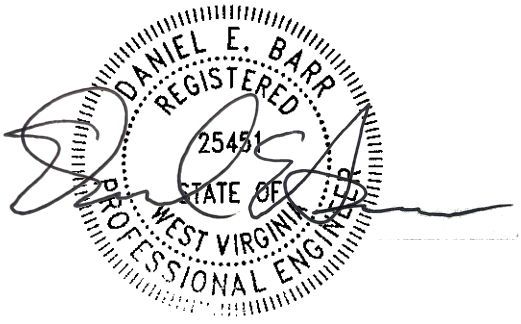
BID SET

Water Treatment Plant
Solids Handling Bldg. Improvements

City of Wheeling, WV

October 2026



0000034141

verdantas

2001 Main Street, Suite 600 | Wheeling | OH | 26003 |
304-232-2784 | www.verdantas.com

CITY OF WHEELING OFFICIALS

ADMINISTRATION

Denny Magruder, Mayor

Robert Herron, City Manager

William Lanham II, Assistant City Manager

Chelsea Brown, Administrative Assistant

Nathan Greene, Finance Director

David Pesi, Utility Accounting

Marci Embrey, Water Billing/Accounting

Rosemary Humway-Warmuth, City Solicitor

Travis Workman, Interim City Engineer

Mike Chiazza, Water Pollution Control Plant Superintendent

Lori Siburt, Water Department Superintendent

COUNCIL

Tony Assaro, Ward 1

Ben Seidler, Ward 2

Connie Cain, Ward 3

Jerry Sklavounakis, Ward 4

Ty Thorngate, Ward 5

Dave Palmer, Ward 6

Jessica Holloway, City Clerk

ADVERTISEMENT FOR BIDS/PUBLIC NOTICE TO BIDDERS

Sealed bids will be received by the City of Wheeling, WV at the office of the City Manager until 2:30 p.m. November 12, 2026 and will be opened and read immediately thereafter for the

WATER TREATMENT PLANT
SOLIDS HANDLING BLDG. IMPROVEMENTS

OPINION OF PROBABLE CONSTRUCTION COST: $2,011,700.00

COMPLETION DATE: AUGUST 27, 2027

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.verdantas.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 Verdantas LLC at a non-refundable cost of One Hundred Fifty Dollars ($150.00) for hard copies and Forty-Five Dollars ($45.00) for electronic files. Documents may be ordered by registering and paying online at https://bids.verdantas.com. Please contact planroom@verdantas.com or call (440) 530-2351 if you encounter any problems viewing, registering, or paying for the documents.

There will be a Non-Mandatory Pre-Bid Conference on November 3, 2026 at 10:00 a.m. at the WTP, 1551 Richland Avenue, Wheeling, West Virginia 26003

Publish: *The Intelligencer & Wheeling News-Register*
October 22, 2026
October 29, 2026

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014323 QUALIFICATIONS OF TRADESMEN
014523 TESTING, ADJUSTING, AND BALANCING
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024100 DEMOLITION

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DIVISION 05 – METALS

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Page No.

SECTION 6 SPECIFIC PROJECT REQUIREMENTS SR.1

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 his bid prior to the opening of bids, he shall state his purpose in writing to the Owner before the time fixed for the opening, and when reached it shall be handed to him unread.

1.9 After the opening of bids, no Bidder may withdraw his bid for a period of 90 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 himself with local conditions that may in any manner affect cost, progress, or performance of the work.

C. Familiarize himself 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 his bid each Bidder will, at his own expense, make such additional investigations and tests as the Bidder may deem necessary to determine his 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 his 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 he has 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 his 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. It is understood that the scheduled quantities of work to be done and materials to be furnished for items labeled as "Contingency" may be increased or diminished by any amount and the awarded quantity of all other items may be increased or diminished up to 15% without in any way invalidating the bid unit prices.

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.

PART 5 SUBCONTRACTORS

5.1 The Owner reserves the right to limit the total amounts of subcontractors to 60% of the total contract price.

5.2 The Bidder shall state on the appropriate bid form the names of all Subcontractors 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.

5.3 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 his bid without sacrificing his 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.

5.4 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.

5.5 No contractor shall be required to employ any Subcontractor, person or organization against whom he has 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 his 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 informal and may be rejected.

6.4 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 he deems necessary to assist in the evaluation of any bid and to establish the responsibility, qualifications, and financial ability of the Bidders, 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 bid security in the form of a certified or cashier's check or a bid bond in the amount of 5% of the amount bid including all alternates, if any. The certified or cashier's check shall be from a financial institution authorized to transact business in the State of West Virginia and acceptable to the Owner. The bond shall be underwritten by a Surety Company authorized to transact business in the State of West Virginia have an agent licensed to do business in West Virginia. The Surety Company shall be listed on the most current Department of the Treasury Circular 570, "Surety Companies Acceptable on Federal Bonds."

7.2 The certified or cashier's check or bid 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 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 his 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 5% 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 his 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 5% of the amount of the bid, whichever is less.

7.4 Checks for bid security of all bidders will be returned within seven days of the Effective Date of the Agreement.

PART 8 CONTRACT BOND / PERFORMANCE AND PAYMENT 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 a Contract Bond AKA a Performance and Payment Bond in the amount of 100% of the awarded Contract Price. The Contractor and his 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 West Virginia have an agent licensed to do business in West Virginia. The Surety Company shall be 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.

The Awarded Contractor and his Surety shall sign the Supplemental Bond Acknowledgement form and submit it with the Contract (Performance and Payment) Bond.

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 90 days after the day of the bid opening. When necessary and by mutual consent between the Owner and the Successful Bidder, this 90-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 or binder 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 Each bid must be accompanied by a completed Noncollusion Affidavit provided within the contract documents.

11.2 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 ORIGINAL DOCUMENTS

12.1 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 13 ADDENDA

13.1 The bidder shall be responsible to obtain Addenda from the web at https://bids.verdantas.com .

END OF SECTION

06/25

CITY OF WHEELING

CITY COUNTY BUILDING
1500 CHAPLINE STREET
WHEELING, WEST VIRGINIA 26003

DEPARTMENT OF PUBLIC WORKS - ENGINEERING DIVISION
304.234.3731 Fax 304.234.3605 www.wheelingwv.gov

MEMORANDUM

TO: All Prospective Bidders
FROM: City Engineer

For your information, the following conditions are applicable for this project.

1) A City of Wheeling Contractor's License is required for the successful bidder. Cost is $15.00 per year Beginning July 1st and will be prorated for less than one year if applicable.

2) A West Virginia Contractor's License is required at the time of bidding.

3) City of Wheeling contracting privilege tax is $2.00 per $100 of values (2%)

4) There is a City Service Fee of $2.00 per week for individuals who work within the City of Wheeling. Copies of the regulations, documents, forms, etc. can be obtained from the City Finance Department or accessed online at wheelingwv.gov. Look in departments, finance, city service fee.

5) Tax releases from both City and State must be received before the release of the final payment will be made.

6) A 5% bid guaranty is required, see Instructions to Bidders in the contract documents.

If you have any questions concerning this information related to this project, please contact the Engineering Department at (304) 234-3731.

PRICES TO INCLUDE

PART 1 - GENERAL

Any work shown on the plans or required in the specifications but not paid for separately as a bid item shall be included in the cost of other bid items. The amount bid for each Bid Item shall include 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 Reimbursement to Owner for costs of re-inspection or re-testing of any work not installed in compliance with the Contract Documents.

1.8 Erosion control measures, as required to prevent the erosion of soil resulting from the work outlined in the project documents.

1.9 Pavement removal required for the installation of new pipe and removal of existing pipe.

1.10 Flap gates installed as part of the storm sewer system.

1.11 Outside drops for sanitary manhole.

1.12 Abandonment of existing sewers, bulkheads, blind connects, and masonry collars required for the installation of the proposed sewer.

1.13 All provisions required for connection of the proposed sewer system to an existing structure, including grout, sealants, coring, fittings, patching and reshaping of the existing flow channel.

1.14 Any locations on the plans where it is indicated to expose an existing utility, the cost for potholing, exposing, and excavation.

1.15 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). See the Instructions to Bidders, Supplemental Conditions and Specific Project Requirements.

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»

ACKNOWLEDGMENT

«ContractCAPName»

_____

«ContractFirst» «ContractLast», «ContractTitle»

CONTRACT

FOR «TitleCaps»

THIS AGREEMENT, made and entered into at «OwnerCity», «OwnerState», this _____ day of _____, 20____, by and between the «OwnerMuni», «OwnerState» ("OWNER"), 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 his 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 or Performance and Payment Bond
6. Contract Provisions
7. General Conditions
8. Supplementary Conditions
9. Specifications
10. Specific Project Requirements
11. Contract Drawings, 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 shall proceed with the said work in a prompt and diligent manner and shall do the several parts thereof, at such times and in such order as the OWNER may direct. Further he 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 parties.

IN WITNESS WHEREOF: The parties 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 GENERAL LIABILITY INSURANCE POLICY AND AUTOMOTIVE INSURANCE POLICY

B) CERTIFICATE OF INSURANCE FOR OWNER'S AND CONTRACTOR'S PROTECTIVE POLICY

C) CERTIFICATE OF WORKER'S COMPENSATION

D) CONTRACT BOND OR PERFORMANCE AND PAYMENT BOND
(Made payable to the Owner)

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

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

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

PRODUCER	CONTACT NAME:	
SAMPLE CERTIFICATE OF INSURANCE	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A :	
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED

ABC Company
Main Street
Wheeling, WV 26003

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

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

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	X COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	$ 2000,000
	CLAIMS-MADE X OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 1,000,000
	X XCU Included						MED EXP (Any one person)	$ Excluded
	X Contractual Liability						PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 4,000,000
	POLICY X PRO-JECT LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
	OTHER:							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$ 2,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
	UMBRELLA LIAB OCCUR						EACH OCCURRENCE	$
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$
	DED RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N			Include WV Broad Form, Employers Liability Section 23-4-2 of WV Code			X PER STATUTE OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? N	N/A					E.L. EACH ACCIDENT	$ 1,000,000
	(Mandatory in NH)						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - POLICY LIMIT	$ 1,000,000

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

- Project Name
- City of Wheeling and CT Consultants, Inc. are Additional Insured with a Waiver of Subrogation and primary & non-contributor language on all policies except Workers Compensation.
- Workers Compensation includes a Waiver of Subrogation
- It is understood and agreed that any insurance carried by the named Additional insured(s) is excess and in no way contributory or quota share.

CERTIFICATE HOLDER

City of Wheeling
1500 Chapline Street
Wheeling, WV 26003

CANCELLATION

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

AUTHORIZED REPRESENTATIVE

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SUPPLEMENTAL BOND ACKNOWLEDGEMENT

PROJECT: Water Treatment Plant Solids Handling Bldg. Improvements

OWNER: City of Wheeling, WV

By signature of the attached Contract and these presents the undersigned contractor and his surety acknowledge that the attached Contract Bond or Performance and Payment Bond shall cover and warrant all work for the correction period per the General Conditions and as supplemented or amended elsewhere in these Contract Documents, which period is one (1) year commencing on the final acceptance of the work by Owner. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the project or part of the project is located and shall be instituted within one year from the last day of the correction period under the project or within one year after the Surety refuses or fails to perform its obligations under this Bond, whichever first occurs.

BIDDER		**SURETY**	
BIDDER:	_____	SURETY:	_____
SIGNATURE:	_____	SIGNATURE:	_____
NAME:	_____	NAME:	_____
TITLE:	_____	TITLE:	_____
DATE:	_____	DATE:	_____
PHONE NO.:	_____	PHONE NO.:	_____
			*Attach Power of Attorney

APPROVED SUBCONTRACTORS

PROJECT: «TitleCaps»

PRIME CONTRACTOR: «ContractCAPName»

1. Name: _____

   Address: _____

   City/State/Zip: _____

   Description of Work to be Performed: _____

   Phone: _____ Amount: _____ % of Contract: _____

   EIN# _____ Unique Entity ID# _____

2. Name: _____

   Address: _____

   City/State/Zip: _____

   Description of Work to be Performed: _____

   Phone: _____ Amount: _____ % of Contract: _____

   EIN# _____ Unique Entity ID# _____

3. Name: _____

   Address: _____

   City/State/Zip: _____

   Description of Work to be Performed: _____

   Phone: _____ Amount: _____ % of Contract: _____

   EIN# _____ Unique Entity ID# _____

4. Name: _____

   Address: _____

   City/State/Zip: _____

   Description of Work to be Performed: _____

   Phone: _____ Amount: _____ % of Contract: _____

   EIN# _____ Unique Entity ID# _____

«OwnerCaps»

_____

«OwnerCEOFirst» «OwnerCEOLast», «OwnerCEOTitle»

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»

REV. 04/23

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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NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by

CONSTRUCTION SPECIFICATIONS INSTITUTE

EJCDC C-700 Standard General Conditions of the Construction Contract
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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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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

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

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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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.

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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.

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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.

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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

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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:*

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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.

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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

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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:*

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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

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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

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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

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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

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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

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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

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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.

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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.

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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:

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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:

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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

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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

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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.

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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.

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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.

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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

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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

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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.

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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

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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

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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.

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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.

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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

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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:

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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,

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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.

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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.

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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.

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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

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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.

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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.

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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.

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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

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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

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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.

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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, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 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.

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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.

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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;

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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

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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.

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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.

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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

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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

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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

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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

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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

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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

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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.

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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:*

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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:

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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.

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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.

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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.

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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 2.02A 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 twentieth 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 ninety days after the date on which the bids are opened.

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

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." It is understood and agreed that any insurance carried by the Owner is excess and in no way contributory or quota share.

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 $2,000,000

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) with Employment Exclusion deleted. $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 have a 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 West Virginia;”

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 paragraphs:

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

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.

SC-6.02(C) Add the following Paragraph:

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-6.10(B) Add the following:

The Owner is exempt from West Virginia Sales Taxes and, by West Virginia Code §11-15-8d, can now extend this tax exemption to Contractors supplying goods on their behalf. The Contractor shall coordinate with the Owner the filing of any and all applications to the State of West Virginia, exempting the purchase of the specified Goods from West Virginia Sales Tax and hereby agrees to include the savings from such sales tax exemption in its total base bid. from State Sales and Use Taxes on materials and equipment to be incorporated in the Project.

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 West Virginia and Owner 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:

1. 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-9.03 Add the following new paragraphs immediately after Paragraph 9.03.A:

SC-9.03 (B)

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.
2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.

4. Liaison:

    a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

    b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

    c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.

5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. Shop Drawings and Samples:

    a. Record date of receipt of Samples and Contractor-approved Shop Drawings.

    b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

    c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.

7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

8. Review of Work and Rejection of Defective Work:

    a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.

    b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:

    a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

    b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

10. Records:

    a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

    b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

    c. Maintain records for use in preparing Project documentation.

11. Reports:

    a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

    b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

    c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

14. Completion:

    a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.

    b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.

    c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.

5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

8. Authorize Owner to occupy the Project in whole or in part.

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.

SC-14.02(A) (4) Add the following paragraph:

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 provide for 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 Ohio County Court of Common Pleas. Arbitration will be entered into only if agreed upon in writing by both parties.

SECTION 5
SPECIFICATIONS

SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 LOCATION OF THE PROJECT

A. The project is located at the City of Wheeling Water Treatment Plant (WTP), 1551 Richland Avenue, Wheeling, West Virginia 26003, in Ohio County.

1.3 RELATED DOCUMENTS

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

B. The Project Manual consists of one volume of Contract Documents, including the Legal Notice, Table of Contents, Instructions to Bidders, Bid Forms, Contract Forms, General Conditions, Supplementary Conditions, Specific Project Requirements, and technical specifications.

C. The Work includes furnishing all labor, materials, equipment, and incidentals necessary to complete the Work indicated on the Drawings and specified in the Contract Documents, whether expressly stated or reasonably implied, unless specifically indicated to be furnished or performed by others.

D. The Contractor shall review the Contract Documents in their entirety and coordinate the Work with all related and adjacent trades.

1.4 PROJECT DESCRIPTION

A. The City of Wheeling WTP - Solids Handling Improvements Project consists of replacing the existing belt filter presses with new multi-disk screw presses, a polymer feed system, thickened sludge feed pumps, and replacing the collection mechanisms and other auxiliary equipment for the existing gravity thickener units.

1.5 SCHEDULES AND SEQUENCE OF CONSTRUCTION

A. The Contractor shall prepare and submit a detailed construction schedule in accordance with the provisions set forth within the General Conditions. The schedule shall detail all phases of construction to completion with milestones and associated dates. The schedule shall be presented in a format acceptable to the Owner and Engineer.

B. The City of Wheeling WTP shall remain in continuous operation at all times, except during outages specifically approved by the Owner.

C. During the construction period, solids generated by the WTP operations will be discharged to the sanitary sewer system. The Contractor shall coordinate and sequence the Work to accommodate this operating condition and minimize the duration of solids discharge to the sanitary sewer system.

D. Plant Operations will drain the existing Gravity Thickeners, one unit at a time, before demolition activities begin.

E. The Contractor shall coordinate with Plant Operations and power wash each drained Gravity Thickener before the commencement of demolition. The Contractor shall plan and sequence the Work such that no more than one gravity thickener is removed from service at any time.

F. In preparing the construction schedule, the Contractor shall account for the following critical sequencing and coordination requirements:

1. Complete and submit Shop Drawings and other required submittals for Project components in a timely and properly sequenced manner. Avoid multiple last-minute submissions that could delay review or construction.
2. Complete mobilization to the Project site.
3. Sludge Handling Facility:
    a. Gravity Thickener Replacement: Remove only one gravity thickener from service at a time and maintain the other gravity thickener in operation.
    b. To minimize downtime of the WTP sludge dewatering system, maintain the existing dewatering train consisting of Gravity Thickener No. 1, Sludge Feed Pump No. 1, and Belt Filter Press No. 1 in continuous operation while demolishing and replacing the dewatering train consisting of Gravity Thickener No. 2, Sludge Feed Pump No. 2, and Belt Filter Press No. 2.
    c. Do not commence demolition of Belt Filter Press No. 2 until all sludge from Gravity Thickener No. 2 has been processed through the existing belt filter press system.
    d. Do not commence demolition of Belt Filter Press No. 1 until all sludge from Gravity Thickener No. 1 has been processed through the existing belt filter press system.
    e. Coordinate and sequence the Work so that replacement of the existing polymer feed system with the new polymer feed skid occurs concurrently with demolition of Belt Filter Press No. 1.

G. Before commencing the Work, submit a detailed written sequence of construction. Maintain proper WTP operation throughout construction. The following is a probable generalized sequence of construction and does not relieve the Contractor of responsibility for developing and coordinating the detailed sequence.

1. Process all sludge from Gravity Thickener No. 2, drain the tank, and power wash the tank.
2. Demolish the No. 2 dewatering train, including Gravity Thickener No. 2 sludge collection mechanism, Sludge Feed Pump No. 2 (disc flow pump), and Belt Filter Press No. 2.

3. Install the new sludge collection mechanism for Gravity Thickener No. 2 and the new Sludge Feed Pump No. 2.
4. Complete required modifications in the Sludge Dewatering Building, including closing the cake discharge chute opening for Belt Filter Press No. 2 and modifying sludge feed piping, polymer feed piping, water piping, and associated appurtenances.
5. Process all thickened sludge from the Gravity Thickener Tank No. 1, drain the tank, and power wash the tank.
6. Demolish the No. 1 dewatering train, including Gravity Thickener No. 1 sludge collection mechanism, Sludge Feed Pump No. 1, and Belt Filter Press No. 1.
7. Demolish the existing polymer feed system.
8. Install the new sludge dewatering equipment and polymer feed system.

H. The Contractor shall furnish all labor, supervision, materials, equipment, incidentals, taxes, permits, operations, and methods necessary to complete the Work described in the Contract Documents.

I. Do not commence an activity until the labor, materials, and equipment required to complete that activity are available and the activity can proceed without interruption or delay.

1.6 PROTECTION OF WORK AND IMPROVEMENTS

A. The Contractor shall protect Owner property, existing improvements, and Work installed by the Contractor or others from damage, dust, debris, and other objectionable materials resulting from construction activities.

B. Provide suitable covers, partitions, and other dust- and fume-containment devices appropriate for the construction operations.

C. Keep Owner property, existing improvements, and the Work, including structures, mains, fittings, and accessories, free from dirt and foreign matter.

D. Temporarily plug or cap existing and newly installed openings, holes, and pipe ends..

E. Repair or replace property, improvements, and Work damaged by the Contractor to the satisfaction of the Owner.

F. Cooperate with the Owner and utility companies to maintain services and facilities in operation. Repair damaged utilities to the satisfaction of the applicable utility owner.

1.7 CONTRACTOR USE OF SITE

A. The existing WTP is operational and shall remain in continuous operation. The Contractor shall not interfere with daily facility operations. Portions of the WTP may be shut down for piping connections, electrical work, and similar activities for a maximum of 8 hours

per shutdown and only with prior approval by the Owner. Submit requests for partial shutdowns to the Engineer at least 48 hours before the requested shutdown period.

B. Access to Site: Limited to areas noted on the Drawings.

C. Construction Operations: Limited to areas indicated on the Drawings.

D. Coordinate with Plant Operations in advance for Work proposed outside normal working hours.

END OF SECTION 011100

SECTION 011419 – USE OF SITE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section establishes requirements for the Contractor's use of the Site, maintenance of access, protection of existing facilities, temporary sanitary facilities, housekeeping, and restoration.

B. Related Sections

1. Section 011423 – Additional Work, Overtime: Restrictions on night, Sunday, and legal-holiday work.
2. Section 013119 - Project Meetings: Site logistics and access coordination.
3. Section 013233 - Photographic Documentation: Documentation of existing and complete conditions.
4. Section 013236 - Video Monitoring and Documentation: Preconstruction video record of the construction zone of influence.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 USE OF STREETS

A. Confine operations to areas designated for the Work and to limits permitted by laws, ordinances, permits, and the Contract Documents. Do not unreasonably encumber the Site with materials or equipment.

B. Coordinate access, staging, storage, temporary facilities, and interruptions with the Owner and Engineer at the preconstruction meeting and throughout the Work.

3.2 USE OF STREETS AND MAINTENANCE OF ACCESS

A. Maintain safe and unobstructed access for vehicular and pedestrian traffic on public streets, drives, and walks affected by the Work. Maintain free access to fire hydrants and water and gas valves.

B. Indemnify and hold harmless the Owner to the extent required by the Contract Documents for claims, costs, and expenses arising from the Contractor's operations on streets and walks.

C. If the Contractor fails to maintain required access or safety provisions, the Owner may perform the necessary work and deduct the cost from amounts due. The Owner's action does not relieve the Contractor of responsibility for public safety or protection of the Work.

D. Remove, at least daily, mud, debris, and materials tracked or deposited on existing streets, drives, parking areas, and walks by the Contractor, Subcontractors, or suppliers.

3.3 PROTECTION OF EXISTING FACILITIES

A. Protect existing buildings, roadways, parking areas, utilities, landscaping, fences, and other public or private property that may be affected by the Work.

B. Promptly repair or replace property damaged by construction operations. Perform such work at no additional cost to the Owner and to a condition at least equal to that existing before damage occurred.

C. Replace existing fences removed or disturbed for execution of the Work.

3.4 TEMPORARY SANITARY FACILITIES

A. Furnish, maintain, and remove sufficient portable toilet facilities at locations accepted by the Owner for use by the Contractor and Subcontractors.

3.5 RESTORATION

A. Restore disturbed areas as shown and specified. Where restoration requirements are not indicated, restore areas to a condition at least equal to that existing before the Work began.

END OF SECTION 011419

SECTION 011423 - ADDITIONAL WORK, OVERTIME

PART 1 - GENERAL

1.1 SUMMARY

A. This Section establishes restrictions and authorization requirements for work at night, on Sundays, and on legal holidays.

B. Related Section:

1. Section 011419 – Use of Site.

1.2 NIGHT, SUNDAY, AND HOLIDAY WORK

A. Do not perform Work at night, on Sundays, or on legal holidays unless the Work is indicated in the Contract Documents, is required because of an emergency, or is authorized in writing by the Engineer.

B. For nonemergency Work proposed during restricted periods, submit a written request to the Engineer at least 48 hours before the proposed start of the Work. State the reason, location, activities, personnel, equipment, and anticipated duration.

C. In an emergency, perform only the Work necessary to protect persons, property, and the Work. Notify the Owner and Engineer as soon as practicable and provide written documentation of the emergency and actions taken.

D. Work performed without required authorization, or when the Engineer is not present, is at the Contractor's risk and remains subject to inspection and rejection in accordance with the Contract Documents.

E. Authorization to work during a restricted period does not relieve the Contractor from compliance with applicable laws, ordinances, permits, noise restrictions, safety requirements, or other Contract requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011423

SECTION 013119 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section establishes requirements for the preconstruction meeting and periodic progress meetings.

B. Related Sections:

1. Section 011419 - Use of the Site.
2. Section 011423 - Additional Work, Overtime.
3. Section 013233 – Construction Photographs.
4. Section 013236 - Video Monitoring and Documentation.
5. Section 013323 - Shop Drawings, Product Data, and Samples

1.2 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 the following, as applicable, for review and coordination:

1. Proposed construction progress schedule.
2. Submittal schedule coordinated with Section 013323.
3. Quality-control plan and required design mixes.
4. Site logistics plan addressing access, staging, storage, temporary facilities, and protection of existing facilities.
5. Sequence for erosion- and sediment-control measures required by the Contract Documents.
6. Plan and schedule for completing preconstruction photographic and video documentation before disturbance of existing conditions.
7. Anticipated requests for night, Sunday, or legal-holiday Work.

