\$ 28.65	13.64
GROUP 6 - Bridge Equipment Tender & or Containment Builder.....	\$ 35.86	13.64
GROUP 7 - Tanks, Stacks & Towers.....	\$ 31.09	13.64
GROUP 8 - Bridge Blaster, Rigger.....	\$ 38.86	13.64

PAIN0356-002 09/01/2009

KNOX, LICKING, MUSKINGUM, and PERRY

	Rates	Fringes
PAINTER		
Bridge Equipment Tenders and Containment Builders....	\$ 27.93	7.25
Bridges; Blasters; and Riggers.....	\$ 34.60	7.25
Brush and Roller.....	\$ 20.93	7.25
Sandblasting; Steam Cleaning; Waterblasting; and Hazardous Work.....	\$ 25.82	7.25
Spray.....	\$ 21.40	7.25
Structural Steel and Swing Stage.....	\$ 25.42	7.25
Tanks; Stacks; and Towers...	\$ 28.63	7.25

PAIN0438-002 12/01/2023

BELMONT, HARRISON and JEFFERSON COUNTIES

	Rates	Fringes
PAINTER		

Bridges, Locks, Dams, Tension Towers & Energized Substations.....	\$ 36.09	19.49
Power Generating Facilities..	\$ 32.94	19.49

PAIN0476-001 06/01/2024

COLUMBIANA, MAHONING, and TRUMBULL COUNTIES

	Rates	Fringes
PAINTER		
GROUP 1.....	\$ 28.39	17.14
GROUP 2.....	\$ 35.02	17.14
GROUP 3.....	\$ 28.60	17.14
GROUP 4.....	\$ 28.89	17.14
GROUP 5.....	\$ 29.04	17.14
GROUP 6.....	\$ 29.29	17.14
GROUP 7.....	\$ 30.39	17.14

PAINTER CLASSIFICATIONS:

- GROUP 1: Painters, Brush & Roller
- GROUP 2: Bridges
- GROUP 3: Structural Steel
- GROUP 4: Spray, Except Bar Joist/Deck
- GROUP 5: Epoxy/Mastic; Spray- Bar Joist/Deck; Working Above 50 Feet; and Swingstages
- GROUP 6: Tanks; Sandblasting
- GROUP 7: Towers; Stacks

PAIN0555-002 11/01/2023

ADAMS, HIGHLAND, JACKSON, PIKE & SCIOTO

	Rates	Fringes
PAINTER		
GROUP 1.....	\$ 32.18	20.29
GROUP 2.....	\$ 33.81	20.29
GROUP 3.....	\$ 35.44	20.29
GROUP 4.....	\$ 38.63	20.29

PAINTER CLASSIFICATIONS

- GROUP 1 - Containment Builder
- GROUP 2 - Brush; Roller; Power Tools, Under 40 feet
- GROUP 3 - Sand Blasting; Spray; Steam Cleaning; Pressure Washing; Epoxy & Two Component Materials; Lead Abatement; Hazardous Waste; Toxic Materials; Bulk & Storage Tanks of 25,000 Gallon Capacity or More; Elevated Tanks
- GROUP 4 - Stacks; Bridges

PAIN0639-001 05/01/2011

Rates Fringes

Sign Painter & Erector.....\$ 20.61 3.50+a+b+c

FOOTNOTES: a. 7 Paid Holidays: New Year's Day; Memorial Day; July 4th; Labor Day; Thanksgiving Day; Christmas Day & 1 Floating Day
b. Vacation Pay: After 1 year's service - 5 days' paid vacation; After 2, but less than 10 years' service - 10 days' paid vacation; After 10, but less than 20 years' service - 15 days' paid vacation; After 20 years' service - 20 days' paid vacation
c. Funeral leave up to 3 days maximum paid leave for death of mother, father, brother, sister, spouse, child, mother-in-law, father-in-law, grandparent and inlaw provided employee attends funeral

PAIN0788-002 06/01/2024

ASHLAND, CRAWFORD, ERIE, HANCOCK, HURON, MARION, MORROW, OTTAWA (Allen, Bay, Bono, Catawba Island, Clay Center, Curtice, Danbury, Eagle Beach, Elliston, Elmore, Erie, Fishback, Gem Beach & Genoa), RICHLAND, SANDUSKY, SENECA & WYANDOT

Rates Fringes

PAINTER
Brush & Roller.....\$ 29.13 17.52
Structural Steel.....\$ 30.73 17.52

WINTER REPAINT: Between December 1 to March 31 - 90%JR

\$.50 PER HOUR SHALL BE ADDED TO THE RATE OF PAY FOR THE CLASSIFICATION OF WORK:

While working swingstage, boatswain chair, needle beam and horizontal cable. While operating sprayguns, sandblasting, cobblasting and high pressure waterblasting (4000psi).