D. Reviewing at the meeting does not constitute acceptance of submittals or relieve the Contractor from obtaining required reviews before beginning affected Work.

1.3 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 attend and shall provide an updated construction progress schedule showing actual progress, current activities, upcoming activities, critical-path impacts, and corrective actions for delays.

C. Be prepared to discuss submittals, requests for information, changes, coordination among trades, site access, safety coordination, quality-control matters, testing, startup activities, and other issues affecting progress of the Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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 the actual progress has been indicated, 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 where 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 the 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 precautions. The Contractor shall ensure the new construction aligns with any existing work.

END OF SECTION 013223

SECTION 013233 – CONSTRUCTION PHOTOGRAPHS

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 SUMMARY

A. Provide preconstruction, periodic progress, and Final Completion photographic documentation of the Work and existing conditions affected by construction.

B. Compile photographs in a PDF document with not more than four images per page. In addition, retain the original digital image files and provide them when requested by the Engineer.

1.3 SUBMITTALS

A. Submit photographic documentation electronically to the Engineer within seven days after photographs are taken.

B. Digital Images: Provide images in PDF format or as otherwise posted to the website as individual photographs, with a minimum sensor size of 4 megapixels.

C. Compile photographs in a PDF document with not more than four images per page. In addition, retain the original digital image files and provide them when requested by the Engineer.

D. Identify each page or image with the following:
   a. Owner's Name
   b. Contract Description
   c. Contractor Name
   d. Description of view, indicating location, direction (by compass point), and elevation or story of construction
   e. Date photograph was taken

1.4 QUALITY REQUIREMENTS

A. Provide clear, properly exposed color digital images with a minimum resolution of 4 megapixels.

B. Do not materially alter images. Rotation, cropping, and adjustments needed for legibility are permitted, provided they do not misrepresent documented conditions.

PART 2 - PRODUCTS

2.1 DIGITAL MEDIA

A. PDF compilation and original digital image files compatible with commonly available software.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION PHOTOGRAPHS

A. Before mobilization or disturbance of existing conditions, photograph the construction zone of influence, access routes, staging areas, adjacent property, pavements, landscaping, structures, and other features that may be affected by the Work.

B. Coordinate locations and coverage with the preconstruction video required by Section 013236.

3.2 PROGRESS PHOTOGRAPHS

A. Take progress photographs weekly while Work is in progress and at additional times and locations directed by the Engineer.

B. Photograph concealed Work before it is covered and significant changes in Site conditions when they occur.

3.3 FINAL COMPLETION PHOTOGRAPHS

A. After completion of the Work and removal of temporary facilities, photograph completed Work and restored areas from viewpoints comparable to preconstruction photographs, where practicable.

3.4 PROJECT SITE RECORDS

A. Maintain an organized electronic set of submitted photographs at the field office and make it available to the Owner and Engineer throughout construction.

END OF SECTION 013233

SECTION 013236 – VIDEO MONITORING AND DOCUMENTATION

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 SUMMARY

A. Provide a complete color audio-video record of existing surface features within the proposed construction zone of influence. The record is intended to document preconstruction conditions.

B. Provide labor, materials, equipment, recording media, logs, indexes, and services necessary for a complete record

1.3 QUALIFICATIONS

A. Retain a commercial firm experienced and regularly engaged in preconstruction audio-video documentation. Submit information requested by the Owner to demonstrate the firm's ability to perform the Work in accordance with the Contract Documents.

1.4 SUBMITTALS

A. Submit the complete audio-video record on a high-quality USB flash drive before construction activities disturb existing conditions within the documented area.

B. Include a video log and index identifying recording date, general location, direction of travel or view, and sequence of recorded areas.

PART 2 - PRODUCTS

2.1 RECORDING MEDIA

A. Provide digital audio-video files on a high-quality USB flash drive in a format compatible with commonly available media-player software.

PART 3 - EXECUTION

3.1 RECORDING

A. Record the construction zone of influence, including access routes, pavements, curbs, walks, landscaping, drainage features, utilities visible at the surface, structures, and adjacent property that may be affected by the Work.

B. Provide continuous, clear, properly exposed coverage sufficient to establish the location and preconstruction condition of recorded features. Avoid rapid camera movement and excessive changes in viewing direction.

C. Provide audible narration identifying the date, location, direction of view, and significant features or existing damage being documented.

D. Coordinate video coverage with the preconstruction photographs required by Section 013233. Complete both records before disturbance of existing conditions.

END OF SECTION 013236

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's review of the 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 may review submitted data in detail, such review is an effort to discover errors and omissions in the Contractor's drawings. The Engineer's review shall in no way relieve the Contractor of his obligation to properly coordinate the work and to engineer the details of the work in such manner that the purposes and intent of the contract will be achieved. Such review by the Engineer 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 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.

F. It is the responsibility of each Prime Contractor to furnish all other Prime Contractors, and especially the General Construction Contractor, with 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 the same have been reviewed by the Engineer.

H. Accepted and reviewed Shop Drawings shall not be construed as approval of changes from Contract plan and specification requirements.

I. The Engineer 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 the 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 Number
4. Name and Address of Engineer
5. Name and Address of Contractor
6. Name and Address of Subcontractor
7. Name and Address of Supplier
8. Name of Manufacturer
9. Specification Section number and title.
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’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 electronic format for review. Upon approval by the Engineer, the Contractor shall provide the final approved Shop Drawings in electronic format only; no hard copies are required.

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 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. SAMPLES: For products which require the 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. The Engineer will review with reasonable promptness all properly submitted Shop Drawings. Such reviews 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 the entire system as a package.

C. Engineer review shall not be construed as approval of deviations from the Contract Documents unless such deviations are specifically identified in writing and expressly accepted.

D. All Shop Drawings submitted for review shall be stamped with the Engineer's action and associated comments.

E. Except for submittals for record, information, or similar purposes, where action and return are required or requested, the Engineer 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 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. Reviewed – No Exceptions Taken: Submittal is in general compliance; no resubmittal required.
2. Reviewed – Approved as Noted: Minor comments noted; resubmittal not required.
3. Revise and Resubmit: Submittal is incomplete or inadequate; resubmittal required.
4. Rejected: Submittal does not comply with Contract Documents; new submission required.

F. Submittals requiring a Change Order will not 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 the 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 the 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 effect 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 the included CHANGE ORDER.
_____Not accepted as submitted. See Remarks.
_____Acceptance requires completion of the 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 the 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 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, the effective date, the Contractor’s name, 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 remain in effect for a period of one (1) year commencing on the date of Substantial Completion of the Work and acceptance by the Owner. If a longer warranty period is specified in an individual Section of Divisions 1 through 46 of the Project Manual, the longer period shall govern.

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 shall be executed and placed into effect as the FINAL Warranty. Unless otherwise specified in an individual equipment Section, the Warranty period shall commence upon Final Completion of Work or the Owner's written acceptance of the applicable equipment or system for continuous operation, whichever occurs later.

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 representative 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 items 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 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 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 that 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 that 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 the 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. A 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 the 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 014223 - INDUSTRY STANDARDS

PART 1 - GENERAL

1.1 ABBREVIATIONS

A. Abbreviations, as used, designate the following:

ACI	-	American Concrete Institute
AIEE	-	American Institute of Electrical Engineers
AISC	-	American Institute of Steel Construction
ANSI	-	American National Standards Institute
ASTM	-	American Society for Testing and Materials
AWWA	-	American Water Works Association
CMS	-	Construction and Material Specifications
NEMA	-	National Electrical Manufacturers Association
W. Va Code	-	West Virginia Code Chapters
UL	-	Underwriters Laboratories, Inc.

1.2 REFERENCE TO OTHER SPECIFICATIONS

A. Where reference is made to specifications such as ASTM, AWWA, or ANSI, the latest edition shall be used, unless otherwise noted on the plans or in 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 014523 – TESTING, ADJUSTING, AND BALANCING

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 general requirements for the conduct of testing, adjusting, and balancing.

B. 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 013323 – Shop Drawings, Product Data, and Samples

B. Section 017517 – Starting of Systems / Commissioning

1.4 DEFINITIONS

A. Factory Testing:

1. 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

B. Field Testing:

1. Field Testing is the overall on-site testing phase performed after installation and startup. It includes all testing activities conducted in the field and must be witnessed by the Owner. Field Testing includes, but is not limited to:
   a. Dry Testing
   b. Wet Testing
   c. Performance Testing
   d. Operational Demonstration
2. Conform to the specific test requirements as given in individual sections of the Project Manual.
3. Provide all necessary assistance to Owner personnel, at no additional cost to the Owner.

C. Dry Testing:

1. Dry Testing is performed by the Contractor and Manufacturer Representative without introducing process sludge, water, or any test material into the system. Dry Testing verifies alignment, lubrication, rotation, electrical continuity, control logic, interlocks, alarms, and proper operation of all motors, drives, valves, sensors, and instrumentation.

D. Wet Testing:

1. Wet Testing is performed by the Contractor and Manufacturer Representative using clean water or other approved test material to verify mechanical and electrical operability under flow conditions. Wet Testing confirms leak-tightness, pump operation, polymer system operation (including mineral oil testing where applicable), valve function, flow distribution, and proper operation of all piping and appurtenances.

E. Performance Testing:

1. Performance Testing is performed jointly by the Manufacturer Representative and Contractor under actual operating conditions using process sludge. Performance Testing demonstrates that the complete dewatering system meets all performance requirements specified in the Contract Documents.

F. Operational Demonstration: A commissioning activity conducted by the Contractor following achievement of stable operation. The Contractor shall operate, maintain, and demonstrate the complete system for a period of (thirty) 30 days of continuous operation.

G. During the Operational Demonstration period, Owner personnel may operate and maintain the system, or individual components, systems, or unit processes, under normal operating conditions for training or familiarization purposes. The Contractor shall retain responsibility for the performance of the Work and shall provide continuous on-site supervision, qualified personnel, labor, materials, equipment, and technical support necessary to ensure successful completion of the Operational Demonstration. The Owner's participation in operation of the system shall not relieve the Contractor of any obligations under the Contract Documents.

1.5 SUBMITTALS

A. Quality Control Submittals:

1. 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 013323 – Shop Drawings, Product Data, and Submittals

B. Project Record Documents:

1. The Contractor must record all testing, adjusting, and balancing data and follow the exact documentation requirements given in the Specifications.

1.6 REGULATORY REQUIREMENTS

A. The requirements of this Section are in addition to all applicable Regulatory Agency specifications. Unless another Specification Section explicitly changes or prohibits a requirement in this Section, the Contractor shall fully comply with all requirements stated herein.

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 the 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 before 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 before each test. See Section 017517, Starting of Systems/Commissioning.

3.3 TESTING, ADJUSTING, AND BALANCING

A. 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 a 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 failure, delay, 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 before the re-testing of the equipment.

B. Dry Testing:

1. All equipment and systems shall be tested, adjusted, aligned, lubricated, and balanced in accordance with the manufacturer's instructions before witness testing.

2. Test individual components before testing the system of which they are a part.

C. Wet Testing:

1. Test all equipment and systems with test material, such as potable water. 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 back-charged 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 restart the test in its entirety.

4. The Contractor will dispose of the test material at 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.

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 013323 – Shop Drawings, Product Data and Submittals.

B. Tests 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 014523

SECTION 015100 - TEMPORARY POWER SERVICE

PART 1 - GENERAL

1.1 ELECTRICAL POWER

A. The Contractor shall furnish at his own expense all electrical power which may be required for the project. All temporary lines shall be furnished and installed by the Contractor at his own expense in a manner which meets the approval of the Engineer, and shall be removed by the Contractor at the completion of the construction.

END OF SECTION 015100

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 RESIDENT ENGINEER'S OFFICE

A. The General Construction Contractor shall be required to provide and maintain the herein described Resident Engineer's office, services, and office equipment until completion of the contract, including the punch list. All equipment shall be provided with a maintenance contract that provides prompt service. At any time a service or equipment is non-operative, the Resident Engineer may utilize a commercial service or rental equipment at the Contractor's expense until the service or equipment is restored.

B. The Electrical Contractor shall provide and install temporary power, internet access, and telephone lines for the Engineer's office.

C. Office Equipment

1. One (1) Desk with Desk Chair
2. One (1) Plan Tables
3. One (1) Conference Table (Approximately 3' x 6')
4. Eight (8) Chairs for Conference Table
5. Two (2) Four-Drawer Letter Size Lockable Filing Cabinets
6. One (1) Bookcase (36" x 30" x 10" each)
7. One (1) Two-Drawer Letter Size Lockable Filing Cabinet
8. A printer, copier, and scanner are required. Hardware, services, and maintenance of a printer, scanner, and copier with a collator and automatic feeder in the Resident Engineer's office. The copier shall be a plain paper copier, capable of making 8-1/2 by 11 inches and 11x17 inches size for size copies. Also included shall be an allowance for copy materials (including paper supply) in the amount of 2,000 copies per month.

1.3 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 016600 - PRODUCT HANDLING 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 DELIVERY AND STORAGE OF MATERIALS

A. The Contractor shall be responsible for the delivery and storage of all materials.

B. The Contractor shall coordinate with the Owner 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 Owner.

D. The Contractor shall conform to the manufacturer-specific requirements for receiving inspection, indoor or outdoor storage, temperature, humidity, energization of heaters, shaft rotation, lubrication, and storage records.

E. The Contractor shall document and promptly submit to the Owner all damage, defects, shortages, or discrepancies identified upon delivery of materials or equipment. Documentation shall include photographs, shipping records, and a description of the observed condition.

F. All stockpiles shall be neat, compact, completely safe, and barricaded with warning lights if necessary.

G. 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.

H. 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 nighttime to warn the traffic of such obstruction.

I. 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 at work. Stored materials shall be located 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 the written permission of the property owner or lessee, and copies of such written permission shall be furnished to the Engineer.

All storage sites shall be restored to their original condition by the Contractor at his expense.

END OF SECTION 016600

SECTION 016617 - 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 before 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 periodically 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, 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 the 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 016617

SECTION 017517 - 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, is 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 013323, Shop Drawings, Product Data and Samples

B. Section 016617, Maintenance

C. Section 017901, Operational Demonstration

D. Section 017902, Instruction of Owner’s Personnel

E. Section 432110 – Progressive Cavity Pumps

F. Section 463333 – Polymer System

G. Section 467331 – Dewatering Equipment

1.4 DEFINITIONS

A. Commissioning: Commissioning is a series of activities or processes 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 the 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 online. 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 the source and formulas, with all terms defined.
    b. Calculations for all submitted data are 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 c 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 before each start-up and verify their readiness for start-up. Conditions hazardous to equipment or personnel shall be corrected by the Contractor before 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 shall be 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 013323, 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 that 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, adjustments 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. Before 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 017902, Instruction of 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 that 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 that 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 017901, Operational Demonstration, and at other times when the system is online 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. Adjustments and corrections shall be in accordance with Section 016617, 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 017901, Operational Demonstration, and at other times, the work will be online 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 013323, Shop Drawings, Product Data, and Samples within three (3) days of the visit.

END OF SECTION 017517

SECTION 017800 - FINAL COMPLIANCE AND SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The following forms and related sign-offs shall be documented in accordance with the provisions of the contract. These forms shall be completed by the Contractor and approved by the Owner before the final retainer is approved for release. Forms for Items A to E will be attached to the Contractor's executed copy of the contract.

B. Certificate of Substantial Completion (To be submitted at the time of Substantial Completion).

C. Contractor's Certification of Completion.

D. Contractor's Affidavit of Prevailing Wage.

E. Consent of Surety Company for Final Payment.

F. Affidavit of Final Acceptance Date and Correction Period.

G. Before the OWNER approves and accepts the work and releases the retainer, the Contractor shall provide to 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, the name of the claimant, date filed with Contractor, name of insurance company and/or adjuster handling claim, how the claim was resolved, and if the claim was not resolved for the full amount, a statement indicating the reason for such action.

H. DBE Subcontractor Participation Forms SR-EPA.7-8 (Applicable for WPCLF & WSRLA funded projects only).

I. CDBG Subcontractor List 017800 (Applicable for CDBG-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 clean the road, driveway, and/or sidewalk on which construction activity under this contract has resulted in dirt or any other foreign material being deposited with an automatic self-contained mechanical sweeper with integral water spray, vacuum, and on-board or supplementary containment.

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 to 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 putty marks, paint, etc.

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 after the contract.

END OF SECTION 017821

SECTION 017823 – MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements for preparation, review, approval, and delivery of Operation and Maintenance (O&M) Manuals for equipment furnished under the Contract.

B. Submittal of O&M Manuals shall be divided into a two-stage process:

1. Preliminary O&M Manuals shall be submitted by the Manufacturer and approved by the Engineer, prior to equipment shipment. These manuals are not final, as they do not reflect as-installed conditions. These manuals are to support proper storage, handling, installation planning, and coordination with the separately bid Installation Contract.

2. Final O&M Manuals: Complied and submitted by the Contractor after equipment installation, startup, and commissioning are complete.

1.2 DEFINITIONS

A. Preliminary O&M Manual: The initial operation and maintenance documentation prepared by the equipment Supplier and submitted for the Engineer's review and approval prior to authorization of equipment shipment.

1. Preliminary O&M Manuals shall contain the manufacturer's standard operating instructions for the equipment handling and protection during short- and long-term storage and maintenance requirements, lubrication requirements, factory test performance and nameplate data, installation details and requirements, diagrams and illustrations, recommended spare parts lists, and all other essential data available before field installation.

2. Preliminary O&M Manuals are understood to exclude certain site-specific details (such as built configurations, field-verified settings, commissioning records, and field test results) that are not yet available at the time of equipment fabrication and shipment.

3. Preliminary O&M Manuals shall reflect factory-standard information only and shall not include site wiring diagrams, final control settings, or as-built conditions, which are the responsibility of the Installation Contractor.

B. Final O&M Manual: Complete, consolidated documentation reflecting actual installation, tested, started up, and commissioned, prepared by the Installation Contractor.

1. Final O&M Manuals incorporate the approved Preliminary O&M Manual content (updated as necessary) together with all project-specific data, including as-built drawings, final control settings and relay settings, startup and performance test results, field wiring diagrams, warranty certificates, and other information obtained during installation and commissioning.

2. Submit Final O&M Manuals electronically not later than 60 calendar days after successful completion of commissioning.

3. It will be the responsibility of the Installation Contractor to furnish the Final O&M Manuals, which shall include, at a minimum, site-specific details, as-built configurations, including the field-verified settings, performance test reports, commissioning records, and field test results.

4. This manual shall 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.

5. Final O&M Manuals shall incorporate and update Preliminary O&M Manual content and include:
   a. As-built drawings
   b. Final wiring and piping diagrams
   c. Actual control, relay, and calibration settings
   d. Startup and performance test reports
   e. Warranty documentation
   f. Maintenance procedures applicable to in-service operation.
   g. Documentation of storage duration, conditions, inspections, and servicing activities prior to installation.

6. Acceptance of Final O&M Manuals is a condition precedent to Final Completion and final payment

7. In the event of conflict between the Preliminary O&M Manual and site-specific information developed during installation, the Final O&M Manual shall govern.

1.3 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 shall either contain or refer 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 it 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.

D. Submit Preliminary O&M Manuals electronically for Engineer review not less than 30 calendar days prior to the scheduled shipment date.

E. In general, and where applicable, the information shall consist of, but not be limited to, the following:

   1. Equipment Handling and Storage Requirements.

2. Maintenance requirements for the equipment during the short- and long-term storage.
3. Descriptive literature, bulletins, or other data covering equipment or system.
4. Complete list of equipment and appurtenances included with the system, complete with manufacturer and model number.
5. Functional description of each principal component of the system.
6. Installation instructions.
7. General arrangement, and assembly drawings.
8. Utility requirements.
9. Materials of construction.
10. Factory performance test data.
11. Certified performance curve.
12. Performance guarantee.
13. Recommended spare parts list with part and catalog number
14. Lubrication recommendations and instructions.
15. Procedure for starting, proper adjustment, and test procedures.
16. Shutdown instructions.
17. Emergency operating instructions and emergency shutdown instructions.
18. Schematic wiring diagrams.
19. Schematic piping diagrams.
20. Instrumentation data.
21. Drive dimensions and data.
22. Control data.
23. Operating instructions.
24. Maintenance instructions, including troubleshooting guidelines and preventative maintenance instructions with a task schedule.
25. Required tools and equipment for operation and maintenance.
26. Safety considerations for O&M procedures.
27. Programmable Logic Controllers furnished under the contract. Submit a complete programmable logic controller listing of all input/output address assignments, tag assignments, and pre-set constant values, with functional point descriptions.
28. Copy of Warranty bond and service contract as applicable.

1.4 FORMAT OF ELECTRONIC COPIES

A. Electronic Copies of Operation and Maintenance Manuals:

1. Each electronic copy shall include all information included in the corresponding printed copy.
2. Submit each electronic copy on a separate portable USB "thumb drive", unless another electronic data transfer method or format is acceptable to ENGINEER.
3. File Format:
    a. Files shall be in "portable document format" (PDF). Files shall be electronically searchable.
    b. Submit a separate file for each document in the printed copy.
    c. Within each file, provide bookmarks for the following:
        1) Each chapter and subsection is listed in the corresponding printed copy document's table of contents.
        2) Each figure.
        3) Each table.
        4) Each appendix.

B. Copies of Programming and Configuration Files:

1. Furnish a portable USB "thumb drive" copy of all software programming, such as programmable logic controller programs, prepared specifically for the Project. Third-party, licensed, commercially available software is excluded from the requirements of this Article; submit copies of commercially-available, licensed, third-party software, where required, in accordance with the Contract Documents.
2. Submit portable USB "thumb drive" copies of system configuration prepared specifically for the Project, such as plant monitoring system and SCADA display configurations.
3. Submit programming and configuration files concurrently with electronic copies of operation and maintenance data.

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.

END OF SECTION 017839

SECTION 017901 – 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 17517, Starting of Systems - Commissioning

1.4 DEFINITIONS

A. Operational Demonstration is defined in Section 17517, 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:

B. Test Reports:

1. Operational Demonstration log per subparagraph 3.4.A of this Section.

2. 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. Adequate parts and supplies for routine maintenance and replacement are on hand to support system operation through the demonstration period.
3. Start-up of equipment and systems per Section 110801, Starting of Systems/Commissioning, has been completed.
4. All Repair Parts and Maintenance Materials have been delivered to the Owner.
5. Certain instructions for Operating Personnel (training) have been scheduled to take place during the Operational Demonstration, where specified. All other training will occur within 45 days before initiation of the Operational Demonstration. The training of the 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 completed before the end of the Operational Demonstration.
    a. 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 110801, 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 online, conform to the requirements of Section 017517, Starting of Systems/Commissioning, and 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 017517, Starting of Systems - Commissioning.

H. The Owner remains in control of the plant processes per Section 017517, Starting of Systems - Commissioning. The Contractor shall provide technical direction in the operation of equipment and systems.

I. 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 have accepted the Certificate of Substantial Completion.

J. All required maintenance and servicing before 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.

K. 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.

L. The Contractor shall attend operational coordination meetings as called by the Owner to review operating conditions of equipment and systems.

M. 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 notify the Contractor in writing. If, during the Operational Demonstration, the provisions of the General Conditions are invoked to stop the work, the Operational Demonstration will also be considered to have failed.

N. Upon failure of the Operational Demonstration, the Contractor shall promptly remedy any defects in the work and shall promptly reschedule and restart 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.

O. During the Operational Demonstration, the Owner may require or permit the Operational Demonstration to be suspended:

1. As provided in the General Conditions.

P. 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.

1. If the Operational Demonstration is suspended for any reason except failure, Operational Demonstration time shall accrue to the work from the beginning of the Operational Demonstration to the time of the suspension.

3.4 REPORTING

A. Daily: A 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 on 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 017901

SECTION 017902 – INSTRUCTION OF OWNER'S PERSONNEL

PART 1 - GENERAL

1.1 DESCRIPTION

A. General requirements for the conduct of training of permanent plant operating personnel on the care, maintenance, and proper operation of the equipment. Specific requirements for training materials and for training are included in the individual Sections of the Contract Documents.

1.2 SUMMARY

A. Work Included: Except as otherwise specifically provided in individual Sections of the Project Manual, work under this Section includes the preparation of the detailed lesson plans and the conduct of detailed training for permanent plant operating personnel. Training shall be conducted on all components of equipment, as specified in individual Sections of the Project Manual.

B. Training sessions and hours for all equipment specified as requiring training shall be per the manufacturer's recommendations. However, in no case shall the number of sessions be less than two (2) to accommodate multiple shifts. Sessions shall cover maintenance, operations, and electrical.

1.3 RELATED SECTIONS

A. Section 013323 – Shop Drawings, Product Data, and Submittals

B. Section 017901 – Operational Demonstration

1.4 DEFINITIONS

A. Lesson Plan: A Lesson Plan is a submittal containing a statement of the instructional objectives of the training, a training outline, credentials of the instructor, audio/visual requirements, a listing of training materials to be used, and the desired schedule times and dates.

B. Training Aid: A mock-up, model, sample, or other device used during a training class to help demonstrate the maintenance, operation, or control of equipment.

1.5 SUBMITTALS

A. Submittal of Instructor's credentials, Lesson Plans, instructional materials, training aids, and other training information shall be coordinated with the Training Schedule.

B. Enough copies of instructional materials used for training for everyone present shall be provided at the time of the first training session.

C. Provide two copies of all audio/visual aids utilized during training, including films, slides, mock-ups, videotapes, DVDs, or other training aids. All multimedia videos shall be submitted in either Audio Video Interleave (AVI) format or Moving Pictures Expert Group (MPEG) format.

D. Submit the following:

1. Proposed training Schedule for the entire Contract showing tentative dates for each training session, including number, type, and duration of each session. This schedule shall be submitted 120 days before the commencement of any individual training being performed.

2. The detailed credentials of the representative of the equipment manufacturer who is to be the course Instructor for each category and type of training. Include the instructor's name, education, knowledge of equipment, experience as a trainer, and employment history with the manufacturer. Include specific details of the Instructor's experience pertaining to the operation and maintenance of, the training for, the equipment or system specified. These credentials shall be submitted 60 days before the commencement of any training.

3. The Lesson Plan shall be submitted sixty (60) days before the commencement of any training and shall cover all components of equipment, regardless of source of supply or manufacturer, and shall include:
    a. A title page containing: Title of the Lesson Plan, product name and model of equipment; name of manufacturer, manufacturer address and phone number; name and phone number of manufacturer's contact; job location (Name of Facility); contract no.; specification number; Contractor name, address and phone number; subcontractor name, address, phone (if applicable); submittal number assigned by Contractor; and submittal date.
    b. A table of contents listing the headings: instructional objectives; training outline; credentials of Instructor(s); audio/visual requirements; training materials to be used.
    c. The credentials of Instructors are to include name, education, knowledge of equipment, experience of trainer, and employment history with the manufacturer.
    d. The audio/visual requirements listing specific equipment that is to be provided by the Contractor for training purposes.
    e. A list of all training materials to be used. An initial Operations and Maintenance (O&M) Instruction Manual, which has received an acceptable disposition, for the equipment that should be required to be utilized by the Instructor in the training and therefore shall be included on this list.
    f. A request for scheduled dates and times for each training session.
    g. A training outline indicating the category of training (maintenance and operation, electrical and instrumentation, or system); description of the session; length, and type (classroom or field). The training shall include, as a minimum:
        1) Operation and Maintenance Training, Operation of Equipment:
            a) Describe operating principles and practices.
            b) Describe routine operating, start-up, and shutdown procedures.
            c) Describe abnormal or emergency start-up, operating, and shutdown procedures that may apply.
            d) Describe alarm conditions and responses to alarms.

e) Describe routine monitoring and record-keeping procedures.
f) Describe recommended housekeeping procedures.

2) Operation and Maintenance Training, Troubleshooting:
a) Describe how to determine if either corrective maintenance or an operating parameter adjustment is required.

4. Sample Evaluation Form: Submit with the Lesson Plan a sample Evaluation Form. Form shall include an area for comments and evaluation of the instructor, classroom training, and field instruction. The form shall identify Contractor's name and number, Specification Section, Job location, date and time of training, title of training session, name of manufacturer, model number of equipment, Instructor name, and Contractor and Subcontractor's name.

PART 2 – PRODUCTS

2.1 QUALIFICATIONS OF INSTRUCTOR

A. The course Instructor shall be knowledgeable and experienced in the details of operation and maintenance of the equipment.

B. The Instructor must be knowledgeable of the equipment's application specific to this work.

C. The Owner will reject Instructors who are deemed not in compliance with the above-stated minimum qualifications. The Contractor will submit for approval alternate Instructors for consideration. No additional cost will be allowed for the replacement of Instructors who are unacceptable to the Owner.

PART 3 – EXECUTION

3.1 EXAMINATION AND VERIFICATION OF CONDITION

A. The training site for the classroom instruction will be provided by the Owner. The Owner will provide this location.

B. The Contractor shall coordinate and verify to ensure that, before the scheduled training time(s):

1. The equipment is ready for Operational Demonstration in accordance with Section 017901, Operational Demonstration.

2. All associated construction required to operate the equipment in all normal and anticipated operating modes is complete.

3. That the equipment area is well lit and unobstructed, so that all training class attendees may access, hear, and view the training.

4. That the equipment area is free of construction activities that could present a hazard to training class participants.

5. That adequate training materials, as required by paragraph 1.5 of this Section, are on

hand for use during the training session.

6. Any representatives of interfacing Contractors or equipment suppliers needed to perform supporting operations, allowing demonstration of equipment operation, have been notified and will be available.

3.2 PREPARATION

A. Training classes shall be approved by the state-regulating agency for continuing education. This is in the event of the facility choosing to apply for CH/CEU credits for their training program.

B. Videotaping of all training will be conducted by the Contractor. Before the start of training, the Contractor and the Owner will review the training site(s) to establish acceptable sight lines, lighting, and locations for the participants.

C. Training classes shall be scheduled through the Owner. Training shall begin within 45 days of the beginning of the Operational Demonstration period. Certain training sessions will occur only during the Operational Demonstration period as specifically noted in the Contract Documents.

D. Training classes shall be conducted and separated for the following personnel:

1. Maintenance and Operation
2. Electrical and Instrumentation
3. Systems Training

E. Audio-visual equipment available at the Owner's training sites includes:

1. Blackboards and/ or Whiteboards

F. Verify training materials are compatible with all equipment. The Contractor is responsible for providing other audio/visual equipment and training aids as needed.

G. Classroom and field instruction, where specified, shall be provided for each group. Field instruction will include attention to applied familiarization with the actual equipment. Training hours as required in the Contract Documents do not include travel, set-up, or cleanup time by the Instructor.

H. Training may be either "field" or "classroom" as specified. If not specifically noted, provide field training. For field training, the Instructor shall demonstrate all operations of the equipment and may be expected to show assembly and disassembly procedures, maintenance procedures, replacement procedures, and the like. Field training will generally occur at the installed location of the equipment or material unless mock-ups are approved in the Lesson Plan and provided by the Contractor. Such mock-ups will become the property of the Owner after the training sessions unless previously requested in the Lesson Plan.

I. Systems Training: The Lesson will provide a detailed description of the system design, intended operation, and interactions of system components. The Contractor’s portion of

Systems Training will provide additional detailed descriptions of the system's components and their interface with each other and other systems. Contractor's personnel for system training will be the same personnel who provided Operation and Maintenance training and Electrical and Instrumentation training.

J. Training shall be conducted to accommodate the Owner’s shift schedules. Contractor shall coordinate with Owner before scheduling the training sessions. Contractors shall anticipate multiple shifts.

3.3 CONDUCT OF TRAINING

A. All topics of the approved Lesson Plan shall be discussed, in the classroom or the field, in complete and sufficient detail to allow plant operating personnel to knowledgeably operate and maintain the equipment in accordance with the manufacturer's recommended procedures and safety considerations during all anticipated operational and maintenance situations.

B. Safety concerns and features intended to enhance safety should be specifically addressed.

C. Tasks required to maintain the warranty should be specifically addressed.

D. Frequent reference shall be made to the Operation and Maintenance instructions.

E. Address all questions and comments proposed by the training session participants as they are raised to the maximum extent practicable. If questions or comments cannot be addressed during the training session, additional materials and/or training may be required as determined by the Contractor.

F. If any training session exceeds three (3) hours in duration, provide a 1/2- hour break.

G. Ensure that all parts of the training session are legible or audible on the final tape. The Instructor must repeat all questions to ensure that they are audible. Final acceptance of the training is contingent on the acceptability of the videotape.

H. The Contractor will be back-charged for cancelled training classes if the Owner is not notified at least 72 hours before the scheduled training.

I. Training Sessions shall be attended not only by the Owner's Operating Personnel but also by members of the Contractor or any other entities designated by the Owner.

3.4 EVALUATION

A. Immediately following training, the Instructor shall pass out an evaluation form to the Owner’s personnel. This form shall provide a means for the Owner's personnel to comment on the Instructor and the quality, completeness, and value of the session.

B. Evaluation Forms shall be collected, along with the Attendance Sheet, at the end of each training session, and the original documents shall be submitted to the Owner for use in determining if additional training is required by the Contractor. If additional training is required due to the material as outlined in the Lesson Plan not being covered correctly or

in its entirety or the inability of the Instructor to answer questions pertaining to the operation and maintenance of the equipment, or if the training aids or equipment fail to operate as intended, the Contractor shall provide such additional training at no additional cost to the Owner.

END OF SECTION 017902

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. Equipment
2. 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. Gravity Thickener
4. Polymer Feed Equipment
5. Multi-Disc Screw Press
6. Instrumentation & Control, SCADA
7. 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 024100 - DEMOLITION

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. It is the intent of this Section that the Contractor shall furnish all labor, materials, equipment, tools and incidentals necessary to demolish and remove existing process equipment, including but not limited to the existing Belt Filter Presses (BFPs), sludge feed pumps, and polymer feed system; selective demolition of the Gravity Thickeners sludge collection mechanisms and a mixer; removal of the degritter; and removal of miscellaneous appurtenances as indicated on the Contract Drawings, specified herein, or as directed by the Owner or Engineer.

B. Work shall include, but is not limited to, disconnection, dismantling, removal, handling, and transportation of designated equipment and demolition debris off-site for proper disposal.

C. Temporary dismount window for moving the new sludge dewatering equipment into the building

1.3 JOB CONDITION

A. The Contractor shall exercise all necessary precautions to protect the structure and adjacent process equipment from falling debris, material, and sections during the demolition process.

1.4 SUBMITTALS

A. The Contractor shall submit to the Engineer before the start of any proposed demolition a written description of the method proposed to dismantle and remove the existing BFPs, degritter, polymer feed system, sludge feed pumps, gravity thickening sludge collector mechanisms, and auxiliary equipment.

1.5 SCHEDULE

A. Demolition shall be scheduled and performed in strict conformance with these specifications and in a manner that will ensure no interruption of Water Treatment Plant operation beyond that provided for and approved by the Owner. The date and time of commencing the demolition work shall be submitted to the Owner for review, and no

demolition work shall commence until the Owner's approval of the date and time for the specific operation is in the hands of the Contractor.

B. The Contractor shall submit the proposed date and time for commencing demolition activities to the Owner for review. Demolition Work shall not begin until the Contractor has received written approval from the Owner for the scheduled date and time of the specific operation.

C. Water Treatment Plant Operations will drain the existing Gravity Thickeners (one unit at a time) in advance of demolition activities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION & REMOVAL

A. Owner retains the right of first refusal for all salvaged equipment, at which point Contractor may elect to retain as property of the Contractor.

B. The Contractor shall be responsible for the demolition, removal, and transportation of designated materials and equipment from the site, all to the satisfaction of the Owner and Engineer, including but not limited to the following:

1. Existing Belt Filter Press: Remove BFP, 2 units, including but not limited to sludge feed pumps, polymer feed system and aging tanks, cake chutes, control panels, and piping all auxiliary equipment as shown on the Contract Drawings.

2. Remove degritter and selective parts of the 4-inch degritter feed line and 6-inch degritter sludge line as shown on the Contract Drawings.

3. Gravity Thickeners sludge collection mechanisms, including but not limited to the rake arm assembly, vertical shaft, drive mechanism, and influent well; remove mixer located in the influent distribution box; and auxiliary equipment as shown on the Contract Drawings.

4. Selective concrete demolition as indicated on the Contract Drawings.

3.2 OWNERSHIP & DISPOSAL OF MATERIALS

A. All salvaged material shall become the property of the Contractor, except the items listed below, at the Owner’s option, which shall remain the property of the Owner and shall be delivered to a location designated by the City of Wheeling Water Treatment Plant operations personnel:

1. One (1) existing Disc Flow Pump and the variable frequency drive (VFD), currently used to convey sludge to the Belt Filter Press, shall be removed together with the motor and associated Variable Frequency Drive (VFD) and returned to Water Treatment Plant Operations.

B. All materials, whether they may be salvageable or not, shall be promptly removed from the construction site as demolition progresses. The Contractor shall transport all material designated as waste to an approved landfill facility for proper disposal.

END OF SECTION 024100

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 1 Specification sections, apply to the work of this section.

1. Section 013319 – Field Testing Requirements

1.2 SUMMARY

A. Provide all materials and labor necessary to complete all concrete, plain and reinforced, as indicated on Drawings or as specified in these specifications and as required to complete the Project. Work, without limiting the generality thereof, includes:

1. Installation of concrete to provide footings, foundations, foundation walls, slabs on grade, and other incidental concrete Work.
2. Furnishing and installation of admixtures.
3. Work of other trades required to be built into concrete, such as inserts for connections to steel members, waterstops, flashing reglets, anchors, embedded plates, high-strength mortar, controlled low strength material, grouting of precast members, and reinforcing dowels.
4. Providing vapor retarder [or waterproofing membrane] below slabs on grade.
5. Finishing of concrete as specified herein or as indicated on Drawings.

B. This Section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

1. Extent of concrete work is shown on drawings.
2. Concrete paving and walks are specified in Division 2.
3. Precast concrete is specified in other Division-3 sections.
4. Mechanical finishes and concrete floor toppings are specified in other Division-3 sections.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements and 01 33 00 - Submittal Procedures for submittal procedures.

B. Product Data: Submit data for proprietary materials and items, including but not limited to repair mortar, concrete mix design data, Portland cement. Fly ash, reinforcement, forms, forming accessories, bonding agent, admixtures, patching compounds, waterstops, joint systems, high-strength repair/patching mortar, control

joint/construction joint locations, curing compounds, dry-shake finish materials, and others as requested by the Engineer.

1. Mix Design: Submit each proposed concrete mix design. Mix design(s) proposed shall be sealed by a Professional Engineer registered in the state of Ohio. The concrete mix design shall provide the following data:
   a. The expected strength.
   b. Corresponding slump before and after the introduction of mid- or high-range water-reducing admixtures.
   c. Weights and test results of the ingredients.
   d. Concrete mix compressive strength test results.
   e. Other physical properties necessary to review each mix design for conformance with these specifications.
   f. Indicate the proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   g. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
2. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

C. Shop Drawings; Reinforcement: Submit original shop drawings prepared for fabrication, bending, and placement of concrete reinforcement. Comply with the ACI Detailing Manual, showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Shop Drawings; Formwork: Submit shop drawings prepared by a registered Professional Engineer for fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joint or reveals, location and pattern of form tie placement, and other items which affect exposed concrete visually.

1. Engineer's review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is the Contractor's responsibility.

E. Samples: Submit samples of materials as requested by the Engineer, including names, sources, and descriptions.

F. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design tests.

1. The proposed mix design submittal(s) shall follow the procedures of Chapter 5, Sections 5.2 to 5.3 of ACI-318.
2. Reference should be made to ACI-211.5R "Guide for Submittal of Concrete Proportions" for the required submittal information. Sample forms for presenting the necessary information can be found in the addendum at the end of this section. Example Form B should follow a completed Example A in the submittal when laboratory trial batches are used to document a water-cementitious materials ratio curve.

3. Additional data summarizing the past performance records should be an integral part of the submittal if the submittal is based on past performance with the proposed materials and proportions.

4. Alkali-silica reactivity test results.

G. Materials Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by the Engineer. Materials certificates shall be signed by the manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, latest revisions, except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings."
2. ACI 318 "Building Code Requirements for Reinforced Concrete."
3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
4. ACI 347 "Guide to Formwork for Concrete."
5. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
6. ACI 232.3R - Report on High-Volume Fly Ash Concrete for Structural Applications.
7. ACI 305R - Guide to Hot Weather Concreting.
8. ACI 305.1 (305.1M) - Specification for Hot Weather Concreting.
9. ACI 306.1 - Standard Specification for Cold Weather Concreting.
10. ACI 306R - Guide to Cold Weather Concreting.
11. ACI 308.1 (308.1M) - Specification for Curing Concrete.
12. ACI 350.5 (350.5M) - Specifications for Environmental Concrete Structures.
13. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
14. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
15. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
16. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
17. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
18. ASTM C150/C150M - Standard Specification for Portland Cement.
19. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
20. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.

21. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
22. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
23. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.
24. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

B. Construct and erect concrete formwork and accessories in accordance with ACI 301, ACI 347 and ACI 350. Perform cast-in-place concrete work in accordance with ACI 301, ACI 318 (for typical structures) and ACI 350 (for environmental structures).

C. Materials and installed work may require testing and retesting at any time during the progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

D. Engage a testing agency acceptable to Engineer to perform initial material evaluation and certification tests for mix designs and to design concrete mixes.

E. Pre-installation Conference: Conduct a conference at the project site to comply with requirements of Division 1 Section "Project Meetings" and the following:

1. At least 35 days prior to submitting design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials, inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including, but not limited to, the following:
   a. Contractor's Superintendent
   b. Agency responsible for concrete design mixes.
   c. Agency responsible for field quality control.
   d. Ready-mix concrete producer.
   e. Concrete Subcontractor
   f. Primary admixture manufacturers.

F. Concrete Testing Service: Employ and pay an independent testing laboratory, acceptable to the Owner and Architect, to perform material evaluation tests and to review concrete mix designs proposed by Contractor to conform to this Specification.

G. Alkali-Silica Reactivity Testing: Aggregates used in the concrete shall be tested by an independent testing agency for alkali-silica reactivity in accordance with ASTM C1260.

1.5 PROJECT CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301, ACI 306.1, and as follows:

1. Protect concrete Work from physical damage or reduced strength caused by frost, freezing actions, or low temperatures.
2. When average high and low temperatures are expected to fall below 40-deg. F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg. F, other than reinforcing steel.
5. 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 at the time of discharge not to exceed 95-deg. F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

C. Protect adjacent finish materials against spatter during concrete placement.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize the number of joints and to conform to joint system shown on drawings.
1. Use plywood 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.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two (2) edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, snap-off metal or glass fiber-reinforced plastic form ties, designed to prevent form deflection and to prevent the spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2" to the exposed surface.
1. Provide ties which, when removed, will leave holes not larger than 1" diameter in concrete surface.
2. All form ties shall have a factor of safety of two (2) to determine the recommended safe working load.

3. Form ties for environmental structures shall have a waterstop located within the middle third of the formed concrete.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. (Flat sheets only)

D. Welded Deformed Steel Wire Fabric: ASTM A 497.

E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
3. For the bottom of slabs that are exposed to sanitary liquids, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II, I/II, V low alkali, and ASTM C 595 blended cement Type IP for typical structures and Type HS for environmental structures.

1. Blended cements that include ASTM C 1157 cements shall not be permitted
2. Use one brand of cement throughout the project, unless otherwise acceptable to the Engineer.
   a. Different types of cement shall not be mixed or used alternately without specific written approval by the Engineer.
   b. Different brands of cement may be used when authorized in writing by the Engineer. A resubmittal will be required if different brands are proposed during the Project.
3. Portland cement shall contain less than 0.60 percent alkalis. Portland-pozzolan cement shall be low alkali.

B. Concrete mixtures shall include either fly ash or slag as shown below, but within the limits stipulated in 2.4.C, unless the proposed combination of cementitious materials has been tested in accordance with ASTM C 1012 and resulted in expansion of not more than 0.10 percent at 6 months.

1. Fly Ash, conforming to ASTM C618, Class F. Limit use of fly ash to not exceed 30% or less than 20% of cementitious material by weight.
    a. Fly ash pozzolan shall contain less than 1 percent by weight of carbon and less than 3 percent by weight of sulfur trioxide.
    b. Alkali content (%Na2Oeq) less than 3.0%.
2. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120: Limit use of granulated blast-furnace slag to not exceed 65% or less than 40% of cement content by weight.
3. The pozzolan supplied during the life of the project shall have been formed at the same single source. The pozzolan color shall not substantially alter the resulting concrete from the normal gray color and appearance.

C. Normal Weight Aggregates: Fine and coarse aggregates shall conform to ASTM C33. Fine and coarse aggregates shall be regarded as separate ingredients.
1. Aggregates shall be non-reactive and shall be washed before use. Provide aggregates from a single source for exposed concrete.
2. Tests for size and grading of fine and coarse aggregates shall be in accordance with ASTM C136. Combined aggregates shall be well and uniformly graded from coarse to fine sizes to produce a concrete that has optimum workability and consolidation characteristics. The final combined aggregate gradation shall be established during the design mix.
3. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
4. Local aggregates not complying with ASTM C 33 but which have been shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Engineer.
5. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 (0.3-mm) sieve, and less than 8 percent may be retained on sieves finer than No. 50 (0.3 mm).

D. Fine aggregate: Fine aggregate shall be hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine. Gradation shall conform to ASTM C33.

E. Coarse aggregate: coarse aggregate shall be hard, angular (not river washed), dense and durable gravel or crushed rock free from injurious amounts of soft and friable particles, alkali, and organic matter. Other deleterious substances shall not exceed the limits listed in ASTM C33, Table 3. Gradation of each coarse aggregate size shall conform TO ASTM C33, Table 2.

F. Water: Conform with ASTM C94. Water for washing aggregate, for mixing and for curing shall be potable and free from oil and deleterious amounts of acids, alkalis, and organic materials; shall not contain more than 1,000 mg/l of chlorides as Cl, nor more than 1300 mg/l of sulfates as SO4; and shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction

of more than 5 percent in the compressive strength of the concrete at 14 days when compared with the result obtained with distilled water. Additionally, water used for curing shall not contain an amount of impurities sufficient to discolor the concrete.

G. Admixtures shall be compatible with the concrete and with each other. Calcium chloride or admixtures containing calcium chloride are not acceptable. Admixtures shall be used in accordance with the manufacturer's recommendations and shall be added separately to the concrete mix.

1. Prohibited Admixtures: Calcium chloride, thyocyanates, or admixtures containing more than 0.1 percent chloride ions are not permitted.

H. Air-Entraining Admixture: ASTM C 260, certified by the manufacturer to be compatible with other required admixtures.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Air-Mix"; Euclid Chemical Co.
   b. "Sika Aer"; Sika Corp.
   c. "MB-VR or MB-AE"; Master Builders.

I. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.1 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "WRDA"; W.R. Grace.
   b. "Eucon WR-75"; Euclid Chemical Co.
   c. "Pozzolith Normal"; Master Builders.

J. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F and containing not more than 0.1 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Sikament 300"; Sika Chemical Corp.
   b. "Eucon 37"; Euclid Chemical Co.
   c. "Rheobuild or Polyheed"; Master Builders.

K. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1 percent chloride ions.

1. Products Subject to compliance with requirements, provide one of the following:
   a. "Accelguard 80"; Euclid Chemical Co.
   b. "Pozzutec 20"; Master Builders.
   c. "Daraset"; W.R. Grace & Co.

L. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Pozzolith"; Master Builders.
   b. "Eucon Retarder 75"; Euclid Chemical Co.
   c. "Plastiment"; Sika Chemical Co.

M. Antimicrobial crystalline waterproofing admixture: Provide Xypex Bio-San C500 admixture as manufactured by Xypex Chemical Corporation. Dosage rate shall be 1.0% by weight of total cementitious material content in the concrete. No substitution of this admixture shall be acceptable. This admixture shall be incorporated in concrete utilize in environmental structures in accordance with manufacturer's recommendations and requirements.

N. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

2. Products: Subject to compliance with requirements, provide one of the following:
   a. Catexol 1000CL; Axim Concrete Technologies.
   b. MCI 2000 or MCI 2005; Cortec Corporation.
   c. DCI or DCI-S; W.R. Grace & Co., Construction Products Div.
   d. Rheocrete 222+; Master Builders, Inc.
   e. FerroGard-901; Sika Corporation.

O. Fiber Reinforcement:

1. Synthetic fiber reinforcing shall be added to the concrete for the areas so indicated in the drawings. Only fibers designed and manufactured specifically for use in concrete shall be acceptable as secondary reinforcement, complying with ASTM C1116, not less than ¾ inch long.

2. The fibers may be added at the batch plant. The incorporation of said fibers shall be documented on the delivery ticket from the ready-mix producer. Fibers shall be added to the concrete in strict accordance with manufacturer's printed instructions. The minimum dosage rate shall be 1.5 lbs/cubic yard.

3. Nylon fibers containing 100% virgin nylon monofilaments shall be utilized to impart a "non-hairy" surface to the finished concrete.

4. Products: Subject to compliance with requirements, provide the following fibrous reinforcement or approved equal:
   a. Nycon Fiber; Nycon, Inc.
   b. Nylo-Mono; Forta Corp.
   c. Fibrasol N; Axim Concrete Technologies

2.4 RELATED MATERIALS

A. Granular Base: Evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

B. Non-Shrink Non-metallic Grout: CRD-C 621 and ASTM C-1107, factory pre-mixed grout.

1. Products: Subject to compliance with requirements; provide one of the following:
   a. Non-metallic
      1) "Set Grout"; Master Builders.

2) "Euco-NS"; Euclid Chemical Co.
3) "Five Star Grout"; U.S. Grout Corp.

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

D. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

E. Liquid Membrane-Forming Curing Compound: Liquid type membrane- forming curing compound complying with ASTM C 309, Type I, Class A. Moisture losses not more than 0.55 kg/sq.m. when applied at 200 sq ft./gal.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Masterkure"; Master Builders.
   b. "Ecocure"; Euclid Chemical Co.
   c. "Horn Clear Seal"; A.C. Horn, Inc.