\$1.00 PER HOUR SHALL BE ADDED TO THE RATE OF PAY FOR THE CLASSIFICATION OF WORK:

For the application of catalized epoxy, including latex epoxy that is deemed hazardous, lead abatement, or for work or material where special precautions beyond normal work duties must be taken. For working on stacks, tanks, and towers over 40 feet in height.

PAIN0813-005 12/01/2008

GALLIA, LAWRENCE, MEIGS & VINTON

Rates Fringes

PAINTER
Base Rate.....\$ 24.83 10.00
Bridges, Locks, Dams &
Tension Towers.....\$ 27.83 10.00

PAIN0841-001 06/01/2023

MEDINA, PORTAGE (South of and including Ohio Turnpike), and SUMMIT (South of and including Ohio Turnpike) COUNTIES

Rates Fringes

Painters:

GROUP 1.....	\$ 30.18	15.50
GROUP 2.....	\$ 30.83	15.50
GROUP 3.....	\$ 30.93	15.50
GROUP 4.....	\$ 31.03	15.50
GROUP 5.....	\$ 31.43	15.50
GROUP 6.....	\$ 39.20	11.75
GROUP 7.....	\$ 31.68	15.50

PAINTER CLASSIFICATIONS:

GROUP 1 - Brush, Roller & Paperhanger

GROUP 2 - Epoxy Application

GROUP 3 - Swing Scaffold, Bosum Chair, & Window Jack

GROUP 4 - Spray Gun Operator of Any & All Coatings

GROUP 5 - Sandblast, Painting of Standpipes, etc. from Scaffolds, Bridge Work and/or Open Structural Steel, Standpipes and/or Water Towers

GROUP 6 - Public & Commerce Transportation, Steel or Galvanized, Bridges, Tunnels & Related Support Items (concrete)

GROUP 7 - Synthetic Exterior, Drywall Finisher and/or Taper, Drywall Finisher and Follow-up Man Using Automatic Tools

PAIN0841-002 06/01/2023

CARROLL, COSHOCTON, HOLMES, STARK, TUSCARAWAS & WAYNE

Rates Fringes

PAINTER

Bridges; Towers, Poles & Stacks; Sandblasting Steel; Structural Steel & Metalizing.....	\$ 31.43	15.50
Brush & Roller.....	\$ 30.18	15.50
Spray; Tank Interior & Exterior.....	\$ 31.03	15.50

* PAIN1020-002 07/01/2024

ALLEN, AUGLAIZE, CHAMPAIGN, DEFIANCE, HARDIN, LOGAN, MERCER, PAULDING, PUTNAM, SHELBY, VAN WERT, and WILLIAMS COUNTIES

Rates Fringes

PAINTER

Brush & Roller.....	\$ 26.54	17.66
Drywall Finishing & Taping..	\$ 27.29	17.66
Lead Abatement.....	\$ 28.29	17.66
Spray, Sandblasting Pressure Cleaning, & Refinery.....	\$ 27.29	17.66
Swing Stage, Chair, Spiders, & Cherry Pickers...	\$ 26.79	17.66
Wallcoverings.....	\$ 27.29	17.66

All surfaces 40 ft. or over where material is applied to or labor performed on, above ground level (exterior), floor level (interior) - \$.50 premium

Applying Coal Tar Products - \$1.00 premium

PAIN1275-002 05/01/2024

DELAWARE, FAIRFIELD, FAYETTE, FRANKLIN, MADISON, PICKAWAY, ROSS & UNION

	Rates	Fringes
PAINTER		
Bridges.....	\$ 36.26	14.91
Brush; Roller.....	\$ 30.65	14.91
Sandblasting; Steamcleaning; Waterblasting (3500 PSI or Over)& Hazardous Work.....	\$ 31.35	14.91
Spray.....	\$ 31.15	14.91
Stacks; Tanks; & Towers.....	\$ 33.46	14.91
Structural Steel & Swing Stage.....	\$ 29.50	14.91