F. Bonding Compound: Epoxy base.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Sikadur-32 Hi-Mod; Sika USA
   b. Armatec-110 EpoCem; Sika USA
   c. Dural 452 Gel; Euclid Chemical Co.
   d. Dural 452 MV; Euclid Chemical Co.
   e. REZI-WELD; W. R. MeadowsEpoxy

G. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material "Type," "Grade," and "Class" to suit project requirements.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Epoxtite Binder 2390"; A.C. Horn, Inc.
   b. "Sikadur 32 Hi-Mod"; Sika Chemical Corp.
   c. "Euco Epoxy 452 or 620"; Euclid Chemical Co.

H. High Strength Repair/Patching Mortar: Contractor can either provide a batch/site mix or a premanufactured bag mix. See Table I for a batch/site mix.

1. Premanufactured bag mix shall be polymer-modified, shrinkage-compensated, rapid-setting, high-strength mortar specifically formulated to make structural repairs in vertical and overhead applications.
2. Bag mix shall conform to ASTM C928 R2 for structural concrete repair and have a 28-day strength of at least 6,000 psi.
3. Bag mix may be extended with aggregate if approved by the manufacturer.
4. The following are approved manufacturers:
   a. Sika Chemical Corp.
   b. Five-Star Products Inc

c. Euclid Chemical Company
d. CTS Cement Manufacturing Corp.
e. Dayton Superior Corporation
f. SpecChem

2.5 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301 and ACI 211. If the trial batch method is used, use an independent testing facility acceptable to the Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to the Engineer.

1. Concrete shall be normal weight concrete composed of specified cement, pozzolan, admixtures, aggregates, and water proportioned and mixed to produce workable, strong, dense, and impermeable concrete.
2. The Contractor may substitute underground Portland-Pozzolan cement conforming to ASTM C595, containing the specified amount of pozzolan in lieu of Portland cement and pozzolan. Pozzolan may be omitted in concrete exposed to normal atmospheric conditions and concrete not in contact with the ground or liquid. Water/cement ratio is based on the combined contents of cement and pozzolan in a given mix proportion.
3. Controlled Low Strength Material (CLSM) shall be a flowable concrete slurry mix, consisting of cement, pozzolan, water, coarse and fine aggregate. The concrete slurry mix shall be produced by a ready-mix concrete supplier.

B. Submit written reports to the Engineer and Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to the start of work. Do not begin concrete production until mixes have been reviewed by the Engineer.

C. Design mixes to provide normal weight concrete with the following properties, as indicated in Table I:

TABLE 1

CONCRETE REQUIREMENTS

Concrete Class	ASTM Coarse Aggregate Size	Maximum Water/Cement Ratio	Pozzolan, Percent by Weight of Cementitious Materials[a]	Minimum Air Content (Percent)	Minimum[b] 28-Day Compressive Strength, PSI	Slump Range Min-Max /Admix[e] (Inches)
A	57	0.4	20-28	5.5[c]	5000	3-4/8
B	467[d]	0.45	20-28	5.5[c]	3500	4-5/8
C	8	0.48	20-28	5.5	3000	5-6/9

a. Pozzolan content may be included in the cementitious fraction. Based on the fly ash ratios, the GGBFS pozzolan shall be multiplied by 1.75.

b. Compressive strength shall be determined at the end of 28 days based on test cylinders made and tested in accordance with ASTM C39.
c. Plus or minus 1.5 percent.
d. ASTM coarse aggregate gradation 57 may be substituted at Contractor's option.
e. Min and max represent slump due to water only. Admix refers to the recommended maximum slump for the mix after the incorporation of water-reducing admixtures.

1. Typical cast-in-place structural concrete shall be Class A, except as otherwise specified or shown on the drawings.
2. Sitework, non-structural concrete (sidewalks, curbs, pavers, etc.) shall be Class B unless otherwise noted on the drawings.
3. Class C shall be used for grouting manhole inverts, as a topping for sloping slabs, forming manhole benches, etc.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warranty; at no additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before use in work.

E. Admixtures:

1. Use high range water-reducing admixture (superplasticizer) in Class A concrete unless noted otherwise.
2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
3. Use air-entraining admixture in all concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content within limits shown in Table I.
4. Use antimicrobial crystalline waterproofing admixture in Class environmental structures concrete.
5. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.
6. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as shown in Table I:
   a. Concrete containing HRWR admixture (super-plasticizer): Not more than 8" after addition of HRWR to site-verified 2"-3" slump concrete.

2.6 CONCRETE MIXING

A. Job-Site Mixing: Mix materials for concrete in appropriate drum-type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in the mixer, before any part of the batch is released. For mixers of capacity larger than one cu. yd., increase

minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.

1. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

B. Ready-Mix Concrete: Comply with the requirements of ASTM C 94, and as herein specified.

1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
   a. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

C. Prepare design mixtures for each type of concrete required.

1. The inclusion of either fly ash or slag in the concrete mix is mandatory.
2. Where fly ash is used:
   a. The minimum fly ash content shall be 20 percent, and the maximum shall be 30% of cementitious material by weight.
   b. Additional fly ash shall not be included in concrete mixed with blended cements.
3. Where slag is used:
   a. The minimum slag content shall be 50 percent, and the maximum shall be 65% of cementitious material by weight.
   b. Additional slag shall not be included in concrete mixed with blended cements.

2.7 WATERSTOPS

A. Polyvinyl Chloride (PVC):

1. PVC waterstops shall be manufactured from virgin polyvinyl chloride conforming to the Corps of Engineers Specification No. CRD-C572. Unless otherwise specified or noted on the drawings, waterstops in construction joints shall be 6-inch flat center/ribbed sides/0.375 inch thick, Greenstreak 679, Vinylex R6-38, or equal. Waterstops in expansion joints shall be 9 inch center-bulb/ribbed sides/0.375 inch thick, Greenstreak 696, Vinylex RB9-38H, or equal. All waterstop tees, crosses, and ells must be factory-made; all field-fabricated joints will be rejected.

B. Expanding (Hydrophilic) Waterstops:

1. Expanding waterstops shall be bentonite-free and made from unvulcanized rubber. Acceptable products include Adeka. Equivalents approved by the Engineer are acceptable. These are allowable for use only where indicated on the drawings or accepted in writing by the Engineer. Provide adhesive approved by the waterstop manufacturer where required due to geometry, irregular surface conditions, or as recommended by the manufacturer. Unless otherwise shown on the drawings, use

Adeka MC-2010MN, Sika Hydrotite CJ-1020-2K, or approved equal at Hydrophilic Waterstop identified locations.

2.8 PRODUCT DATA

A. Manufacturer's Data:

1. Copies of manufacturer's data shall be provided for the following:
   a. Cement
   b. As-delivered concrete strength, slump, temperature, and air content
   c. Final laboratory report.

B. Ready-Mixed Concrete Truck Delivery Tickets:

1. Each load of ready-mixed concrete delivered to the job site shall be accompanied by a delivery ticket showing the information listed in ASTM C94, Section 16.
2. With each load of concrete delivered to the job site, there shall be furnished by the ready mixed concrete producer duplicate delivery tickets, one for the Contractor and one for the Engineer. Delivery tickets shall provide the following information:
   a. Date and serial number of ticket;
   b. Name of ready mixed concrete plant;
   c. Job location;
   d. Contractor;
   e. Type and brand name of cement;
   f. Mix number or specified cement content in bags per cubic yard of concrete;
   g. Truck number;
   h. Time dispatched stamped by a time clock;
   i. Amount of concrete in load in cubic yards;
   j. Admixtures in concrete, if any;
   k. Maximum size of aggregate;
   l. Water added at job, if any;
   m. Slump of concrete ordered

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.2 FORMS

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

B. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retightening forms and bracing after concrete placement if required to eliminate mortar leaks and maintain proper alignment.

3.3 VAPOR RETARDER INSTALLATION

A. Following leveling and tamping of granular base for slabs on grade, place vapor retarder sheeting with longest dimension parallel with direction of pour.

B. Lap joints 6" and seal with manufacturer's recommended mastic or pressure-sensitive tape.

3.4 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.

1. Avoid cutting or puncturing vapor retarder during reinforcement placement and concreting operations. Repair damages before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bars supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.5 JOINTS

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Engineer.

1. Provide a roughened interface with a 1/4" min. amplitude at construction joints in walls, slabs, and between walls and footings.
2. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.

B. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form a continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.

C. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

1. Joint filler and sealant materials are specified in Section 030000.02 of these specifications.

D. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use inserts 1/4 of slab depth, unless otherwise indicated.

1. Form contraction joints by inserting premolded plastic strips into fresh concrete until the top surface of the strip is flush with the slab surface.
2. Follow the directions of the Insert Manufacturer to finish the slab and joints.

E. If joint pattern is not shown, provide joints not exceeding 15' in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third-bays).

1. Joint sealant material is specified in Section 030000.02 of these specifications.

3.6 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto. Electrical conduit shall not be embedded in concrete.

B. Install reglets to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.

C. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units to support screed strips using strike-off templates or compacting type screeds.

3.7 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

B. Coat contact surfaces of forms with an approved, nonresidual, low-VOC, from-coating compound before placing reinforcement.

C. Thin form-coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.8 CONCRETE PLACEMENT

A. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

1. Apply temporary protective covering to lower 2' of finished walls adjacent to poured floor slabs and similar conditions and guard against spattering during placement.

B. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while the preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer and at least 6" into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

3. Maintain reinforcing in proper position on chairs during concrete placement operations.

E. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C), and not more than 80 deg F (27 deg C) at point of placement.
   a. The concrete shall be maintained within this temperature range for not less than seven (7) days.

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 or against cold reinforcing steel.

3. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

F. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature, provided the water equivalent of ice is calculated to the total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineers.

3.9 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed; provide smooth rubbed finish to smooth form finish. Refer to "Concrete Surface Repairs."

C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment.

1. Scarify or roughen the entire surface by grinding or similar effective means.
2. Combine one part Portland cement to 1-1/2 parts fine sand by volume and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that the final color of dry grout will match adjacent surfaces.
3. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
4. Repeat the above process if necessary to fill voids or bug holes and obtain a consistent match to adjacent surfaces, subject to acceptance of the Engineer.

D. Grout Cleaned Finish: Provide grout cleaned finish on scheduled concrete surfaces which have received smooth form finish treatment.

1. Scarify or roughen entire surface by grinding or similar effective means.
2. Apply Thoroseal plaster mix coating by Thoro System Products or approved equivalent with an approximate thickness of 1/8-inch to ¼-inch.
3. Follow the manufacturer's recommendations and guidelines regarding surface preparation, application methods, and curing.
4. Repeat the above process if necessary to fill voids or bug holes and obtain a consistent match to adjacent surfaces, subject to acceptance of the Engineer.

E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring 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.

3.10 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

1. After placing slabs, plane surface to tolerances for floor flatness F(F) 15 and floor levelness F(L) 13, measured according to ASTM E 1155. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work the surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of F(F) 18 F(L) 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when the surface produces a ringing sound as the trowel is moved over the surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to

tolerances of F(F), 20 and F(L) 17, measured according to ASTM E1155. Grind smooth surface defects which would telegraph through applied floor covering system.

D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with a slightly scarifying surface by fine brooming.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

F. Non-slip Aggregate Finish: Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, sloped walks, and elsewhere as indicated.

1. After completion of float finishing, and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate per 100 sq. ft. of surface. Tamp the aggregate flush with the surface using a steel trowel, but do not force it below the surface. After broadcasting and tamping, apply trowel finishing as herein specified.
2. After curing, lightly work surface with a steel wire brush, or an abrasive stone, and water to expose non-slip aggregate.

G. Colored Wear-Resistant Finish: Provide colored wear-resistant finish to monolithic slab surface indicated.

1. Apply dry shake materials for colored wear-resistant finish at a rate of not less than 100 lbs. per 100 sq. ft., unless the material manufacturer recommends a greater amount.
2. Immediately following the first floating operation, uniformly distribute approximately 2/3 of the required weight of dry shake material over the concrete surface, and embed by means of power floating. Follow the floating operation with a second shake application, uniformly distributing the remainder of the dry shake material with overlapping applications, and embed by power floating.
3. After completion of broadcasting and floating, apply trowel finish as herein specified. Cure slab surface with curing compound recommended by dry shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.11 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete from rapid moisture loss before and during finishing operations.

1. The evaporation graph, Figure 1, of ACI 308 - Curing Concrete, shall be used to determine the evaporation rate during concrete placement. If the rate of evaporation equals or exceeds 0.2 lbs/sq.ft./hr., steps shall be taken to prevent excessive evaporation from the surface.

2. Start initial curing as soon as free water has disappeared from the concrete surface after placing and finishing.

    a. Initial curing may be any of the methods listed herein that maintain a satisfactory moisture content and temperature.

3. Begin final curing procedures, if they differ from initial curing, immediately following initial curing and before concrete has dried. Continue curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at the end of the final curing period.

B. Curing Methods: Perform curing of all structural concrete as herein specified.

1. Provide moisture curing by following methods.
    a. Keep concrete surface continuously wet by covering with water.
    b. Continuous water-fog spray.
    c. Cover the concrete surface with a specified absorptive cover, thoroughly saturating the cover with water and keeping it continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows:
    a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during the curing period using cover material and waterproof tape.

C. Provide curing and sealing compound to pavement, walks, and curbs only, as follows:

1. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours) and after surface water sheen has disappeared. Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.

D. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

E. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by moist curing methods.

1. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

3.12 SHORES AND SUPPORTS

A. Comply with ACI 347 for shoring and reshoring in multistory construction, and as herein specified.

B. Extend shoring from ground to roof for structures four (4) stories or less, unless otherwise permitted.

C. Extend shoring at least three (3) floors under the floor or roof being placed for structures over four (4) stories. Shore the floor directly under the floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout the structure.

D. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.

1. Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.13 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for five (5) days after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of the concrete location or members. Lab-cured cylinders will not be considered.

C. Form facing material may be removed five (5) days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.14 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Engineer.

3.15 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment with template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

1. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

D. Steel Pan Stairs: Provide concrete filling for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces as scheduled. Cure concrete as herein specified.

E. Reinforced Masonry: Provide concrete grout conforming to ASTM C476 for reinforced masonry lintels and bond beams where indicated on drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.16 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.

1. Saw-cut out honeycomb, rock pockets, voids over 1/4" in any dimension, down to solid concrete but, in no case, to a depth of less than 1”. Make edges of cuts slightly undercut to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with Portland Cement patching mortar, or precast cement cone plugs secured in place with bonding agent. When other materials are used, apply them in accordance with manufacturer's recommendations.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
2. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having the required slope.
3. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
4. Correct high areas in unformed surfaces by grinding, after concrete has cured for at least 14 days.
5. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Engineer.
6. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of the same materials to provide concrete of the same type or class as the original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
8. Perform structural repairs with prior approval of Engineer or Structural Engineer for method and procedure, using specified epoxy adhesive and mortar.
9. Repair methods not specified above may be used, subject to acceptance of the Engineer.
10. Underlayment Application: Leveling of floors for subsequent finishes may be achieved by use of specified underlayment material.

3.17 THROUGH SECTION CONCRETE CRACK REPAIRS

A. Sealing through wall or slab cracks.

1. Seal cracks for a watertight or structurally bonded repair with epoxy or chemical grouting procedures.
    a. The Contractor shall make proper repairs with epoxy injection or chemical injection with a moisture-reactive hydrophilic polyurethane foam grout, as directed by the Engineer.

ADDENDUM

EXAMPLE FORM A

CONCRETE SUPPLIER:_____

PROJECT:_____ CONTRACTOR:_____

MIXTURE ID:_____ SPECIFIED f'c:_____PSI

MATERIAL MIXTURE PROPORTIONS lbs-mass/cu.yd. (pcy)

1.0 Cement Type_____ Source:_____

Sp. Gr._____ _____pcy _____cu. ft.

1.1 Other Cementitious Materials:_____ Class:_____ Source:_____

Sp. Gr._____ _____pcy _____cu. ft.

2.0 Aggregate (No. 1) Type:_____ Size:_____ Source:_____

SSD Sp. Gr._____ _____pcy _____ cu. ft.

Dry Rodded Unit Wt.:_____pcf

Alternate (No. 1) Lightweight Aggregate Type:_____ Size:_____Source:_____

Sp. Gr. Factor _____ over dry pcy _____ cu. ft.

Loose Unit Wt._____pcf Estimated Wet _____pcf

2.1 Aggregate (No. 2) Type:_____ Size:_____ Source:_____

SSD Sp. Gr._____ _____pcy _____cu. ft.

Dry Rodded Unit Wt.: _____pcf (If Fine Sized - FM _____)

2.2 Aggregate (Nos. 3, 4, n) Type:_____ Size:_____ Source:_____

SSD Sp. Gr._____ _____pcy _____cu. ft.

Dry Rodded Unit Wt.: _____pcf

3.0 Water: _____gal. _____pcy _____cu. ft.

4.0 Admixtures expressed as fluid ounces/cubic yard, and estimated range

Source:_____ Name:_____ Type_____ _____oz

Source:_____ Name:_____ Type_____ _____oz

Source:_____ Name:_____ Type_____ _____oz

Total Admixture Liquid Vol. _____ cu. ft.

(*) Note: Show volume in 4.0 if not included in cubic feet of air or water.

5.0 Other Materials - fibers, color pigment or other additions

Sp. Gr._____ _____pcy _____cu. ft.

Total Mixture Mass and Volume: _____pcy _____cu. ft.

Fresh Concrete Properties

Slump _____ +/-_____ in.

Coarse & Fine Aggregate Gradation

Percent Passing

Sieve Size	Aggregate No.				
	1	2	3	4	Combined

Unit Weight _____ pcf	2 in.	____	____	____	____	_____
Air Content _____+/-_____%	1-1/2 in.	____	____	____	____	_____
	1 in.	____	____	____	____	_____
	3/4 in.	____	____	____	____	_____
	1/2 in.	____	____	____	____	_____
If Trail Batch Data -	3/8 in.	____	____	____	____	_____
Identify Batch No. _____	No. 4	____	____	____	____	_____
Batch Date _____	No. 8	____	____	____	____	_____
Concrete Temp._____°F	No. 16	____	____	____	____	_____
Comp. Strength-Average _____°F	No. 30	____	____	____	____	_____

7 day avg. _____psi	No. 50	____ ____ ____ ____ _____
28 day avg. _____psi	No. 100	____ ____ ____ ____ _____
	No. 200	____ ____ ____ ____ _____

Comments:_____

_____

Signature: _____ Date:_____

Title: _____

Organization: _____

EXAMPLE FORM B

CONCRETE SUPPLIER:_____

MATERIAL	TRAIL BATCH NUMBER - proportions per cubic yard			
	1	2	3	4
1.0 Cement Source: _____				
Type ____	_____lb	_____lb	_____lb	_____lb
1.1 Other Cementitious Material Sources:_____				
Type ____	_____lb	_____lb	_____lb	_____lb
2.0 Aggregate No. 1 Size_____ Source:_____				
SSD ____	_____lb	_____lb	_____lb	_____lb
Alternate No. 1 Lightweight Aggregates Type _____ Source: _____				
Sp. Gr. Factor _____				
Oven Dry	_____lb	_____lb	_____lb	_____lb
Wet	_____lb	_____lb	_____lb	_____lb

2.1 Aggregate No. 2 Size_____ Source:_____

SSD ____ _____lb _____lb _____lb _____lb

2.2 Aggregate Nos. 3, 4, n) Size_____Source:_____

SSD ____ _____lb _____lb _____lb _____lb

3.0 Water _____lb _____lb _____lb _____lb

4.0 Admixtures Source: _____

_____ Type _____ _____oz _____oz _____oz _____oz

_____ Type _____ _____oz _____oz _____oz _____oz

_____ Type _____ _____oz _____oz _____oz _____oz

EXAMPLE FORM B (CONTINUED)

5.0 Other Materials

_____ Type _____ _____lb _____lb _____lb _____lb

_____

Total Mass: _____lb _____lb _____lb _____lb

Total Mass/cy: _____pcy _____pcy _____pcy _____pcy

Relative Cubic Yard Volume:

_____cy _____cy _____cy _____cy

Water-Cementitious Material Ratio:

Fresh Concrete Properties

_____

TRAIL BATCH NUMBER

	## -1	## -2	## -3	## -4
Slump-inches	_____	_____	_____	_____
Air-Content %	_____	_____	_____	_____

Unit Wt. pcf	_____	_____	_____	_____
Concrete Temp. °F	_____	_____	_____	_____

Compressive Strength Results (ASTM C192, C39) or Other Specified Test Requirements

7 days	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
Average (7 day)	_____	_____	_____	_____

28 days	_____	_____	_____	_____
	_____	_____	_____	_____
	_____	_____	_____	_____
Average (28 day)	_____	_____	_____	_____

Water-Cementitious Material Ratio:

_____	_____	_____	_____

Signature: _____ Date:_____

Title:_____

Organization: _____

END OF SECTION 033000

SECTION 051400 - STRUCTURAL ALUMINUM FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install structural aluminum framing.

2. The Work also includes:

a. Providing openings in and attachments to structural aluminum framing to accommodate the Work under this and other Sections and providing for structural aluminum framing items such as anchorage devices, studs, and all items required for which provision is not specifically included under other Sections.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before structural aluminum framing Work.

C. Related Sections:

1. Section 03 60 00, Grouting.

2. Section 05 05 33, Anchor Systems.

3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. AA ADM-1, Aluminum Design Manual – Specifications for Aluminum Structures.

2. AISC Specifications for Structural Joints using ASTM A325 or ASTM A490 Bolts, approved by RCSC.

3. ASTM A325, Specification for Structural Bolts, Steel, Heat-Treated, 120/105 KSI Minimum Tensile Strength.

4. ASTM A563, Specification for Carbon and Alloy Steel Nuts.

5. ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6. ASTM B211, Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

7. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

8. ASTM B308/B308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
9. ASTM B429/B429M, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
10. ASTM F436, Standard Specification for Hardened Steel Washers.
11. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
12. ASTM F594, Specification for Stainless Steel Nuts.
13. AWS D1.2/D1.2M, Structural Welding Code - Aluminum.
14. NAAMM AMP 500, Metal Finishes Manual for Architectural and Metal Products.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Welders and Welding Processes:
   a. Qualify welding processes and welding operators in accordance with AWS D1.2/D1.2M.
   b. When requested by ENGINEER, provide certification that all welders employed on or to be employed on the Work have satisfactorily passed AWS qualification tests within the previous 12 months. Ensure that all certifications are current.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
   a. Complete details and schedules for fabrication and shop assembly of members and details, schedules, procedures, and diagrams showing proposed sequence of erection. Shop Drawings shall not be reproductions of Contract Drawings.
   b. Include complete information for fabrication of the structure's components, including location, type, and size of bolts, details of blocks, copes and cuts, connections, camber, holes, member sizes and lengths, and other pertinent data. Clearly indicate welds using standard AWS notations and symbols, and clearly show or indicate size, length, and type of each weld.
   c. Provide setting drawings, templates, and directions for installing anchorage devices.
2. Product Data:
   a. Copies of manufacturer's specifications and installation instructions for products listed below.
      1) Welding electrodes and rods.

B. Informational Submittals: Submit the following:

1. Certificates.
   a. Welders' certifications, when requested by ENGINEER.
2. Test Reports.
   a. Laboratory test reports and other data required to show compliance with the Contract Documents for the following:
      1) Mill test report documenting chemical and physical properties of each type of aluminum framing material.
      2) Mill test report documenting chemical and physical properties of stainless steel connection bolts, nuts, and washers.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Site at such intervals to ensure uninterrupted progress of the Work.

B. Storage:

1. Do not store materials in a manner that could cause distortion or damage to the members. Repair or replace damaged materials as directed by ENGINEER.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Types:

1. Aluminum Shapes: ASTM B308/B308M, Alloy 6061-T6, ASTM B221, Alloy 6061-T6.
2. Aluminum Tubes and Pipes: ASTM B429, Alloy 6061-T6.
3. Aluminum Bars and Rods: ASTM B211, Alloy 6061-T6.
4. Aluminum Plates: ASTM B209, Alloy 6061-T6.

B. Anchorages, Fasteners, and Connectors:

1. Anchorage Devices: Refer to Section 05 05 33 Anchor Systems.
2. Threaded Fasteners: Stainless steel bolts, ASTM F593, AISI Type 303, and stainless steel nuts and washers, ASTM F594, AISI Type 303.
3. Bolts used in slip-critical connections shall comply with ASTM A325; nuts shall comply with ASTM A563 Grade DH; and washers shall comply with ASTM F436. Bolts, nuts, and washers shall be zinc-coated by the hot-dip process in accordance with ASTM A325.

C. Electrodes for Welding: ER 5356 complying with AWS D1.2/D1.2M.

D. Finish: Provide mill finish as specified in NAAMM AMP 500.

2.2 FABRICATION

A. Shop Fabrication and Assembly:

1. General:
   a. Fabricate and assemble structural assemblies in the shop to the greatest extent possible. Fabricate items of structural aluminum in accordance with AA ADM-1, the Contract Documents, and as shown on approved Shop Drawings. Provide camber in structural members as shown.
   b. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize handling of materials for storage and minimize handling at the Site.
   c. Where finishing is required, complete the assembly, including welding of units, before commencing finishing operations. Provide finish surfaces of members exposed-to-view in the completed Work that are free of markings, burrs, and other defects.
   d. Design of Members and Connections:
      1) Details shown on the Drawings are typical; similar details apply to similar conditions, unless otherwise shown or specified.

B. Connections:

1. Shop Connections:
   a. Unless otherwise shown or indicated, shop connections may be welded or stainless steel bolted. Unless shown otherwise, welds shall be 1/4-inch minimum.
   b. Where reaction values of a beam are not shown or indicated, connections shall be detailed to support the total uniform load capacity tabulated in AA ADM-1 tables for allowable loads on beams for the given shape, span, and aluminum specified for the beam in question.
   c. Shop-welded connections shall be detailed to eliminate or minimize eccentricity in the connection.
   d. End connection angles fastened to webs of beams and thickness of angles, size and extent of fasteners or shop welds, shall comply with design standards in AA ADM-1. Connections shall be two-sided unless otherwise shown or indicated.
2. Fabrication Considerations Regarding Field Connections:
   a. Unless otherwise specified below or indicated, make field connections using stainless steel bolts.
   b. Field welding is not allowed.
3. Bolted Construction:
   a. Stainless steel design shear values shall be based on bolts with bearing-type connections with threads in the shear plane.

b. Bolted connections shown or indicated as “SC” shall comply with slip-critical connection requirements in AISC Specifications for Structural Joints using ASTM A325 or ASTM A490 Bolts.
   1) Faying surfaces shall have a Class B surface condition.
   2) Slip-critical bolts shall be fully pre-tensioned as indicated in AISC Specifications for Structural Joints using ASTM A325 or ASTM A490 Bolts.

c. Minimum bolt diameter shall be 3/4-inch, unless otherwise shown or indicated.

4. Welded Construction: Comply with AWS D1.2/D1.2M for procedures, appearance, and quality of welds, and methods used in correcting defective welding Work.

C. Bracing:

1. Bracing for which stress is not shown or indicated shall have a minimum two- bolt connection, or shop-welded connection of equivalent strength.

2. Vertical bracing and knee braces connecting to columns shall be on the centerline of columns, unless otherwise shown or indicated.

3. Knee braces shall be at a 45-degree angle, unless otherwise shown or indicated.

4. Connection plates shall be minimum 3/8-inch thick, unless otherwise shown.

D. Columns: Fabrication tolerances shall be as required by AA ADM-1 and AWS D1.2/D1.2M for welded members.

E. Holes and Appurtenances for Other Work:

1. Provide holes required for securing other work to structural aluminum framing, and for passage of other work through framing members, as shown on the Shop Drawings and the Contract Documents. If large block-outs are required and approved, reinforce the webs to develop specified shear strength. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work.

2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not frame cut holes or enlarge holes by burning. Drill holes in bearing plates.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which structural aluminum Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 ERECTION

A. Comply with AA ADM-1 and the Contract Documents.

B. Anchorage Devices:

1. Provide anchorage devices, including anchor bolts, and other connectors required for securing structural aluminum to foundations and other in-place Work.

2. Provide templates and other devices necessary for pre-setting anchorage devices to accurate locations.

3. Refer to Section 05 05 33, Anchor Systems, for anchorage requirements.

C. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of bases and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on stainless steel wedges or other adjusting devices.

2. Tighten anchorage devices after positioning and plumbing supported members. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.

3. Place non-shrink grout between bearing surfaces and bases or plates in accordance with Section 03 60 00, Grouting. Finish exposed surfaces, protect installed materials, and cure in compliance with grout manufacturer's instructions.

4. Leveling plates and wood wedges are not allowed.

D. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure within tolerances specified in AA ADM-1. For members requiring accurate alignment, provide clip angles, lintels, and other members with slotted holes for horizontal adjustment at least 3/8-inch in each direction, or more when required.

2. Splice members only where shown or indicated.

E. Erection Bolts: On exposed, welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

F. Gas Cutting: Do not use gas-cutting torches at the Site for correcting structural framing fabrication errors. Field-cutting will be allowed only on secondary members that are not under stress, as approved by ENGINEER. Finish gas-cut sections equal to sheared appearance when allowed.

G. Protection of Aluminum from Dissimilar Materials:

1. Coat surfaces of aluminum that will contact dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09 91 00, Painting.

3.3 FIELD QUALITY CONTROL

A. OWNER will engage an independent testing and inspection agency to inspect stainless steel bolted connections and welded connections as follows:

1. Visually inspect all welds. Test welds that appear to be visually deficient using non-destructive methods by a qualified testing laboratory. CONTRACTOR shall correct improper workmanship by removing and replacing, or repairing, as instructed by ENGINEER, welds that are defective. Pay for all corrections and subsequent retesting to confirm integrity of welds.

2. Visually inspect all bolted connections.
   a. Visually inspect connections to verify that plies of connected elements are in snug contact.
   b. For connections that are slip-critical or subject to axial tension, inspector shall verify proper pre-tensioning in accordance with Paragraph 2.2.B.3.b of this Section.
   c. Where bolts or connections are defective, correct improper workmanship and materials by removing defective bolts and connections and replacing or repairing as directed by ENGINEER. Pay for corrections and subsequent tests required to confirm integrity of connection.

3. Independent testing and inspection agency shall prepare a report on each structure. Report shall summarize observations made by inspector and be submitted to ENGINEER.

B. Correct defective structural aluminum Work. Perform additional tests, at CONTRACTOR'S expense, necessary to confirm non-compliance of the original Work and to demonstrate compliance of corrected Work.

END OF SECTION 051400

SECTION 055117 – ALUMINUM STAIRS

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 shall provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install aluminum stairs including surface preparation and shop priming.

1. The extent of aluminum stairs shall be as shown.

2. The Work also includes: Providing openings in and attachments to aluminum stairs to accommodate the Work under this and other Sections and providing for the aluminum stairs all items such as anchor bolts, studs and all items required for which provision is not specifically included under other Sections.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the aluminum stairs Work.

C. Related Sections:

1. Section 05 05 33, Anchor Systems.

2. Section 05 14 00, Structural Aluminum Framing.

3. Section 05 52 00, Aluminum Handrails and Railings.

4. Section 05 53 00, Aluminum Grating.

1.3 REFERENCES

A. Standards referenced in this Section are listed below:

1. Aluminum Association (AA), Specification for Aluminum Structures.

2. American Society for Testing and Materials, (ASTM).
   a. ASTM B 209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   b. ASTM B 211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
   c. ASTM B 221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
   d. ASTM B 308/B 308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
   e.

f. ASTM B 429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
g. ASTM F 593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
h. ASTM F 594, Specification for Stainless Steel Nuts.

B. American Welding Society, (AWS).

1. AWS D1.2/D1.2M, Structural Welding Code-Aluminum.

C. National Association of Architectural Metal Manufacturers, (NAAMM).

1. NAAMM, Metal Stairs Manual and Metal Finishes Manual.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations each in satisfactory operation for at least five years.

B. Component Supply and Compatibility:

1. Obtain all products included in this Section regardless of the component manufacturer from a single pre-engineered aluminum stair manufacturer.

2. The pre-engineered aluminum stair manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.

3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pre-engineered aluminum stair manufacturer.

C. Codes: Comply with the applicable requirements of the state and local building codes.

D. Source Quality Control: Contractor shall be responsible for entire design, fabrication and installation of pre-engineered aluminum stair Work.

E. Delegated Design: the Shop Drawings and calculations shall be prepared by a Registered Professional Engineer licensed in the State in which the pre-engineered aluminum stairs will be installed and is a recognized expert in the type of Work shown and specified. The design shall be in conformance with Section 05 14 00, Structural Aluminum Framing.

1.5 SUBMITTALS

A. Action Submittals: Submit the following: Representative samples of materials including nosings, tread material, and other items as requested by the Engineer. Review will be for type only. Compliance with all other requirements is exclusive responsibility of Contractor.

B. Shop Drawings: Erection and detailed Shop Drawings, which show the plan location, elevation and details for the fabrication and erection of the aluminum stair Work. Show anchorage and accessory items. Include details of all connections between all materials.

C. Delegated Design Submittals:

1. Provide signed and sealed Shop Drawings and calculations, which are prepared by a Registered Professional Engineer licensed in the State in which the aluminum stairs will be installed.

2. Provide certification by professional engineer that design of aluminum stairs was performed in accordance with performance and design criteria stated in the Contract Documents, and that design complies with Laws and Regulations and prevailing standards of practice.

1.6 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading: Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection: Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect materials from corrosion and deterioration.

C. Acceptance at Site: All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Pre-engineered aluminum stairs shall comply with the requirements of the NAAMM, "Metal Stairs Manual".

B. Sizes of miscellaneous items such as carrier angles and platform stiffeners, and design stresses shall be as recommended in Section 4 of the "Metal Stairs Manual", unless otherwise shown.

C. All required stair loadings and other stair related requirements shall comply with the governing building code in which the pre-engineered aluminum stairs will be installed.

2.2 FABRICATION

A. General:

1. Use welding for joining pieces together, unless otherwise shown or specified. Welding to comply with the applicable provisions of AWS D1.2/D1.2M. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight and make connections between parts light-proof tight. Provide continuous welds, ground smooth where exposed.

2. Construct stair units to conform to sizes and arrangements as shown. Provide pre-engineered aluminum framing, hangers, columns, struts, clips, brackets, bearing plates and other components for the support of pre-engineered aluminum stairs and platforms. Erect pre-engineered aluminum stair Work to line, plumb, square, and true with runs registering level with floor and platform levels.

3. Provide brackets and bearing surfaces as detailed and as required to anchor and contain the pre-engineered aluminum stairs on the supporting structure.

4. Finish: Provide Architectural mill finish as specified in the NAAMM Manual.

5. Protection of Aluminum from Dissimilar Materials: Coat all surfaces of aluminum in contact with dissimilar materials, such as concrete, masonry and steel.

B. Stair Framing:

1. Fabricate stringers of structural aluminum channels, or plates, or a combination thereof. Provide closures for exposed ends of stringers.

2. Construct platforms of structural aluminum channel headers and miscellaneous framing members. Bolt or weld headers to stringers. Bolt or weld framing members to stringers and headers.

C. Aluminum Grating Treads and Platforms:

1. For aluminum grating and treads, refer to Section 05 53 16, Aluminum Grating.

2. Fabricate grating treads with abrasive nosing on one edge and with aluminum angle or aluminum plate carrier at each end for stringer connections. Secure treads to stringers with bolts.

3. Fabricate grating platforms, with nosing matching that on grating treads, at all landings. Provide toe-plates at open-sided edges of floor grating fastened to platform framing members.

4. Provide platforms 3/8-inch minimum thick with solid abrasive surface matching that on treads. Secure platforms to platform framing members with bolts.

D. Stair Aluminum Railing:

1. Aluminum railings shall conform to the requirements of Section 05 52 15, Aluminum Handrails and Railings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall examine the conditions under which the Work is to be installed and notify the Engineer, 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.

3.2 PREPARATION

A. Provide concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction.

3.3 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing pre-engineered aluminum stairs to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts and other connectors as required. The anchorage devices and fasteners shall be Type 316 stainless steel.

B. Cutting, Fitting and Placement:

1. Perform cutting, drilling and fitting required for the installation of the pre-engineered aluminum stairs. Set the pre-engineered aluminum stairs accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.

2. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

END OF SECTION 055117

SECTION 055200 - ALUMINUM HANDRAILS

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. The Contractor, under this section, shall provide and install all aluminum handrailing as shown on the Drawings or as directed. Unless otherwise shown on the Drawings, all handrailings shall be aluminum.

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

1.3 QUALITY ASSURANCE

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

1.4 SUBMITTALS

A. Submit manufacturer's certificates and calculations indicating the compliance of all OSHA requirements and loadings.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified Professional Engineer responsible for their preparation.

C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

D. Samples for Verification: For each type of exposed finish required.
   1. Sections of each distinctly different linear railing number, including handrails, top rails, posts, and balusters.
   2. Fittings and brackets.
   3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
      a. Show method of connecting members at intersections.

PART 2 - PRODUCTS

2.1 HANDRAILING

A. Aluminum pipe rails and posts shall be 1-1/2 in. nominal diameter pipe made of alloy 6063-T6. Aluminum handrail shall be anodized. The color shall be selected by the Engineer. Railing components, fastenings, and complete structure shall meet all requirements of OSHA. All rails and posts shall be a minimum of Schedule 40 and 80 respectively.

B. All handrails, unless otherwise shown on the Drawings, shall be as follows:
   1. All bottom mounted rails should be 3 ft.-6 in. high, measured from the floor to the top of the rail, with intermediate rail on the posts. Posts shall be placed at a maximum of 6 ft. and at each change in direction. Posts shall be attached to the top of the walkway or curb as shown on the Drawings. The mounting plate shall be made of alloy 6061-T6.
   2. Bends, where called for, shall be shop formed and present pleasing appearance.
   3. The top surface of the top railing shall be smooth and shall not be interrupted by a projecting fitting.
   4. All openings in the railing shall be spanned with a 1/4 in. type 304 stainless steel chain with snap hook at one end and fixed to post at other end. Hooks and eyes shall be stainless steel.
   5. Toe plates shall conform to OSHA Standards. Toe plates shall not be pop-riveted to posts.
   6. Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
      a. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 PAINTING

A. Direct contact between aluminum components and any dissimilar metals shall be prevented by painting the dissimilar metal with primer or asphalt paint.

B. Direct contact between aluminum components and concrete or mortar shall be prevented by painting exposed aluminum surfaces with bituminous paint or water white methacrylate lacquer.

C. Finishing shall be in accordance with Aluminum Association M10C22 A41 Clear Anodized. The handrail system shall be plastic wrapped and not removed until after installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work performed shall be in accordance with the manufacturer's recommendation for installation.

B. All work shall be free from defects of any type which affect durability, strength, or appearance.

C. Support brackets shall be securely anchored into the wall by anchor bolts or wedge type expansion bolts.

D. Posts shall be set on mounting plates attached to the floor or curb by stainless steel concrete anchor bolts in concrete.

E. All erection shall meet OSHA requirements and the manufacturer's recommendations.

F. Upon completion of railing installation all work shall be cleaned to make it acceptable for final inspection.

G. For protection from temperature induced stresses an expansion joint and gap shall be provided in every top rail on a maximum of 24 feet. Top rails only shall have expansion joints between the fixed points. Use 1/8 inch gap between bottom rail and each fitting.

END OF SECTION 055200

SECTION 055300 – ALUMINUM FLOOR GRATING

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 the installing of all aluminum floor gratings as shown on the Drawings and necessary to complete the work of this contract. Gratings include all clips, spacers, frames, supports, fasteners, and other incidental materials needed for a complete installation.

B. Floor grating and frames shall be as detailed on Drawings.

1.3 QUALITY ASSURANCE

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

1.4 SUBMITTALS

A. Samples of each type of floor gratings proposed shall be submitted for approval prior to placement of purchase orders.

B. Manufacturer's catalog data showing:

1. Dimensions, spacing, and construction of grating.

2. Design tables showings limits for span length and deflection under various uniform and concentrated loads.

3. Materials of construction.

C. Detail shop drawings showing:

1. Dimensions of each grating.

2. Sectional assembly.

3. Location and identification mark.

4. Size and type of supporting frames required.

PART 2 - PRODUCTS

2.1 ALUMINUM FLOOR GRATING

A. Material for aluminum floor gratings shall be aluminum alloy 6061-T6 and 6063-T5 for structural supports and frames in accordance with the latest ASTM Specification B221.

B. Gratings shall be furnished with a standard mill finish.

C. Aluminum bar gratings shall be designed for a live load of 300 lbs./sq. ft., unless otherwise and/or except that when located in a roadway it shall be designed to carry a truck rear axle load of 24,000 lbs. Maximum deflection under 100 lbs./sq. ft. load shall not exceed 1/4-in. or 1/180th of the span, whichever is least. Gratings shall be 1-1/2 in. deep with spacer bars spaced not more than 4 in. unless otherwise shown, specified or required.

D. Banding of the ends of bearing bars and around openings through the panels shall be provided by 1/4-in. aluminum bars of the same depth as the panels.

E. Grating shall be fabricated from field dimensions taken after facilities requiring passage through the gratings are in place.

F. Individual grating panels shall not exceed a total weight of 125 lbs. unless otherwise shown or specified.

G. Grating frames shall conform to details on the Drawings. Frames shall be shop welded with full strength welds and all exposed welds ground flush.

H. In a case where frames would be large and bending could occur, field jointing shall be allowed using mechanical joints. All frames shall be adequately braced and strapped to wood blocking during shipment and installation to prevent damage.

2.2 PAINTING

A. Direct contact between aluminum components and any dissimilar metals shall be prevented by painting the dissimilar metal with primer or asphalt paint.

B. Direct contact between aluminum components and concrete or mortar shall be prevented by painting aluminum contact surfaces with bituminous paint or water white methacrylate lacquer.

C. Provide mill finish as fabricated in accordance with NAAMM Finishes Manual. EXECUTION

2.3 INSTALLATION

A. The gratings shall be installed in angle frames set in the floor or fastened thereto to support the gratings. The tops of the gratings shall be set flush with the surface of the floor in which it is installed. No panel shall rock when any part of it is stepped on.

B. A maximum spacing of 1/4 in. shall be maintained between the grating and adjacent surfaces.

C. Type 304 stainless steel fasteners shall be installed where indicated on the Drawings or required.

END OF SECTION 055300

SECTION 260500 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. General

B. Intent of Drawings

C. Interpretation of Drawings

D. Quality Control

E. Submittals

F. Location Environmental Considerations

G. Products

H. Coordination

I. Demolition

J. Electrical Installation

K. Relocate or Make Modifications to Any Existing Electrical, Instrumentation or Control Systems Wiring

L. Quality Assurance

M. Examination

N. Preparation and Storage

O. Installation

P. Field Quality Control

Q. Painting

R. Cleaning

S. Operation - Maintenance and Spare Parts Data

1.2 GENERAL

A. The Electrical Contractor shall be responsible to check with the equipment manufactures of the physical size of the equipment that it will fit and that it can be moved into the indicated locations.

B. Intent of Drawings – The Drawings are not intended to be used for construction purposes for the electrical work, but to supplement the Specifications as to the principal features of the electrical design. The intent of this section is that all equipment and electrical devices furnished and installed under this and other sections of the Specifications be properly interconnected to permit successful system operation regardless of whether all interconnections are specifically referenced in the Specifications and associated Drawings.

C. Interpretation of Drawings

1. The locations of equipment to which electrical connections are to be made are approximate as shown on the drawings. It shall be the Electrical Contractor's responsibility to determine the exact conduit locations by reviewing shop drawings. The sizes of disconnect switches, motor starters, overload heaters, fuses or circuit breakers are approximate, and it shall be the Electrical Contractor's responsibility to obtain the correct sizes based on the actual installed equipment or items. The conduit and wire sizes shown on the drawings are the minimum sizes required and shall not be reduced.

D. Quality Control

1. The Electrical Contractor shall maintain a level of quality of materials and installation means as to assure the completed electrical, instrumentation and control system will be completed in compliance with the Specifications.

E. Submittals

1. Shop Drawings - Submit shop drawings under provision of Section 01061 for all electrical equipment and devices.
2. Shop drawings shall include manufacturer's literature, specifications, schematic diagrams, field wiring interconnection diagrams and any other data necessary to indicate compliance with the Specifications
3. Final "Record" Contract Drawings - Drawings and information required shall include but not be limited to the following:
    a. Conduit runs shall be shown and identified at each end of run, include where conduit originates and the termination. Each conduit shall have a pull string attached and fastened at each end.
    b. Power Distribution Schematics - Show actual installed switching details, cable size and type, conduit size, locations and runs, fuse size and type, circuit breaker frame size, trip setting and type.
    c. Details and Diagrams
4. Elementary Wiring Diagrams – Show actual motor control wiring with wire numbers, telephone system cable routing and station identification with cable numbers.
5. One Line Diagrams - Show equipment names, fuse sizes and types, heater sizes, conduit and wire sizes, motor FLA and horsepower. Include wire and cable numbers or identification.
6. Instrumentation and control Diagrams - Show actual installed, wired instrumentation loop diagrams, include actual installed device Tag Nos, Model Nos, Scaling.

7. Lighting and Device Schedule
    a. Show actual manufacturers and model numbers.
    b. Lighting panel layouts
    c. Actual circuit No. circuit description, breaker size and type.
8. Payment for Division 26 work and materials shall not exceed 90% of the total bid price until all Operations and Maintenance data and record as built drawings have been completed and received by the Owner.

F. Location Environmental Considerations

1. Provide satisfactory operation and maintenance under the following conditions
2. Temperature:
    a. Outside: - 20° to 110° F.
    b. Inside: +40° to 120° F.
3. Relative Humidity: 100 percent
4. Process Temperature:
    a. Liquid: 32° to 105° F
    b. Air: - 32° to 200° F
5. Atmosphere:
    a. As indicated on the drawings
    b. Corrosive atmosphere Hydrogen Sulfide
    c. Wet Locations
        1) As defined in NEC ART 100.
        2) Outside exposed areas, areas indoors near pumps, frequent washdown areas.
    d. The interiors of conduits and raceways located in wet areas shall also classified as wet areas.
    e. Damp Locations
        1) As defined in NEC ART 100.
        2) Areas under covered enclosures.
    f. Wet and Corrosive areas
        1) Enclosures located in areas that are wet and corrosive shall be rated for NEMA 4X Stainless Steel or as noted on the drawings.
    g. Hazardous Areas (Classified)
        1) Areas that are a hazardous area are indicated on the drawings. All new equipment and installation methods shall conform to the requirements in the NEC.

G. Products

1. Electrical materials and equipment shall be new and shall be labeled by the Underwriters Laboratories, Inc when ever standards have been established and the label service applies.
2. Wire and Terminal Labeling - Tag all wire, cable and conduit at each end or termination with suitable permanent tags, printed, stamped, or engraved with the wire, cable or conduit number. The figures on the tags shall be clear and legible.
3. Safety Signs - High voltage warning signs shall be provided and placed at all guarded locations as required by the N.E.C. The signs shall be permanent and conspicuous,

and shall be plainly visible even when doors are open or panels removed from compartments.

4. Engraved Nameplates - Identify all electrical enclosures with engraved phenolic nameplates. Engrave and mount nameplates for all switchgear, disconnect switches, and individual motor starter enclosures indicating equipment served. Nameplates shall be white with black letters. Minimum letter size shall be one-quarter inch.

H. Demolition

1. Electrical Contractor shall disconnect power from existing process equipment scheduled for removal by General Contractor. General Contractor to remove and dispose of actual equipment.
2. Electrical contractor shall perform the complete demolition and removal of electrical distribution equipment where indicated on the electrical contract drawings.

I. Electrical Installation

1. Electrical Contractor shall furnish and install, adjust, connect, and put into satisfactory operation all electrical equipment, control components and instrumentation items as indicated on the Drawings and specified herein.

J. Coordination

1. Electrical Contractor shall review all Specifications and Drawings for the electrical work included under these sections and coordinate this work. Investigate existing conditions in the field before submitting proposal. Become acquainted with the conditions under which the work of this section of the Specifications will be performed and accept all conditions as found.
2. Schedule and coordinate all relocations of, or modifications to electrical, instrumentation or control systems wiring, conduit equipment, or appurtenances to whatever extent is necessary and required in order to conform to structural and architectural conditions, duct work and piping interference's, etc., shall be included under this section of the Specifications.
3. Coordinate with other trades on the project so that all trades install their work to avoid interference with each other. Arrangements made among the trades which result in deviations from Drawings and Specifications are subject to the approval of the Owner.
4. The control panels and/or equipment are to be provided by the equipment supplier, General Contractor, and System Integrator. These items will require power and/or interconnections from the disconnect switch to the control panel and/or field mounted devices or junction boxes for power and control. Specific details to be determined by the shop drawings.

1.3 REFERENCES

A. American National Standards Institute (ANSI).

B. Factory Mutual Engineering Division (FM).

C. Illumination Engineering Society (IES).

D. Institute of Electrical & Electronics Engineers (IEEE).

E. Insulated Cable Engineers Association (ICEA).

F. Instrumentation, Systems and Automation Society (ISA)

G. Joint Industrial Council (JIC).

H. National Electrical Code (NEC).

I. National Electrical Manufacturers Association (NEMA).

J. International Electrical Testing Association (NETA).

K. National Fire Protection Association (NFPA)

L. Occupational Safety and Health Administration (OSHA)

M. Ohio Building Code (OBC).

N. Underwriters' Laboratories Incorporated (UL).

O. ANSI/NEMA 1-2000 Standard Practices for Good Workmanship in Electrical Contracting.

P. Quality Assurance

1. Regulatory requirements
   a. The Contractor shall obtain and pay for all fees for permits and inspections as required.
2. Installation Standards
   a. NEC – installation of electrical items shall be in accordance with the NEC.
   b. Instrumentation and control – Installation of the instrumentation, control system shall be in accordance with standards of the ISA.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect all devices at delivery for damage.

B. Confirm all devices at delivery are as required according to design and shop drawings.

C. Examine the site and structures for any obstructions which may interfere with the electrical installation as planned.

3.2 PREPARATION AND STORAGE

A. Provide a dry heated storage area for all electrical and electronic equipment and devices.

B. Electrical and electronic equipment devices shall be stored and shall be heated to prevent condensation from forming. Electrical and electronic equipment found with condensation in the enclosure or condensation caused damage will not be accepted.

3.3 INSTALLATION

A. The locations of equipment to which electrical connections are to be made are approximate as indicated on the Drawings.