PLAS0109-001 06/01/2024

MEDINA, PORTAGE, STARK, and SUMMIT COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 31.70	23.63

PLAS0109-003 06/01/2024

CARROLL, HOLMES, TUSCARAWAS, and WAYNE COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 31.70	23.63

* PLAS0132-002 07/01/2024

BROWN, BUTLER, CLERMONT, HAMILTON, HIGHLAND, WARREN COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 30.40	16.54

PLAS0404-002 05/01/2018

ASHTABULA, CUYAHOGA, GEAUGA, AND LAKE COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 29.63	17.11

PLAS0404-003 05/01/2018

LORAIN COUNTY

	Rates	Fringes
PLASTERER.....	\$ 28.86	17.11

PLAS0526-022 05/01/2018

COLUMBIANA, MAHONING, and TRUMBULL COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 28.86	17.11

PLAS0526-023 05/01/2018		

BELMONT, HARRISON, and JEFFERSON COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 28.21	17.11

PLAS0886-001 07/01/2024		

FULTON, HANCOCK, HENRY, LUCAS, PUTNAM, and WOOD COUNTIES

	Rates	Fringes
PLASTERER.....	\$ 33.73	23.25

PLAS0886-003 07/01/2024		

	Rates	Fringes
PLASTERER.....	\$ 33.73	23.25

PLAS0886-004 07/01/2024		

	Rates	Fringes
PLASTERER.....	\$ 33.73	23.25

PLUM0042-002 07/01/2024		

ASHLAND, CRAWFORD, ERIE, HURON, KNOX, LORAIN, MORROW, RICHLAND & WYANDOT

	Rates	Fringes
Plumber, Pipefitter, Steamfitter.....	\$ 40.62	25.67

PLUM0050-002 07/01/2024		

DEFIANCE, FULTON, HANCOCK, HENRY, LUCAS, OTTAWA, PAULDING, PUTNAM, SANDUSKY, SENECA, WILLIAMS & WOOD

	Rates	Fringes
Plumber, Pipefitter, Steamfitter.....	\$ 49.70	30.76

PLUM0055-003 05/01/2024		

ASHTABULA, CUYAHOGA, GEAUGA, LAKE, MEDINA (N. of Rte. #18 & Smith Road) & SUMMIT (N. of Rte. #303, including the corporate limits of the city of Hudson)

	Rates	Fringes
PLUMBER.....	\$ 42.36	29.90

PLUM0083-001 07/01/2023		

BELMONT & MONROE (North of Rte. #78)

	Rates	Fringes
Plumber and Steamfitter.....	\$ 35.94	37.35

PLUM0094-002 05/01/2023

CARROLL (Northen Half), STARK, and WAYNE COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER.....	\$ 38.03	23.09

PLUM0120-002 04/29/2024

ASHTABULA, CUYAHOGA, GEAUGA, LAKE, LORAIN (the C.E.I. Power House in Avon Lake), MEDINA (N. of Rte. #18) & SUMMIT (N. of #303)

	Rates	Fringes
PIPEFITTER.....	\$ 47.07	28.15

PLUM0162-002 06/01/2024

CHAMPAIGN, CLARK, CLINTON, DARKE, FAYETTE, GREENE, MIAMI, MONTGOMERY & PREBLE

	Rates	Fringes
Plumber, Pipefitter, Steamfitter.....	\$ 43.05	27.18

PLUM0168-002 06/01/2024

MEIGS, MONROE (South of Rte. #78), MORGAN (South of Rte. #78) & WASHINGTON

	Rates	Fringes
PLUMBER/PIPEFITTER.....	\$ 39.43	37.29

PLUM0189-002 06/01/2024

DELAWARE, FAIRFIELD, FRANKLIN, HOCKING, LICKING, MADISON, MARION, PERRY, PICKAWAY, ROSS & UNION

	Rates	Fringes
Plumber, Pipefitter, Steamfitter.....	\$ 43.25	26.94

PLUM0219-002 06/01/2024

MEDINA (Rte. #18 from eastern edge of Medina Co., west to eastern corporate limits of the city of Medina, & on the county road from the west corporate limits of Medina running due west to and through community of Risley to the western edge of Medina County - All territory south of this line), PORTAGE, and SUMMIT (S. of Rte. #303) COUNTIES