B. It shall be the Contractor's responsibility to check shop drawings relating to equipment requiring electrical connections and to determine the exact conduit locations.

C. Electrical and electronic equipment installed but not energized shall continue to have a heat source to maintain the enclosure free of condensation. Electrical and electronic equipment found with condensation in the enclosure or condensation caused damage will not be accepted.

D. Contractor shall perform all chasing, channeling, drilling and patching necessary. Repair any damage to the building or any equipment. Replace damaged equipment if, in the Engineer's judgment, the repair would not be satisfactory.

E. No work shall be covered or hidden from view until it has been inspected and approved by the Engineer.

F. Any workmanship or materials not meeting the requirements of the Specifications or Drawings shall be immediately replaced by the Contractor without cost to the Owner and to the satisfaction of the Owner.

G. All wiring shall have permanent labels at all terminations and junctions of the wires and on all field wiring terminal strips.

H. Safety signs shall be furnished and installed on or around all electrical equipment.

I. Permanent marking labels shall be installed on exposed sides of each piece of electrical equipment, pull boxes, junction boxes and terminal boxes stating the maximum voltage level involved with the associated equipment.

J. Concrete equipment pads for electrical equipment shall be furnished and placed by the Electrical Contractor.

3.4 PAINTING

A. All wood panel mounting boards shall be painted.

B. All electrical enclosures shall undergo a phosphatizing prepainting treatment. Final paint coats shall be a polyester powder coating with ANSI 61 light gray color for enclosures

mounted inside and with ANSI 24 medium gray color for enclosures mounted outside.

C. Remove any rust and touch up any scratches on all new electrical devices or enclosures with matching touch-up paint as supplied by the manufacturer.

3.5 FIELD QUALITY CONTROL

A. Major components of the Electrical System shall be tested per NETA standards. NETA's Standard Specification for Testing, Parts 1 to 5, shall govern all testing.

B. The following tests are per NETA Acceptance Testing Specifications, Part 7, Inspection and Test Procedures. Visual and Mechanical Inspections shall be performed for all equipment.

1. Cables - Low Voltage shall have the following tests: Insulation resistance, continuity.
2. Circuit Breakers - Low Voltage (Molded Case) that are rated at over 100 amps shall have the following tests: Contact resistance, time-current characteristic, instantaneous pickup current, insulation resistance.
3. Grounding Systems shall have the following test: Fall of potential.
4. Surge Arresters shall have the following tests: 60 hz sparkover, insulation power factor, ground continuity.

C. After all testing has been completed to the satisfaction of the Owner, the entire Electrical (Power) System shall operate for a minimum test period of 30 days. Cumulative down time of all components furnished under Division 26 shall not exceed 1/2 hour as recorded by the Engineer during the test period. System documentation shall be delivered on the last day of test period. Test period shall not end until system documentation has been delivered. If the cumulative downtime limit is exceeded, the Engineer shall have the following options.

1. Extend the test period as required until the cumulative downtime during the preceding 30 days does not exceed 1/2 hour as recorded by the Engineer.
2. Sub-systems which have no components contributing to the cumulative downtime will be approved as partial acceptance.

D. Sub-systems which have components that contributed to the cumulative downtime shall have their test period begin after all repairs and adjustments have been made.

3.6 OPERATION - MAINTENANCE AND SPARE PARTS DATA

A. Submit specific data and information required under individual Division 26 Sections.

1. Submit operation data as required.
2. Submit maintenance data as required.
3. Spare Parts Data - Submit as required.
4. Parts and supplies judged to be necessary to keep equipment and control system operating successfully for first year of operation shall be furnished.

5. Review individual sections for required lists of spare parts to be furnished.

3.7 CLEANING

A. All areas are to be cleaned of construction debris and wire. Electrical equipment is to be cleaned of all construction dirt, dust, etc.

B. All electrical and electronic equipment shall be kept clean and free of all dust, dirt, and debris at all times.

C. All electrical and electronic boxes and enclosures shall have the covers of these boxes and enclosures closed and sealed except when actually working in these boxes and enclosures.

END OF SECTION 260500

SECTION 260519 – LOW VOLTAGE CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Building wire and cable.

B. Wiring connectors and connections.

1.2. RELATED SECTIONS

A. Section 260553 - Electrical Identification.

1.3. REFERENCES

A. Quality Control: Follow requirements for references and standards.

B. NECA Standard of Installation (National Electrical Contractors Association).

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).

D. NFPA 70 - National Electrical Code.

1.4. SUBMITTALS FOR REVIEW

A. Submittals: Follow procedures for submittals.

B. Product Data: Provide for each cable assembly type.

1.5. SUBMITTALS AT PROJECT CLOSEOUT

A. Contract Closeout Submittals – Follow as required.

B. Project Record Documents: Record actual locations of components and circuits.

1.6. QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.7. REGULATORY REQUIREMENTS

A. Conform to NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories Inc., or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.8. PROJECT CONDITIONS

A. Verify that field measurements are as indicated.

B. Conductor sizes are based on copper only.

C. Wire and cable routing indicated is approximate unless dimensioned.

1.9. COORDINATION

A. Coordinate Work under provisions of Section 260500.

B. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Manufacturers:

1. Okonite Company.
2. Alpha Wire Company.
3. Southwire
4. Substitutions: Follow as required for Material and Equipment.

B. Description: Multi-stranded insulated copper wire, #12 AWG minimum for feeders and branch circuits and #14 AWG minimum for control circuits.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: NFPA 70; Type XHHW or THWN insulation for service, feeders and branch circuits and control circuits.

2.2 WIRING CONNECTORS

A. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.

B. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller. Buchanan crimp (Split cap and insulator) or Ideal crimp connector with wrap cap insulator.

C. Use Adhesive-lined heat shrink tubing for watertight connections; T & B, 3M, or Raychem.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

A. Quality Control: Follow as required by manufacturer's instructions.

B. Route wire and cable as required to meet Project Conditions.

C. Install cable in accordance with the NECA "Standard of Installation."

D. Use stranded conductors for control circuits.

E. Use conductor not smaller than 12 AWG for power and lighting circuits.

F. Use conductor not smaller than 14 AWG for control circuits.

G. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet (25 m).

H. Pull all conductors into raceway at same time.

I. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

J. Protect exposed cable from damage.

K. Use suitable cable fittings and connectors.

L. Neatly train and lace wiring inside boxes, equipment, and panelboards.

M. Clean conductor surfaces before installing lugs and connectors.

N. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

O. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape un-insulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

P. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

Q. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

R. Identify and color code wire and cable under provisions of Section 16075. Identify each conductor with its circuit number or other designation indicated.

S. Replace conductors damaged during installation.

T. No splices are allowed in conduits or raceways.

3.4 FIELD QUALITY CONTROL

A. Starting of Systems: Follow requirements for field inspection, testing, and adjusting.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION 260519

SECTION 260520 – SHIELDED INSTRUMENTATION & VARIABLE FREQUENCY DRIVE CABLE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope: Furnish all labor, materials, equipment and incidentals required to provide shielded cable as shown and specified.

1.2 SUBMITTALS

A. Shop Drawings:

1. Comply with Section 013323.

B. Product data:

1. Submit for review, copies of manufacturer's engineering data and technical information for shielded instrumentation cables proposed for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Instrumentation Cable

1. Single Shielded Pair or Triad: 300 volt.
   a. Tinned copper, 18 AWG or larger, stranded, polyethylene insulated conductors twisted with aluminum-polyester shield, stranded tinned 20 AWG copper drain wire and overall chrome vinyl jacket, 100 percent shield cover. Rated for 300 volts minimum.
   b. Products and Manufacturers:
      1) Belden No. 8760, No. 8770, No. 9318, or No. 9365
      2) Alpha No. 2422, No. 2432.
2. Multi-paired Shielded 300 volt:
   a. Tinned copper, 18 AWG, stranded PVC insulated conductors, twisted in pairs with aluminum-polyester shield over each pair and its stranded drain wire (20 AWG), overall chrome vinyl jacket, 100 percent shield cover.
   b. Products and Manufacturers:
      1) 3 pair - Belden No. 9369.
      2) 6 pair - Belden No. 9389.
      3) 9 pair - Belden No. 9390.
      4) 11 pair - Belden No. 9391.
      5) 15 pair - Belden No. 9392.
      6) Dekoron Poly-set.
      7) Okonite type SP-OS.

B. Variable Frequency Drive Shielded Cable

1. Four conductor shielded cable
    a. Shielding to have an overall shield with an 85% tinned copper braided shield.
    b. Cable to be Belden Variable Frequency Drive Cable 29502 through 29531 wire size as indicated or equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Delivery, Storage and Protection: Comply with Section 016600.

3.2 INSTALLATION

A. Install in conduit separated from power cables unless otherwise shown on the Drawings.

B. Install instrumentation cable conduits as far as possible from power cable conduit.

C. Ground shield at one end only, as recommended by instrument manufacturer, and as approved by the Owner.

D. Terminate stranded conductors with pre-insulated crimp type ring tongue terminals properly sized to fit fastening device and to fit wire size.

E. Identification: Identify all conductors at each terminal and splice location. Identification number labels shall be Thomas & Betts type WSL cable markers or equal with clear heat shrink tubing over the marker.

F. Install CAT 5e and CAT 6 cabling in accordance with Commercial Building Telecommunications Pathways and Spaces ANSI/TIA/EIA 569-A and Commercial Building Telecommunications Cabling Standard ANSI/TIA/EIA 568-A.

3.3 TESTING

A. Test each circuit in the presence of the Owner after permanent cables are in place to demonstrate that the circuit and connected equipment perform satisfactorily and that they are free from improper grounds and short circuits.

B. Maintain a written record of circuits being tested, marking down circuit number and descriptive function and results of each step in the test procedures including repeated tests.

C. Any cable or a portion of the cable which fails when tested shall be replaced with a new cable for the full length and retested.

END OF SECTION 260520

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.2 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.3 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms maximum.

1.4 SUBMITTALS

A. Product Data: Provide for grounding connectors.

B. Test Reports: Indicate overall resistance to ground (and resistance of each electrode).

C. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Sections 017839.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.1 MECHANICAL CONNECTORS

A. Manufacturers:

1. Burndy Corp.
2. O-Z/Gedney.

B. Material: Bronze.

2.2 EXOTHERMIC CONNECTIONS

A. Manufacturers:

1. Erico “Cadweld”.

2.3 WIRE

A. Material: Stranded copper.

B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Provide bonding to meet Regulatory Requirements.

C. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.2 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION 260526

SECTION 260529 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

C. Concrete equipment supports

1.2 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 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.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Anchors and Fasteners:

1. Concrete block walls: Use expansion anchors.
2. Steel Structural Elements: Use welded fasteners.
3. Concrete Surfaces: Use expansion anchors.

2.2 CHANNEL SYSTEMS

A. Manufacturer:

1. Unistrut, B-Line, Allied Power -Strut.
2. or Equal

B. Description:

1. Galvanized steel. - General locations
2. Aluminum- Wet, damp areas
3. Stainless steel - Wet, damp corrosive areas where compatible with chemicals
4. Fiberglass - Wet, damp, corrosive areas where compatible with chemicals

C. Size: 1 5/8” X 1 5/8”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation."

C. Do not fasten supports to pipes and conduit except as shown on Drawings.

D. Obtain permission from Engineer before drilling or cutting structural members.

E. Fabricate supports from structural steel, galvanized steel, aluminum or stainless steel channel. Rigidly weld members or use stainless steel hex head bolts and hardware to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

F. Install surface-mounted cabinets and panel boards with minimum of four anchors.

G. In wet and damp locations use stainless steel or aluminum channel supports with stainless steel fasteners.

H. In wet and damp locations use stainless steel or aluminum spacers to stand cabinets and panel boards one inch off wall.

I. Spray coat cut end of galvanized steel channel or rigid steel conduit with spray cold galvanizing.

J. Galvanized pipe used as equipment supports are to have the open ends capped with galvanized end caps.

K. Provide concrete equipment pad, housekeeping pads, for all equipment that will be floor mounted. Pads to be formed, chamfer edges, and have a troweled finish. Concrete shall be smoothed around conduits. Equipment panels shall be anchored using concrete anchors. Equipment pads for outdoor mounted panels shall extend from the front of the equipment panel 3’-6” min. to allow for opening and standing.

END OF SECTION 260529

SECTION 260533 - CONDUIT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. PVC coated rigid galvanized steel required for all new installations.

B. Flexible metal conduit.

C. Liquid-tight flexible metal conduit.

D. Fittings and conduit bodies.

1.2 RELATED SECTIONS

A. Section 260529 - Supporting Devices.

B. Section 260553 - Electrical Identification.

C. Sections 260534- Boxes.

1.3 REFERENCES

A. NEC Article 500 and 501

B. NEC 501.10(B) – Wiring Methods (Div 2)

C. NEC 501.15 – Sealing

D. NFPA 820 – Fire Protection in Wastewater Treatment and Collection Facilities

E. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

F. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

G. ANSI/NFPA 70 - National Electrical Code.

H. NECA "Standard of Installation."

I. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

J. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.4 SUBMITTALS

A. Submit under provisions of Section 013323.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid-tight flexible metal conduit, nonmetallic conduit, flexible nonmetallic conduit, fittings, conduit bodies of each type planned to be used.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of project general requirements.

B. Accurately record actual routing of all conduits exposed and concealed on record drawings.

1.6 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Section 016600.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.8 PROJECT CONDITIONS

A. Verify routing and termination locations of conduit prior to rough-in.

B. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Minimum Size: 3/4 inch unless otherwise specified.

B. Underground Installations:

1. More than two feet from Foundation Wall: Use schedule 40 PVC conduit.
2. Within two feet from Foundation Wall: Use plastic coated galv. rigid conduit.
3. In or Under Slab on Grade: Use schedule 40 PVC conduit.
4. When changing from underground to above ground, use PVC coated galv. rigid conduit to approximately two feet above finished grade.

5. Conduits passing through poured concrete sidewalks, floating type slabs on grade shall be sleeved.

C. Outdoor Locations, Above Grade: Use rigid galvanized steel conduit.

D. In Slab Above Grade:

1. Use schedule 40 PVC.
2. Maximum Size Conduit in Slab: 3/4" for conduits crossing each other.

E. Continuously Wet and Damp Locations: PVC coated rigid steel conduit.

F. Corrosive Location: Use PVC coated rigid steel or schedule 40 PVC.

G. Dry Locations:

1. Concealed in framed wall or above suspended ceilings: Use steel electrical metallic tubing.
2. Exposed: Use rigid galvanized steel or as noted on drawings.
3. Flexible metal conduit can be used for equipment connections. Max length of 3ft.

H. Classified hazardous Class 1, Division 1 areas & Screen Rooms: PVC coated rigid steel conduit and explosion-proof flexible equipment connections.

I. Equipment Connections:

1. Use liquid-tight flexible metal conduit.
2. In corrosive or chemical rooms, use non-metallic flexible conduit and fittings.

J. Flexible Conduits shall be limited to three feet or less.

2.2 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

Fittings and Conduit Bodies: ANSI/NEMA FB 1 all steel fittings.

2.3 PVC COATED METAL CONDUIT

A. Manufacturers:

1. Robroy Industries "Plasti-Bond."
2. Thomas –Betts – “OCAL Blue”.

B. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 40 mil thick.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating to match conduit.

D. Expansion fittings to comply with UL 651; rated for environmental conditions where installed, and including flexible external bonding jumper.

2.4 FLEXIBLE METAL CONDUIT

A. Description: Interlocked aluminum construction.

B. Fittings: ANSI/NEMA FB 1.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Sealtight VA Anaconda Metal Hose Div.
2. Liquidtight type L.A. Electric Flex Co.

B. Description: Interlocked aluminum construction with PVC jacket.

C. Fittings: ANSI/NEMA FB 1.

2.6 NONMETALLIC CONDUIT

A. Manufacturers:

1. Carlon Electrical Products Div.
2. LCP.
3. Quil.

B. Description: NEMA TC 2; Schedule 40 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

J. Route exposed conduit parallel and perpendicular to walls.

K. Route conduit in and under slab from point-to-point.

L. Do not cross conduits in slab unless ¾" conduits.

M. Maintain adequate clearance between conduit and piping.

N. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

O. Cut conduit square using saw or pipe cutter; de-burr cut ends.

P. Bring conduit to shoulder of fittings; fasten securely.

Q. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

R. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

S. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.

T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

U. Provide suitable fittings to accommodate expansion and deflection where conduit crosses, control and expansion joints.

V. Conduits shall be sloped in such a manner that water may drain to the closest pull box if possible.

W. Provide suitable pull string in each empty conduit except sleeves and nipples.

X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

Y. Ground and bond conduit under provisions of Section 260526.

Z. Identify conduit under provisions of Section 260553.

AA. Flexible conduit, non-metallic, liquid-tight and metallic, shall not be used in length longer than 6ft unless specifically approved. Flexible conduit is not to be used in place of neatly run rigid conduit.

BB. Where called out on plans provide cable terminators / sealing bushings, CRC by O-Z/Gedney or approved equal. Verify specific cable outside diameters and follow manufacturer's installation requirements.

CC. Coordinate with General Contractor for conduit floor and wall penetrations to avoid interference with equipment or reserved spaces.

DD. Reuse existing conduit and raceways for new work where possible. Reused conduit shall be inspected, cleaned or replaced if necessary,

END OF SECTION 260533

SECTION 260534 - PULL, JUNCTION BOXES AND ENCLOSURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pull Boxes

B. Junction Boxes

C. Accessories

1.2 RELATED SECTIONS

A. Section 260529 - Supporting Devices.

1.3 REFERENCES

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.

C. ANSI/NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Submit under provisions of general project requirements and Section 260500.

B. Product Data: Provide manufacturer's standard data for boxes and enclosures.

C. Junction box locations and details

1. Terminal block layout
2. Grounding

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hoffman.

B. Rittal.

C. Or Equal

2.2 PULL BOXES

A. Construction:

1. Outdoors, Wet Damp areas, Corrosive areas. NEMA Type 4/4X, sunlight resistant fiberglass, polycarbonate or SS as specified on Drawings, enclosure with continuous hinge covers.
   a. Covers: Continuous SS hinge, held closed by SS screws
2. Indoors exposed NEMA 12, 13 or as specified on Drawings.
3. Indoors flush wall mounted NEMA 1 w/ flush covers
4. Indoors concealed NEMA 1 w/ screw cover
5. Indoor wet and damp NEMA 4XSS
6. Indoor corrosive areas NEMA 4XSS or compatible with chemical
7. Hazardous locations NEMA 7

2.3 TERMINAL HINGED COVER ENCLOSURES

A. Construction:

1. Outdoor, Wet Damp areas, Corrosive areas. NEMA 4/4X, sunlight resistant fiberglass or polycarbonate or SS as specified on Drawings, Type 4/4X enclosure with continuous hinge cover.
   a. Covers: Continuous SS hinge, held closed by flush latch operable by screwdriver.
2. Indoors exposed NEMA 12, 13
3. Indoors flush wall mounted NEMA 1 w/ flush covers
4. Indoors concealed NEMA 1 w/ screw cover
5. Indoor wet and damp NEMA 4XSS
6. Indoor corrosive areas NEMA 4XSS or compatible with chemical
7. Hazardous locations NEMA 7

B. Provide white enamel interior metal panel for mounting terminal blocks and electrical components.

2.4 CABINETS

A. Provide metal barriers to form separate compartments containing control wiring at less than 50 volts from power wiring.

B. Provide accessory feet for free-standing equipment.

2.5 TERMINAL BLOCKS

A. Manufacturers:

1. Weidmuller SAK 6, SAK 2.5, ASK 1.
2. Allen-Bradley
3. Sq. D
4. Or equal

B. Terminal Blocks: ANSI/NEMA ICS 4.

C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.

D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts. Ground terminal shall be green.

E. Provide ground bus terminal block, with each connector bonded to enclosure.

F. Provide a typed legend of cables and terminal numbers with origin and destination.

G. Boxes where water may drain from the attached conduits shall have drains installed in the bottom or the lowest point of the box. Conduit penitration at such boxes shall be located along the sides or top of the box. Conduits shall not be installed in a manner that water can enter attached pull conduits.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.

C. Do not attach boxes directly to masonry, concrete, or brick walls but provide a 1/4 inch spacer of PVC, nylon, or stainless steel.

D. Install enclosures and boxes using stainless steel fasteners.

E. Provide supports where required when no wall or other adequate support is available.

END OF SECTION 260534

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

C. Conduit markers.

1.2 REFERENCES

A. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submit under provisions of Section 260500.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates:

1. Equipment Identification: Engraved three-layer laminated plastic, black letters on white background.
2. Emergency Powered Equipment: Engraved three-layer laminated plastic, black letters on red background. As required by NEC
3. Equipment supply voltage and phase: Engraved three-layer laminated plastic, black letters on yellow background. (ie 480/277V 3PH)
3. Equipment power source identification: Engraved three-layer laminated plastic, black letters on yellow background. (ie SOURCE: MCC1 CB-1A)

B. Locations:

1. Each electrical distribution and control equipment enclosure.
2. Junction box.

C. Letter Size:

1. Use 1/8 inch letters for identifying individual equipment and loads.
2. Use 1/4 inch letters for identifying grouped equipment and loads.

D. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, and control device stations.

2.2 WIRE MARKERS

A. Manufacturers:

1. T & B Shrink-Kon HVM wire markers.
2. Panduit - Pan Code HSDL.
3. Brady.

B. Description: Tubing type wire markers.

C. Locations: Each conductor at panelboard gutters, outlet and junction boxes, terminal strip and each load connection.

D. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on Drawings.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings or on shop drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

A. Install nameplate parallel to equipment lines.

B. Secure nameplate to equipment front using stainless steel screws, rivets, or adhesive.

C. Identify underground conduits using foil backed underground warning tape. Install one tape per trench at 6 inches below finished grade.

END OF SECTION 260553

SECTION 262816 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fusible switches.
B. Safety Disconnect switches

1.2 RELATED SECTIONS

A. Section 260553 – Electrical Identification

1.3 REFERENCES

A. NECA - Standard of Installation (published by the National Electrical Contractors Association).
B. NEMA FU1 - Low Voltage Cartridge Fuses.
C. NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
D. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (published by the International Electrical Testing Association).
E. NFPA 70 - National Electrical Code.
F. NEC Article 500 and 501
G. NEC 501.10(B), 501.130, 501.15
H. NNFPA 820 (hazardous area classification for WWTPs)

1.4 SUBMITTALS FOR REVIEW

A. Follow requirements for submittals, procedures for submittals, in general project requirements.
B. Product Data: Provide switch ratings and enclosure dimensions.

1.5 SUBMITTALS FOR CLOSEOUT

A. Record actual locations of enclosed switches in project record documents.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.
B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Follow requirements for material and equipment in general project requirements: Product options and substitutions.
B. Eaton
D. Square D.
E. Siemens Energy and Automation
F. General Electric / ABB
G. Substitutions: Engineer Approved Equal.

2.2 FUSIBLE SWITCH ASSEMBLIES

A. Description: NEMA KS 1, Type HD enclosed load interrupter knife switch. Handle lockable in OFF position.
B. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses.
C. Short Circuit rating: 200,000 amps

2.3 ENCLOSURES

A. Fabrication: NEMA.
    1. Provide NEMA 7 and listed for Class 1 Div 2 installation.
    2. Interior Dry Locations: Type 1 or 12 as indicated on Drawings.
    3. Exterior Locations: Type 4X SS.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."
B. Install fuses in fusible disconnect switches.
C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.2 FIELD QUALITY CONTROL

A. Follow requirements for Starting of Systems in general project requirements: Field inspection, testing.
B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION 262816

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.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Metal Fabrications" for materials for attaching hangers and supports to building structure.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, “Guidelines on Terminology for Pipe Hangers and Supports.”

1.4 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 trapeze for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.5 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 pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

C. 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.

D. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.

1.6 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and trapeze by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified:

1. Pipe Hangers:
   a. AAA Technology and Specialties Co., Inc.
   b. B-Line Systems, Inc.
   c. Carpenter & Patterson, Inc.
   d. Empire Tool & Manufacturing Co., Inc.
   e. Globe Pipe Hanger Products, Inc.
   f. Grinnell Corp.
   g. GS Metals Corp.
   h. Michigan Hanger Co., Inc.
   i. National Pipe Hanger Corp.
   j. PHD Manufacturing, Inc.
   k. PHS Industries, Inc.
   l. Piping Technology & Products, Inc.
2. Channel Support Systems:
   a. B-Line Systems, Inc.
   b. Grinnell Corp.; Power-Strut Unit.
   c. GS Metals Corp.
   d. Michigan Hanger Co., Inc.; O-Strut Div.
   e. National Pipe Hanger Corp.
   f. Thomas & Betts Corp.
   g. Unistrut Corp.
   h. Wesanco, Inc.
3. Thermal-Hanger Shield Inserts:
   a. Carpenter & Patterson, Inc.
   b. Michigan Hanger Co., Inc.
   c. PHS Industries, Inc.
   d. Pipe Shields, Inc.
   e. Rilco Manufacturing Co., Inc.
   f. Value Engineered Products, Inc.
4. Powder-Actuated Fastener Systems:
   a. Gunnebo Fastening Corp.
   b. Hilti, Inc.
   c. ITW Ramset/Red Head.

d. Masterset Fastening Systems, Inc.

2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.

1. General:
   a. Interior hangers, rods, supports, etc. to be corrosion resistant, hot dipped galvanized steel.
   b. Exterior hangers, rods, supports, etc. to be corrosion resistant, Type 304 or 316 stainless steel.
2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
3. All attachments to precast hollow-core concrete slabs shall comply with slab manufacturer’s installation instructions.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

1. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.
2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.

1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
2. Material for Cold Piping: ASTM C 552, Type I cellular glass with vapor barrier.
3. Material for Cold Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
4. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
5. Material for Hot Piping: ASTM C 552, Type I cellular glass.
6. Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate.
7. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
8. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
9. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 MISCELLANEOUS MATERIALS

A. 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.

B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

D. Grout: ASTM C1107, Grade B, factory-mixed and -packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.

1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
2. Properties: Non-staining, noncorrosive, and nongaseous.
3. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATION

A. General: Interior hangers, rods, supports, etc. to be corrosion resistant, hot dipped galvanized steel. Exterior hangers, rods, supports, etc. to be corrosion resistant, Type 304 or 316 stainless steel.

B. All attachments to precast hollow-core concrete slabs shall comply with slab manufacturer’s installation instructions.

C. Specific hanger requirements are specified in Sections specifying equipment and systems.

D. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450-deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated stationary pipes, NPS 3/4 to NPS 8.
7. Adjustable Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.
9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated stationary pipes, NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450-deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450-deg F piping installations.

H. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.

b. Medium (MSS Type 32): 1500 lb.
c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where head room is limited.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

J. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.

4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
a. Horizontal (MSS Type 54): Mounted horizontally.

b. Vertical (MSS Type 55): Mounted vertically.
c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.

1. Field assemble and install according to manufacturer's written instructions.

C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

D. Install building attachments within concrete slabs or attach 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, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

E. 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.

F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. All piping shall be adequately supported and braced by means of adequate hangers, concrete piers, pipe supports, brackets, or as otherwise shown on the plan or recommended by the pipe and equipment manufacturer requirements. No pipe support shall fall on a pipe joint. Contactor shall provide unions and flexible couplers (not shown on plans) to provide adequate removal of valves and equipment.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

L. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.9.
2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

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: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

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.

1.2 SUMMARY

A. This Section includes materials, equipment, appurtenances, operators, and incidentals required for process valves and miscellaneous fittings, as shown and specified. Work includes all types of valves and miscellaneous fittings required for buried, exposed, submerged, and other types of piping except where otherwise specifically included in other Sections.

B. Extent of each type of valve size of valve required is indicated on drawings and/or schedule.

C. All valves used for a particular service are to be of the same manufacturer, make and style for each valve type.

D. 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 place, tested, and ready for service in conformance with project conditions.

1.3 SUBMITTALS

A. General: Submit the following in accordance with the conditions of the 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. Supply valves and appurtenances are standard products in regular production by a manufacturer whose products have proven reliable in similar service for at least three (3) years.

B. All valves used for a particular service are to be of the same manufacturer, make and style for each valve type.

C. All shaft couplings and mounting plates shall be coordinated by, approved by, and warranted by the valve manufacturer.

D. Each valve shall be subjected to operation and hydrostatic tests at the manufacturer's plant as specified within applicable AWWA Standards.

E. 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 the 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 the 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.

PART 2 - PRODUCTS

2.1 GENERAL

A. Manufacturer’s Name and Working Pressure: Cast information in raised letters on valve body.

B. Valve bodies shall be of either gray or ductile cast iron.

C. Valves shall have non-rising stems, open by turning left or counterclockwise, and be provided with either a 2-inch square nut for buried valves or a 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.

D. All body bolts and nuts shall be bronze or stainless steel for buried, submerged or non-protected applications and cadmium plated for exposed or interior applications that will receive protective finish coatings.

2.2 VALVES

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. Valves shall provide a 100% port of nominal pipe size when fully open. The 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 the steam above the 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 manufactured by:

1. American Flow Control,
2. Clow
3. M & H
4. Mueller, U.S. Pipe
5. Or an approved equal.

2.3 BUTTERFLY VALVES – WATER

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 disc edge surface for body applied seats.

E. Full body style valve seats shall be of Buna-N (Nitrile) rubber applied to either the body:

1. Body applied seats shall be retained by a bonding process meeting ASTM-D-429, Test Method "B" or may be mechanically retained.

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.

2.4 Valves shall be as manufactured by: DeZurik, Mueller, Pratt, or an approved equal.

2.5 CHECK VALVES – WATER

A. Swing Check: Valves shall be quiet-closing and constructed for a minimum of 150 pounds working pressure. They shall be an iron body, stainless steel body seats, with an outside lever and adjustable weights, and have hinge pins of stainless steel.

B. Valves shall be as manufactured by: Valves shall be a product of Clow, GA, APCO, or an 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 equivalent. Cushioned check valves shall be installed in the noted locations.

D. Valves shall be in full compliance with the latest revision of AWWA Specification C508.

2.6 GATE OR TAPPING VALVES

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. Valves shall provide a 100% port of nominal pipe size when fully open. The 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 the steam above the thrust collar.

E. Thrust bearings shall be of the low-friction torque reduction type, located both above and below the steam collar.

2.7 PLUG VALVES

A. Valves shall be the non-lubricated, 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 a raised surface weld to ensure 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 or elastomer-coated ductile iron ASTM A536 Grade 65-45-12. 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 the valve in line under pressure. Round-shaped ports are not acceptable.

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 type and shall be externally adjustable and replaceable without removing the valve or actuator while under pressure.

F. Plug Valves 4-inch and above shall be equipped with a gear and handwheel.

G. Valves shall be as manufactured by: DeZurik, or an approved equal.

2.8 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 nuts, handwheel, cranks, 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 the installed centerline of the 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 the 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).

2.9 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.

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 for lifting 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 TESTING

A. All valves shall be tested in place by the Contractor as far as practicable under conditions for the pipelines in which they are placed, and defects revealed in valves or connections under test shall be corrected at the expense of the Contractor to the satisfaction of the Engineer.

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 maintaining instructions, and a complete parts and recommended spare parts list. The O & M Manuals shall comply with the General Requirements of these specifications.

END OF SECTION 400523

SECTION 412213 – PORTABLE ADJUSTABLE GANTRY CRANE

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 WORK INCLUDED

A. The Contractor shall furnish and install an aluminum gantry crane with a minimum rated capacity of two (2) tons and overall span of 12 feet. The gantry crane shall be a modular, pre-engineered design, portable, corrosion-resistant system, designed for manual operation with minimum operating effort. The gantry crane shall provide adjustable height and span settings and shall be capable of safe relocation while supporting a suspended load within the manufacturer's rated capacity.

B. A-frame Gantry Crane shall provide coverage of a rectangular area of size and consist of:

1. A-Frame fabricated Gantry crane from mechanical tubing.
2. Standard I-beam and hardware assembly
3. Four-position swivel lock casters and polyurethane wheels
4. Adjustable-span I-beam.
5. Manual push trolley.
6. Chain hoist.
7. Locking casters.
8. All accessories required for a complete operating system

C. The gantry crane shall be designed for portable lifting and maintenance of the screw press drums as described herein and indicated on the Contract Drawings.

1.3 REFERENCES

A. Comply with the latest editions of:

1. ASTM B221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire Profiles, and Tubes.
2. ANSI/ASME B30.2 – Overhead and Gantry Cranes.
3. ANSI/ASME B30.11 – Monorails and Underhung Cranes
4. ANSI/ASME B30.16 – Overhead Hoists.
5. OSHA 29 CFR 1910.179 – Overhead and Gantry Cranes
6. AWS D1.1/D1.2/D1.2M – Structural Welding Code and Aluminum Welding.

1.4 QUALITY SERVICE

A. Manufacturers' Qualifications: A company with more than 30 years of experience successfully designing and manufacturing cranes and material handling solutions.

B. A single manufacturer shall manufacture crane components.

C. Crane shall be designed, fabricated, and installed in accordance with ANSI B30.11 and OSHA 1970.179.

D. Deflection Guidelines: Aluminum Gantry Crane shall be designed with a maximum deflection of L/450.

1.5 SUBMITTALS

A. Product Data:

1. Product data shall be included for the crane and all accessories. Product data shall provide capacities, performance, standard operations, and applied forces to the foundation.
2. Manufacturer's catalog data.

B. Shop Drawings

1. Shop drawings shall outline crane configuration, dimensions, and installation details.
2. Manufacturer's Installation Instructions

C. Manufacturer's Warranty

D. Operation and Maintenance Manual:

1. Provide complete parts, operating, and maintenance manuals covering equipment at the time of installation, including, but not limited to:
   a. Description of system and components.
   b. Schematic diagrams.
   c. Manufacturer's printed operating and maintenance instructions.
   d. List of original manufacturer's parts, including suppliers' part numbers and cuts, recommended spare parts storage quantity, and local parts and service source.

E. Structural calculations certified by a Professional Engineer registered in the state of the Project.

F. Load test certification.

1.6 WARRANTY

A. Manufacturer's Warranty shall cover repair or replacement for manual crane products to cover defects in materials and execution within the warranty period of ten (10) years from the date of shipment.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver equipment in manufacturer's containers appropriately packaged and/or crated for protection during domestic shipment and storage in humid, dusty conditions.

B. Project Conditions

1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by the manufacturer.

2. Do not install products under environments

C. Delivery, Storage, and Handling

1. Store products in manufacturer's packaging until ready for installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with these Specifications:

1. A-Series Aluminum gantry Crane, two (2) tons capacity, with overall span of 12 feet, manufactured by Spanco, Inc., 604 Hemlock Road, Morgantown, PA 19543; phone: (800)869-2080.

2.2 DESIGN, CAPACITY AND SIZE

A. Design Factors: Gantry Crane shall be designed to meet all specifications using a 25 percent factor of rated load for impact and a 15 percent factor of rated load for hoist and trolley weight.

B. Design Loading

1. Gantry cranes shall support:
   a. Rated load.
   b. Trolley weight.
   c. Hoist weight.
   d. Impact factors required by ANSI/ASME standards.

C. Crane shall remain stable against overturning under all operating conditions within the manufacturer's rated capacity.

D. The gantry crane unit must be allowed to be moved under load.

E. Construction

1. Aluminum, fabricated from T6061 Aluminum sections with finished ends and surfaces.

2. Safety factor in accordance with applicable ANSI and OSHA requirements.

F. Capacity

1. Rated capacity: 4,000 pounds or 2 tons
2. Capacity shall be maintained throughout the entire adjustable span range.

G. Span

1. Clear span: 10’-9”.
2. Adjustment shall be field-configurable without drilling or welding.

H. Hight

1. Under-beam clearance height: 9’-10” to 12’-2”.
2. Height adjustment shall be provided in increments not exceeding 6 inches.
3. Overall crane height shall accommodate installation within the space shown on the Drawings.

2.3 SYSTEM COMPONENTS

A. Beam

1. Standard Aluminum I-Beam.
2. Adjustable span capabilities

B. A-Frame

1. Fabricated from mechanical tubing
2. Adjustable height accomplished using spring-loaded steel locking pins.
3. Center tube adjusts in six (6) inch increments.

C. Casters

1. Four position floor-protecting casters.
2. 8” Polyurethane tread with 4-position swivel locks.
3. Polyurethane wheels
4. Minimum caster capacity equal to crane-rated load plus crane dead load.

D. Manual Trolley

1. Push-type manual trolley.
2. Adjustable to fit beam flange.
3. Rated capacity: two (2) tons
4. Anti-drop plates required.

E. Manual Chain Hoist

1. Hand chain operated.
2. Rated capacity: 2 tons minimum

3. Lift height: 3 feet minimum.
4. Distance from the hoist high hook position to the finished floor (lift): 10 ft
5. Mechanical load break.
6. Alloy load chain.
7. Forged hook with safety latch.

2.4 SHOP PAINTING

A. Standard Paint Colors
   1. Standard aluminum finish for all aluminum gantries

B. Surface preparation and Painting Procedures
   1. Adhere to the standards of the Society for Protective Coatings (SSPC) for all product surface preparation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Check materials to ensure all parts are present.

B. Standard Gantry Crane shall be completely portable and require no foundation or structural support.

3.2 INSTALLATION

A. Units and accessories should be installed in accordance with manufacturer’s instructions and shop drawings.

B. Do not modify crane components without manufacturer’s approval.

C. Clearances for moving crane components:
   1. Minimum vertical clearance: Three (3) inches from any overhead obstruction
   2. Minimum horizontal clearance: Two (2) inches from any lateral obstruction.

3.3 FIELD TESTING

A. Perform field quality control testing as recommended by the Manufacturer.

B. Inspection:
   1. Ensure crane operates properly (movement is smooth and consistent).
   2. Make adjustments as needed, and correct inadequacies.

C. Acceptance Test

1. After the enclosed track crane system has been installed, OSHA requires an acceptance test before operating and also after any modifications. An authorized dealer or installer should perform acceptance tests.
2. Load test crane at a maximum of 125 percent of rated capacity.
3. Submit written load test report.

3.4 IDENTIFICATION

A. Permanently display

1. Rated capacity.
2. Manufacturer's name.
3. Model number.
4. Serial number.

B. Post operating and safety instructions on the gantry frame.

END OF SECTION 412213

SECTION 432110 - PROGRESSING CAVITY PUMPS GENERAL

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. References

1. AISI American Iron and Steel Institute
2. ASTM American Society for Testing and Materials
3. IEEE Institute of Electrical and Electronics Engineers
4. NEMA National Electrical Manufacturers Association
5. SSPC Steel Structures Painting Council
6. NFPA 70 National Electric Code (NEC)

1.2 SUMMARY

A. This section includes the furnishing and installation of two (2) self-priming, positive displacement, progressing cavity pumps for conveying thickened sludge from the Gravity Thickeners to the sludge dewatering equipment. The Equipment Schedule is provided at the end of this section.

B. Each pump shall be equipped with Variable Frequency Drives (VFDs), drive shafts, couplings, in-line motor assemblies, drive bases, pump bases, anchor bolts, and all required appurtenances, furnished complete and installed, ready for service, as shown on the Drawings and specified herein.

C. Manufacturer shall provide pumps with an in-place maintenance design, which allows to replace the rotor and stator without having to disconnect the pump from the suction or discharge piping.

D. The Manufacturer shall review the intended application and operating requirements of the pump system and shall recommend a pump that best meets the specified performance requirements

E. Furnish all labor, materials, equipment, products, incidentals, and testing necessary to provide a complete and operational system. Install the system at the locations indicated on the Drawings and in accordance with these Specifications.

F. The unit shall include all manufacturers' motors, VFDs and control panel. The Pump Control Panel unit shall be provided by the equipment Manufacturer and installed by the Electrical Contractor. Electrical Contractor shall provide necessary, conduits and wiring.

G. Coordinate all work with this equipment with any other related equipment installed or specified under other sections of these Specifications.

H. All work performed under this section shall be in accordance with all approved trade practices and manufacturer's recommendations.

1.3 QUALITY ASSURANCE

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

B. Provide equipment that is a standard product of the manufacturer.

C. The pumps, gear reducers, and motors shall be a product of the manufacturers regularly engaged in the manufacturing of equipment having similar service and equal size for a minimum of ten (10) years and a minimum of 20 installations at equivalent applications. Supplier shall provide a list of names and dates of installations for verification by the engineer or Owner’s Representative.

D. Factory test each pump using water with a factory-certified motor, the same size as that specified. Tests shall consist of checking each pump at its rated speed, head, capacity, efficiency, and brake horsepower; and at such other conditions of head and capacity to properly establish the performance curve. Submit copies of the performance curves to the Contractor for the Engineer's review before releasing the pumps to the Contractor. The standards of the Hydraulic Institute shall govern the procedures and calculations for these tests.

E. All pumping equipment furnished under this Section shall be of a design and manufacture that has been used in similar applications, and it shall be demonstrated to the satisfaction of the Owner that the quality is equal to equipment made by that manufacturer specifically named herein.

1.4 SUBMITTALS

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

B. Product Data: Submit the manufacturer's technical data and installation instructions, including certified pump curves with efficiency, capacity, head, speed, brake horsepower required, and operating point required for each pump.

C. Shop Drawings: Submit the manufacturer's technical data and installation instructions, including certified pump curves with efficiency, capacity, head, speed, brake horsepower required, and operating point required for each pump.

1. Complete description in sufficient detail to permit an item-by-item comparison with the Specification. Complete description in sufficient detail to permit an item-by-item comparison with the Specification,

2. Dimensions and required clearances,

3. Pump with motor weights
4. Performance data, including pump curves showing overall pump efficiencies, low rate, head, break horsepower, motor horsepower, speed, and shut-offhead.
5. Materials of construction
6. Layout drawings for all equipment showing installation details and anchor bolt layout.
7. Wiring diagrams for all electrical equipment.
8. Deviations from Contract Documents.
9. Manufacturer's installation and testing instructions.
10. Manufacturer's standard guarantee.
11. Certification from the pump supplier that site conditions have been examined.

D. Maintenance and Operating Instructions, including the following additional information:

1. Recommendations for short and long-term storage.
2. Explanation of operating safety considerations.
3. Detailed installation instructions, with clear step-by-step points on the correct mechanical and electrical installation procedures.
4. Repair parts and maintenance materials.
5. Troubleshooting data.
6. Repair data.
7. Manufacturer’s warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. All equipment shall be delivered in the largest pieces practical for field assembly by the Contractor. Individual pieces shall be permanently tagged with welded erection marks or stainless steel tags cross-referenced with information on the manufacturer's erection and assembly drawings.

B. Packing, Shipping, Handling, and Unloading.

1. Comply with Section 016600, Product Handling and Protection.

C. Acceptance at Site.

1. Inspect all equipment and materials against the reviewed Shop Drawings at the time of delivery.
2. Equipment and materials damaged or not meeting the requirements of the reviewed Shop Drawings shall be immediately returned for replacement or repair.

D. Storage and Protection

1. Carefully prepare for storage and label all equipment and materials after they have been inspected.

2. Store all equipment and materials in a dry, covered, ventilated location and protect from harm according to the manufacturer's instructions.

1.6 WARRANTY

A. The pump manufacturer shall guarantee the complete pumping assemblies for a period of 12 months after acceptance or 18 months after shipment, whichever occurs first. The warranty as specified here shall cover all defective parts, materials, and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with specified requirements, supply the progressing cavity pumps from one of the following manufacturers:

1. Moyno Pumps, EZStrip Moyno.

2. Netzsch Pumps.

3. Or Engineer Approved equal.

B. Contractor choosing an alternative shall refer to the Bid Form. Any proposed alternative must provide all of the qualities described within this specification along with the bid.

2.2 PUMP CONSTRUCTION

A. General:

1. The pumps shall be heavy-duty, positive displacement, single-stage, progressing cavity type. The pumps shall be cradle-mounted, allowing the normally vertical suction port to be rotated 90 degrees clockwise or counter-clockwise to facilitate piping connections.

2. Progressive cavity pumps shall be provided with an in-place maintenance design that permits removal of the rotor, stator, drive shaft, and joint components without disconnecting suction or discharge piping, removing the pump casing, or re-aligning the drive.

B. Pump Suction and Discharge Casing

1. The pump casing shall be designed for the specified type of service. It shall be of sufficient strength, weight, and metal thickness to ensure long life, accurate alignment, and reliable operation.

2. The casing shall have multiple 3/4-inch FNPT connections (minimum 4) for vents, drains, and gauges. The connections shall be at the highest and lowest points of the housing regardless of suction orientation.

3. The pump housing shall be constructed as such to allow for easy access to both joints without having to disconnect piping or remove most of the housing.

4. The suction body of the pump shall be oversized at the entrance of the rotor and stator pumping elements to allow the free flow of high solids materials.

5. The rotor joint head shall be recessed from the stator, and the leading edge of the stator shall be chamfered to prevent restriction of flow into the pumping elements. (Moyno)

C. Stator

1. The pump's stator shall be formed from a single piece of Buna-N rubber molded inside a single-piece carbon steel casing. Additional hardware to seal around the stator shall not be accepted. Split stators or stators with sealing lines are not acceptable as they can potentially leak.

2. The stator shall be fastened to the suction casing by the use of four (4) tie-bar bolts for easy removal and replacement. Stators shall not be affixed to the suction casing by threaded connections or by snap rings. The stators not using tie-bar bolts shall not be accepted.

3. The suction edge of the stator shall be chamfered to allow for unrestricted flow into the pumping elements.

4. The seal shall be integral to the stator sleeve at the suction and discharge to prevent leakage. The use of separate O-rings or flat rings for stator sealing shall not be required.

5. Stator designs that limit pressure capability to less than 90 psi per stage shall not be acceptable. Each stage shall be rated at 90 psi with the capability of a 1.5x hydrostatic test.

6. The removal of the stator shall not require any disconnection of the suction or discharge piping. Pump shall be full service in place. Deviations or special adaptors are not allowed.

D. Rotor:

1. The rotor shall be precision-machined from SAE 4140 alloy steel, heat-treated to a hardness of Rockwell C 57 to 60, and hard chrome plated with a minimum total coating thickness of 0.010 inch for abrasion resistance.

2. The rotor shall extend beyond both ends of the stator when assembled to ensure full sealing line engagement and maximum stator utilization. Rotors that are shorter than, or do not extend past, the stator ends when assembled are not acceptable.

3. Rotor removal shall not require disconnection of suction or discharge piping. Rotor disengagement shall be accomplished by the removal of a single bolt only. The use of multiple fasteners, snap rings, sleeves, clips, wedges, special adaptors, or disconnection of the drive joint is not acceptable.

4. Removal of the rotor and stator shall be accomplished with the rotor joint remaining intact to allow complete inspection and maintenance.

5. Access to the rotor disconnection area shall provide a minimum of 2 inches of clear working space in all directions to permit safe and efficient servicing.

E. Joints

1. The rotor shall be connected to the drive shaft by means of a connecting rod with high-strength, shock-resistant universal joints. The universal joints shall be sealed pin-type, lubricated by oil. Grease is not acceptable.

2. The Pin joint shall be sealed with a stainless steel 316 sleeve with O-rings and held in place with circlips. Joints that use band clamps and hoses are not acceptable as they are not as robust.

F. Drive Train

1. The rotor shall be driven by means of a heavy-duty sealed drive train. The rotor shall be joined to the drive shaft by means of a connecting rod with sealed pin-type universal joints at each end.

2. The connecting rod shall be a two-piece design to allow for the rotor and stator to be removed from the suction housing together, either up or off to the side. Horizontal removal is not acceptable. Disassembly of a joint is not acceptable.

3. The connecting rod shall be joined and driven by hardened pins. Using screws or bolts to transfer rotational thrust is not acceptable.

4. The sealed pin-type universal joints shall be factory lubricated with oil and completely sealed from the abrasive fluid being pumped, utilizing a metal cover over the pin and a flexible rubber seal on the connecting rod end. Grease lubrication shall not be accepted.

5. The joint seal shall not employ sacrificial parts such as clamp bands and shall not require special tools to assemble.

6. To optimize seal and pin joint life, the connecting rod shall be of sufficient length to maintain its operating angle within 1 degree. Flexishafts, cardin joints, gear joints, and unsealed pin joints are not acceptable.

G. Pump Drive Shaft

1. The drive shaft shall be of the solid drive shaft design in order to avoid clogging and/or trapping of solids, which could either interrupt the movement of the connecting rod or disturb the seal of the rear pin joint. Maximum shaft deflection under normal operating conditions shall not exceed 0.002”. Hollow or telescoping drive shafts are not acceptable.

2. The drive shaft shall be connected to a flanged gear reducer by a pin in a close-coupled design to reduce the space needed for a coupling.

H. Bearings (if applicable to pump configuration)

1. The tapered roller type with diverging pressure angle bearings shall be grease-lubricated and integral to the pump. Close-coupled pumps that do not utilize

integral bearings are not permitted. Bearings shall be designed to provide a minimum B-10 service life of 100,000 hours when operating at the maximum operating conditions without periodic lubrication. The bearings shall be protected from contaminants with a bearing cover plate bolted to the bearing housing. The bearings shall be enclosed in a separate housing, incorporating a bearing spacer and bolted bearing cover, eliminating bearing shimming.

2. The stuffing box shall be equipped with a split packing gland and split Teflon lantern ring to permit repacking of the pump without removing the bearings or drive shaft components. Fittings will be provided for water lubrication of the packing.

I. Shaft Seal

1. The stuffing box shall be equipped with a split packing gland and split Teflon lantern ring to permit repacking of the pump without removing the bearings or drive shaft components. Fittings shall be provided for grease lubrication of the packing. Pump manufacturers shall supply the following parts for the seal water system: Y-strainer, pressure gauge, ball valve, pressure regulator valve, and pressure switch for each new pump.

J. Drive Arrangement

1. The pumps shall be directly connected to the motor via a motor-to-gear reducer, with or without a flexible coupling.

K. Gear Motor

1. Gear motors shall be furnished with Totally Enclosed Fan Cooled (TEFC), premium-efficiency motors with Class F insulation and a minimum service factor of 1.15.

2. Motors shall be inverter duty and suitable for operation with a variable frequency drive with a minimum 5:1 constant-torque turndown ratio.