Rates Fringes

Plumber and Steamfitter.....\$ 45.37 27.64

PLUM0392-002 06/01/2024

BROWN, BUTLER, CLERMONT, HAMILTON & WARREN

Rates Fringes

PLUMBER/PIPEFITTER.....\$ 40.65 26.75

PLUM0396-001 06/01/2024

COLUMBIANA (Excluding Washington & Yellow Creek Townships & Liverpool Twp. - Secs. 35 & 36 - West of County Road #427), MAHONING and TRUMBULL COUNTIES

Rates Fringes

PLUMBER/PIPEFITTER.....\$ 38.45 28.96

PLUM0495-002 06/01/2024

CARROLL (Rose, Monroe, Union, Lee, Orange, Perry & Loudon Townships), COLUMBIANA (Washington & Yellow Creek Townships & Liverpool Township, Secs. 35 & 36, West of County Rd. #427), COSHOCTON, GUERNSEY, HARRISON, HOLMES, JEFFERSON, MORGAN (South to State Rte. #78 & from McConnelville west on State Rte. #37 to the Perry County line), MUSKINGUM, NOBLE, and TUSCARAWAS COUNTIES

Rates Fringes

Plumber, Pipefitter,
Steamfitter.....\$ 37.82 36.70

PLUM0577-002 06/01/2024

ADAMS, ATHENS, GALLIA, HIGHLAND, JACKSON, LAWRENCE, PIKE, SCIOTO & VINTON

Rates Fringes

Plumber, Pipefitter,
Steamfitter.....\$ 41.65 27.48

PLUM0776-002 07/01/2024

ALLEN, AUGLAIZE, HARDIN, LOGAN, MERCER, SHELBY and VAN WERT COUNTIES

Rates Fringes

Plumber, Pipefitter,
Steamfitter.....\$ 42.07 29.35

TEAM0377-003 05/01/2024

STATEWIDE, EXCEPT CUYAHOGA, GEAUGA & LAKE

Rates Fringes

TRUCK DRIVER
GROUP 1.....\$ 32.54 16.80
GROUP 2.....\$ 32.96 16.80

TRUCK DRIVER CLASSIFICATIONS

GROUP 1 - Asphalt Distributor; Batch; 4- Wheel Service; 4-Wheel Dump; Oil Distributor & Tandem

GROUP 2 - Tractor-Trailer Combination: Fuel; Pole Trailer; Ready Mix; Semi-Tractor; & Asphalt Oil Spraybar Man When Operated From Cab; 5 Axles & Over; Belly Dump; End Dump; Articulated Dump; Heavy Duty Equipment; Low Boy; & Truck Mechanic

* TEAM0436-002 05/01/2024

CUYAHOGA, GEAUGA & LAKE

	Rates	Fringes
TRUCK DRIVER		
GROUP 1.....	\$ 32.25	18.95
GROUP 2.....	\$ 33.75	18.95

GROUP 1: Straight & Dump, Straight Fuel

GROUP 2: Semi Fuel, Semi Tractor, Euclids, Darts, Tank, Asphalt Spreaders, Low Boys, Carry-All, Tourna-Rockers, Hi-Lifts, Extra Long Trailers, Semi-Pole Trailers, Double Hook-Up Tractor Trailers including Team Track & Railroad Siding, Semi-Tractor & Tri-Axle Trailer, Tandem Tractor & Tandem Trailer, Tag Along Trailer, Expandable Trailer or Towing Requiring Road Permits, Ready-Mix (Agitator or Non-Agitator), Bulk Concrete Driver, Dry Batch Truck, Articulated End Dump

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.20) or 13658 (\$12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at

<https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in

the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

State Adopted Rate Identifiers

Classifications listed under the "SA" identifier indicate that the prevailing wage rate set by a state (or local) government was adopted under 29 C.F.R. 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 01/03/2024 reflects the date on which the classifications and rates under the "SA" identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"