3. Motors shall be 4-pole and shall be integrally mounted to the gear reducer.

4. Gear motors shall be manufactured by NORD. No substitutions or exceptions will be permitted.

5. Gear reducers shall be parallel in-line or right-angle type with a minimum service factor of 1.4. The gear housing shall be a single-piece SAE 30 gray cast iron casing with internal reinforcements to provide strength and rigidity. Split housings, bolt-on output covers, or bolt-on flanges are <u>not</u> acceptable. The housing design shall prevent oil leakage, oil contamination, and gear-set misalignment.

6. Gearbox drive shafts shall be solidly mounted in two antifriction bearings (ball or tapered roller), oil-lubricated. The gearbox or gear motor shall be removable without requiring the disassembly of the pump.

7. Gearboxes or gear motors shall comply with the Anti-Friction Bearing Manufacturers Association (ABMA) minimum B-10 bearing life requirements and shall provide a calculated bearing life exceeding 100,000 hours at the maximum operating conditions specified.

8. The thermal power rating of each gear reducer shall equal or exceed the nameplate power rating of the drive motor. During continuous operation, sump oil temperature shall not rise more than 100°F above ambient air temperature and shall not exceed 200°F.

9. Gear reducers shall be totally enclosed, oil-lubricated units utilizing antifriction bearings throughout.

2.3 ACCESSORIES

A. Pump dry-run protection

1. The pump shall have a thermal probe attached to the stator to monitor stator temperature.

2. The probe shall be connected to a control that would trigger a switch to activate an alarm and/or shut the pump down to prevent a dry run (not ruin the stator).

3. The pump safety control instruments shall be provided by the pump manufacturer and installed in the Control Panel by the Control Integrator.

B. Pressure Gauges:

1. Provide liquid-filled pressure gauges on the suction and discharge piping of each pump. Gauges shall be complete with snubbers and filled with a glycerin-water mixture. Install gauges in locations that permit accurate pressure measurement and convenient observation during operation and maintenance.

2. The isolation ring shall be a flanged type designed for installation between ANSI flanges and sized to match the discharge pipe diameter indicated on the Drawings. The isolation ring body and fittings shall be carbon steel construction and shall be provided with a Buna-N sleeve

3. Each pressure gauge shall be protected by a radial gauge isolator capable of accommodating the full pressure range. Flat diaphragm isolators are not acceptable.

4. Pump flanges shall be tapped for gauge connection.

5. Gauge connections shall be 3/4-inch NPT diameter.

6. Each gauge connection shall be provided with a shutoff needle and sufficient piping to facilitate gauge installation and removal. Unused gauge connections shall be fitted with threaded plugs.

7. Suction-side pressure gauges shall have an operating range of 0 to 20 psig.

8. Discharge-side pressure gauges shall have an operating range of 0 to 30 psig.

9. Manufacturer: Gauges shall be a product of H.O. Trerice, Ashcroft, Wika, or equal.

C. The Contractor shall provide expansion joints for pump suction and discharge lines. Flexible Expansion Pump Connectors: Expansion joints shall be a rubber spool type of a single, open wide arch design. Joint construction shall consist of a Butyl tube and cover, reinforced with a suitable woven fabric. Joints shall be designed to meet the design pressures and temperature for the system. Expansion joints' ends shall

be flanges drilled to 150 lbs class standards and be full rubber-faced and integral to the body. Flange backing rings of cast iron with a built-in support sleeve shall be provided. Expansion joints shall be Flexicraft Industries, Flextra 150 Model, or equal.

D. Data Plates: Attach stainless steel data plates to the pump, showing the manufacturer's name, pump size and type, serial number, capacity, and head rating, and other pertinent data. Attach a special data plate to the pump frame listing the identification of the frame and bearing numbers.

E. Hardware: All machine bolts, nuts, and cap screws shall be hex head. Hardware or parts requiring special tools or wrenches shall not be used.

2.4 CONTROLS

A. Pump Variable Frequency Drive

1. General: Variable Frequency Drives shall provide variable speed operation using a power converter that employs a pulse-width-modulated inverter. The units shall be factory furnished and assembled complete with all necessary controls, circuitry, and hardware as required to provide the functions herein specified and shall only require field connections from the rated three-phase line voltage power source, from the control circuitry, and from motor leads to the load side of the VFD. The VFD design and rating shall be for pumps, and the type of connection used between motor and load, such as direct or through a power-transmission connection. Variable Frequency Drives shall be furnished with ratings not less than the motor nameplate rated full-load running current.

2. Analog Inputs: The VFD shall be provided with two programmable isolated analog input channels. Each channel shall have an input signal range of 0‑10 V DC, or 4‑20 mA DC. Analog Outputs: The VFD shall be provided with two programmable independent isolated analog output channels. Each channel shall have an output signal range of 4‑20 mA DC.

3. Digital Inputs: The VFD shall be provided with a minimum of four independent digital input channels at 24 V dc. Each channel shall be capable of receiving contact closures from 24 V dc supplies. Digital Outputs: The VFD shall be provided with a minimum of four independent digital output channels at 24 VDC. Each channel shall be capable of contact closures from external 24 V dc supplies

4. Communications: The VFD shall be equipped with the proper network interface card and software driver to enable it to directly communicate with Building Automation System (BAS), Process Control Systems (PCS), or other controllers, using that system’s communications protocol. The prescribed network communications protocol shall permit transmission to/from the VFD of control signals, process variables, set points, and configuration settings, and enable remote collection and monitoring of data from the VFD by the control system. Network communications protocols include:
   a. BACnet MS/TP
   b. BACnet/IP
   c. Ethernet

d. Profibus

B. Each pump shall be provided with easily identifiable terminal points to facilitate the exchange of the central control functions between the pumps and the process control system, as indicated on the Contract Drawings.

C. The Sludge Feed Pumps Local Control Panel shall have a NEMA 4X rating and include the following:

1. Selector switches
   a. Power On/Off selector switch
   b. Hand/Off/Auto modes of operation
2. Run/Stop push buttons
3. Pump No 1 / 2 Running (green) and Fault Pilot (red) Lights
4. Fault Reset Button
5. VFDs are included in the Pump Control Panel
6. VFDs pump speed control potentiometer 20-100%
7. General Alarm Pilot Light for the following pump conditions:
   a. Pump running dry.
   b. Overpressure.
8. Sludge flow display

D. General Description

1. The Screw Press PLC system shall control and monitor the Existing Sludge Feed Pumps Local Control Panels No. 1 and 2 via hard-wired signals, including, but not limited to, run command (DO), run feedback (DI), VFD fault feedback (DI), remote feedback (DI), and speed command (AO).
2. The Screw Press PLC system shall have Manual/Auto selector switches that allow running the Sludge Feed Pump from the PLC panel in Auto or Manual modes. In Manual mode, the operator will be able to start and stop the Pumps from the HMI screen, as well as adjust the pump running speed.
   a. In the Remote modes of operation, a flow path needs to be established for Pump #1 or Pump #2 with respect to the manual valves located on the pump suction and discharge sides.
   b. Note: Only manual valves are provided on the pump suction and discharge piping, as well as on the feed line to the Screw-Press. Before starting the system in Remote mode, establish the required flow path by opening the appropriate pump suction and discharge valves and the Screw-Press feed line valve.
3. The flowmeter is located in the Sludge Handling Building (Room 202) on the Sludge Feed Pump force main to the Screw Press and is used for flow monitoring. IP Flowmeter value from the SCADA system shall be displayed locally at the Pump Local Control Panel.
4. “Local” mode of operation: The “Local” mode of operation is mainly for equipment maintenance; it operates the sludge feed pump only from the Local

Control Panel. This allows an operator to manually run the sludge pump in the event the Screw Press PLC system fails.

5. Interlocks: If the Screw Press stops running, it shall stop the respective sludge feed pump.
6. The sludge pump shall be monitored to prevent the pump from running dry.
7. Alarms - The pump shall automatically stop running if the following conditions occur:
   a. Pump running dry.
   b. Overpressure.
   c. Motor overload

2.5 SPARE PARTS AND SPECIAL TOOLS

A. Spare parts to be provided for each set of pumps supplied:

1. One (1) complete gland packing
2. One (1) rotor
3. One (1) stator
4. One (1) joint kit
5. One (1) complete set of any special tools required to dismantle the pump.

2.6 SURFACE PREPARATION AND PAINTING

A. Shop Finishing

1. Protect all exposed ferrous metals with a minimum of one coat of shop primer. Apply an additional coat of two-part epoxy to motors, pumps, gearboxes, and other similar equipment.
2. All surfaces must be dry, clean, and free of rust, scale, oil, and grease. Clean steel surfaces by pickling or blasting to a minimum of SSPC-SP6.
3. Surface preparation, application, and minimum DFT millage to be as per the paint manufacturer's published recommendation.
4. Painting shall be in accordance with the manufacturer's standards.

B. Field Painting

1. All rust, scale, dirt, or other foreign matter shall be removed by solvent cleaning, wire brushing, short blasting, or other standard commercial cleaning procedure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment and accessories in accordance with reviewed Shop Drawings and manufacturer's instructions, as specified herein and shown on Contract Drawings.

B. Furnish and set stainless steel anchor bolts with nuts and washers in accordance with the manufacturer's recommendations.

C. All electrical equipment, conduit, and wiring not indicated on the Drawings, but necessary to provide a complete operating system, shall be provided at no additional cost to the Owner.

D. Electrical Wiring: The external conduit and wiring required for power supply and control to electrical equipment supplied in this Section shall be furnished and installed in Division - 26, Electrical.

E. Motor size: Any deviation in motor size must be approved by the Engineer. Any electrical equipment or wiring that must change to accommodate a different size motor will be at no additional cost to the Owner.

F. The grade and amount of oil and grease shall be in accordance with the manufacturer's recommendations.

G. Initial lubrication required for startup and field test operation shall be furnished and applied in accordance with the manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

A. The manufacturer shall furnish the services of a qualified representative to inspect and adjust the equipment furnished in this section. This qualified representative shall also conduct such tests as necessary to demonstrate satisfactory operation and to instruct the Owner's personnel in the care and operation of the equipment.

B. The Contractor shall coordinate startup services with the Manufacturer.

C. Manufacturer's authorized service representative shall furnish one (1) site visit of two (2) working days for equipment inspection, startup assistance, operational testing, and training of the Owner's personnel. Training shall include operation, mechanical maintenance, and electrical requirements of the equipment

D. If the equipment is not fully installed, operational, and ready for startup when the service representative arrives on Site, any additional visits or service days required to complete startup and training shall be provided at no additional cost to the Owner and shall be at the Contractor's sole expense.

E. For the purposes of this section, a workday is defined as eight hours at the Site, excluding travel time.

3.3 TESTING

A. After completion of installation, the pumps shall be completely tested to demonstrate compliance with operating requirements as specified.

3.4 PUMP SCHEDULE

A. Sludge Dewatering Feed Pumps

1.	Location	-	Solids Handling Building
2.	Service	-	Thickened Sludge Feed Pump to the Screw-Press
3.	Fluid service	-	Solids from Flocculation/Settling Basins
4.	Percent of Solids	-	2% to 7%
5.	Quantity	-	2
6.	Number of stages	-	1
7.	Maximum flow	-	60 gpm
8.	Pump Head	-	30 ft (13 psi)
9.	NPSHr	-	2.44 ft
10.	Maximum pump speed	-	350 RPM
11.	Duty	-	Constant
12.	Motor size	-	5 Hp
13.	Motor Speed	-	1750 RPM
14.	Drive	-	VFD
15.	Ambient environment	-	Indoors
16.	Fluid temperature	-	Ambient
17.	Type of suction port	-	Flanged
18.	Suction and Discharge:	-	3” 125 # FF ANSI per ASME 16.5B

END OF SECTION 432110

SECTION 463333 – POLYMER BLENDING AND FEED EQUIPMENT

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.

B. The following equipment and related work are specified and furnished under other items:

1. Division 26 – Electrical
2. Section 467331 – Sludge Dewatering

1.2 SUMMARY

A. This section includes furnishing, installing, and placing into successful operation one (1) complete polymer blending skid system with two (2) progressive cavity pumps, motors, and controls, including all integral piping, valves, fittings, pipe supports, special equipment, and appurtenances in accordance with this specification, including all incidental work necessary to make it complete, satisfactory, and ready for operation.

B. The polymer dilution and feed system shall be capable of effectively activating and fully blending with water a homogeneous polymer solution.

C. Polymer blending system shall operate in conjunction with sludge dewatering equipment as specified in Section 467331–Multi-Disc Screw Press. All equipment shall be delivered as part of the complete dewatering skid-mounted system.

1.3 SYSTEM DESCRIPTION

A. The polymer dilution and feed system shall be capable of effectively activating and fully blending with water a homogeneous polymer solution ranging from 0.1 to 2% concentration based on neat emulsion polymer with active contents of 30-50%.

B. Design Requirements for the Polymer Feed System:

1. Polymer shall be drawn from a tote located next to the polymer feed system, as shown on the Drawings.
2. Polymer Type: Emulsion.
3. Polymer Activity (percent active): 30 to 50.
4. Solution Concentration Range: 0.1% to 2% based on neat polymer.
5. Solution Concentration Design Point: 0.5% based on neat polymer.

Neat Polymer Flow gph	Dilution Water gph
0.25–5	12–1200

C. Performance Requirements: Polymer Feed System shall be capable of supplying between 0.25 and 5 gallons per hour of liquid emulsion polymer, with the entire flow passing through the preparation unit. Following preparation and mixing, the polymer solution leaving the mixer shall be ready to feed the dewatering volute press unit.

1.4 SUBMITTALS

A. Product Data: Provide unit capacities, projected effluent values, loading parameters, design parameters, oxygen requirements, dimensions, etc.

B. Shop Drawings:

1. Submit detailed specifications and shop drawings with both shaded isometric and orthogonal views of the proposed system, including dimensions and weights.
2. Submit wiring, control schematics, and control logic diagrams for all electrical and control components furnished.
3. Factory testing documentation.

C. Provide detailed Operations and Maintenance Manuals, including storage, installation, start-up, and operating instructions. Provide safety precautions and warnings for all hazards operating equipment.

1.5 QUALITY ASSURANCE

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

B. All equipment included in this section shall be furnished by a single supplier who shall be responsible for the design, coordination, and satisfactory operation of the system.

C. Provide evidence of at least fifteen (15) years of demonstrable experience in the design and manufacture of polymer blending systems. The Supplier shall have at least twenty-five (25) polymer feed systems operating successfully for at least five (5) years in North America at municipal wastewater treatment plants that were designed and furnished under the Supplier’s own name.

D. Prior to shipment, the system shall be inspected for quality construction, verifying all fasteners and fittings are tight, all wires are secure, and connections are whisker-free.

E. The complete system shall be fully factory tested prior to shipment. Testing shall include setting and verification of all instrumentation and sensors per the design requirements of the application; pressure testing all plumbing systems for a minimum of one hour at 100 psi. If leaks are found, they shall be fixed, and a new test shall be conducted for one hour at 100 psi until the plumbing system is verified to be leak-free: verification of system design flow rates, and complete function simulation of operation.

1.6 DELIVERY AND STORAGE

A. The equipment shall be shipped in a new, high-quality, completely enclosed weatherproof wooden crate.

B. The crate shall include a shock sensor to warn of equipment mishandling during shipment.

1.7 WARRANTY

A. The manufacturer shall warrant the equipment furnished under this section to be free from defects in material and workmanship for a period of twelve (12) months after the equipment was first placed into operation at the jobsite or eighteen (18) months after the equipment was first delivered to the site, whichever date occurs first. Any warranted material defects found to exist shall be corrected (repaired or replaced) at no cost to the Owner.

B. The mixing chamber shall be warranted for the life of the system against plugging for any reason.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. VeloDyne – Velocity Dynamics VeloBlend, Model VM-5P-1200
2. Or an Engineer-approved equal.

B. The listed equipment is part of the Base Bid and shall be considered establishing the type, function, appearance, and quality required as defined in the General Conditions.

C. The drawings and specifications were prepared based on Velodyne. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes, including engineering changes, to accommodate the other Base Bid equipment, including but not limited to structural, mechanical, and electrical work.

D. Contractor may provide Alternative Bids for equipment from other manufacturers by writing their name into the blank(s) provided on the Bid form. Contractor shall comply with all provisions regarding substitute items and shall include in the Bid and be responsible for the cost of any changes to accommodate substitute equipment, including, but not limited to, structural, mechanical, and electrical work. Contractor shall also pay costs of engineering services for review of substitutes and for revisions of drawings and/or specifications by the Engineer to accommodate substitutes.

2.2 EQUIPMENT PERFORMANCE

A. The polymer-blending system shall be a complete package that automatically dilutes, activates, and feeds liquid polymer and water. Blenders shall instantaneously invert neat polymer into solution, producing a thoroughly diluted and completely activated homogeneous blend, free of “fish-eyes” and unblended polymer.

B. The polymer blending and feed equipment shall be provided to meet the following performance and design requirements:

1. Polymer Type: Liquid emulsion (30-75 percent active)
2. Neat Polymer Feed Rate: 0.25 to 5 gph
3. Diluted Polymer Concentration: 0.1-1% of Total Active
4. Dilution Water Flow Range: 120-1200 gph at 50 psi minimum.

2.3 MULTIZONE MIXING CHAMBER

A. To provide control and versatility to optimize the performance of the wide range of polymers available and to optimize system reliability, a multi-stage hydro-mechanical polymer blending technology shall be provided with both a non-mechanical and mechanical mixing stage:

1. Non-Mechanical Stage: To optimize reliability, the device shall be capable of activating and blending polymer based on plant water pressure alone of 30 psi or greater. Polymer shall be injected directly into a water jet by means of an injection quill positioned such that the non-mechanical mixing energy is not diminished prior to polymer and water contact. The non-mechanical zone shall be designed such that the velocity of the mixing energy-producing water jet is maintained or increases as flow decreases. Polymer activation efficiency shall be consistent over the dilution water range.
2. Hydro-Mechanical Mixing Stage: To provide optimal polymer performance under all operating conditions and to provide total control over mixing energy, in addition to the non-mechanical mixing stage, the device shall be capable of producing its mixing energy independent of plant water pressure through a variable intensity, controllable stainless-steel hydro-mechanical mixer. The mixing impeller shall be fully controllable and capable of inducing ultra-high, non-damaging recirculation through the impeller. The polymer mixing impeller shall be designed to produce both axial and radial flow to optimize mixing effectiveness and induce high, non-damaging mixing energy across the system's full flow range.
3. To prevent polymer build-up, the mixing chamber shall maintain high velocity in the entire chamber – at no time shall there be low velocity within any portion of the mixing chamber.

B. Both mechanical and non-mechanical mixing zones shall be clear polycarbonate to view the mixing action and blending effectiveness. Acrylic chambers prone to becoming brittle over time and cracking, or opaque pipe, shall not be acceptable.

C. The mixing chamber shall have a maximum rated pressure of 100 psi. Provide a 316 stainless steel, adjustable-range pressure relief valve on the mixing chamber set at 75 psi.

D. Impeller shall be driven by a 0.5-hp, 90-volt DC, washdown-duty, TENV motor with a full-load current of 5.0 amps. Impeller speed shall be not less than 1,750 rpm. Motor shall be directly coupled to the impeller shaft. Mixer speed shall be controlled by an SCR speed controller mounted within the polymer feed motor control panel and located outside the hazardous area. Motors mounted beneath the mixing chamber, where leakage or seal failure could damage the motor, shall not be acceptable.

E. The mixer drive shaft shall be sealed by a mechanical seal which shall have an integrally mounted and factory plumbed seal flush. A drain port behind the seal shall be provided in the mixing chamber to drain the polymer solution in case of a seal failure. The seal shall be easily accessible for replacement. All bearings shall be external to the mixing chamber.

F. Neat Polymer Check Valve: Provide a neat polymer check valve specifically designed to isolate neat polymer from dilution water. The valve shall be designed with an open, unobstructed path to the valve seat. Minimum area to valve seat shall be 3/16 inch. The valve body shall be constructed of Teflon with Viton seals, and the ball shall be stainless steel. The valve shall be readily accessible for cleaning and shall be easily disassembled. Conventional check valves and/or check valves that are installed inside the mixing chamber, or which require mixing chamber disassembly for servicing, will not be accepted.

G. Dilution Water Control

1. If the manufacturer requires two-stream dilution control, dilution water shall be split into two streams. Primary water flow shall supply the mixing chamber. Secondary water flow shall be used to post-dilute the activated polymer stream.

2. Flow indicators and flow control valves shall be provided for the dilution water stream:
    a. The dilution water flow rate shall be monitored by a Rotameter flow meter having a range of 120-1200 gph. Unions of flanges shall be provided on the flow meter to allow easy removal for cleaning.

3. Provide a factory-installed and pre-wired 120 VAC electric solenoid valve for on/off control of dilution water flow. Solenoid valve body shall be 316L SS.

4. A differential pressure type low water differential pressure alarm with 120-volt rated contacts shall be provided. The switch shall be adjustable between 9 and 60 psig. Static working pressure shall be at least 150 psi. The pressure switch shall be as manufactured by Ashcroft, or equal.

5. Dilution water and solution output connections shall be 316 stainless steel unions connected to the chassis.

2.4 DILUTION WATER INLET MANIFOLD

A. The dilution water inlet assembly shall include an inlet fitting, a factory-installed and pre-wired 120 VAC, NEMA 4X dilution water solenoid valve, Rotameter-type flow meter,

stainless steel liquid-filled dilution water inlet pressure gauge, and 316L stainless steel water control valves. Plastic control valves shall not be acceptable. The manufacturer shall provide valves in accordance with Division 40.

2.5 NEAT POLYMER METERING PUMP (PROGRESSING CAVITY)

A. Each skid system shall be provided with two (2) neat polymer metering pumps integrally mounted on the system's skid.

1. The neat polymer metering pump shall be a progressing cavity-type pump, constructed of 316 stainless steel rotor and fluoro-elastomer stator. The shaft seal shall be a lip seal type riding on a ceramic sleeve.
2. The pump shall have a minimum continuous output range of 0.5 to 10 gph.
3. The pump shall contain a minimum of four stages to minimize slip.
4. The pump shall be mounted to the skid frame with a 304 stainless steel bracket that positions the pump suction no more than 18 inches off the base to maintain ideal pump suction conditions.
5. A 120 VAC SCR (Silicon-Controlled Rectifier) variable speed controller with 90-Volt DC, 5.0 FLA, 1/2 HP close-coupled, washdown-duty, TENV motor. Maximum pump shaft speed shall be 545 rpm. The pump speed shall be controlled by an SCR speed controller mounted in the polymer feed motor control panel.

B. Provide a calibration cylinder with one full port PVC ball valve having Viton O-rings. The column shall be calibrated for a one-minute draw-down at maximum pump rate and read in GPH and milliliters. The calibration column shall be rigidly mounted to the system's frame with a minimum of two heavy-duty brackets. Mounting the calibration to the neat polymer inlet piping shall not be acceptable. Provide a breather plug in the top of the calibration column designed to allow adequate displacement of air during calibration while preventing water or other foreign material from entering the calibration column.

C. Provide a thermal-type loss of polymer flow sensor.

D. Pump shall be a progressive cavity pump by Seepex Inc, or equal.

E. Pump shall allow for manual adjustment of the pumping capacity.

F. Provide a factory-installed and pre-wired high-pressure switch on the discharge of the pump. Pressure switch shall be Square D Type GAW, or equal. High-pressure setting shall be set by the manufacturer. The high discharge pressure switch shall shut down the pump in the event of high discharge pressure (On and Remote modes). A manual reset shall be required to restart the pump.

G. Spare Parts: The spare parts shall be identified, prepared, and packed for long-term storage.

2.6 SOLUTION DISCHARGE ASSEMBLY

A. Provide a 2-1/2-inch stainless steel liquid-filled pressure gauge to monitor system discharge pressure.

B. Provide a PVC ball-type check valve to prevent backflow, sized for the total solution flow of the system.

2.7 FRAME/SKID

A. The system's frame shall be of rugged 304 stainless steel construction. All pipe supports shall be stainless steel. Piping and valves shall be mounted with rigid pipe clamps.

B. All components of each dilution/feed assembly, including pump, drive, control devices and instruments, and local control panel shall be factory pre-plumbed and pre-wired.

2.8 CONTROL PANEL

A. The vendor shall furnish, install, and commission a Local control panel for the polymer blending system. The local control panel shall be mounted on the polymer blending skid and pre-wired to all on-skid equipment and instrumentation.

B. The local control panel shall be factory-mounted to the polymer system skid and pre-wired to all skid motors and controls. The control panel shall have all logic controllers, SCR motor controllers, digital displays, potentiometers, switches, lights, relays, and other control devices as required for a functioning system.

C. The polymer system control panel shall have the following devices on the front of the control panel enclosure:

1. Local – Off – Remote selector switch.
2. Manual mixer speed control potentiometer.
3. Manual polymer metering pump speed potentiometer (ten turns).
4. Polymer metering pump flow display (signal based on pump speed).
5. Power-on indicating light.
6. Red "low water differential pressure" alarm indicating light.
7. Red "low polymer flow" alarm indicating light.

D. The Polymer system control panel shall receive the following inputs from the Screw Press Main Control Panel

1. Polymer system start/stop command (discrete dry contact).
2. Polymer metering pump pacing speed signal (analog 4-20mA).

E. Polymer system control panel shall provide the following outputs to the Screw Press Main Control Panel

1. Polymer system "in remote" (discrete dry contact).

2. Polymer system “Running” (discrete dry contact).

3. Polymer system common alarm (discrete dry contact) active when any system alarm is active.

F. Control panel shall accept 120-volt AC, single-phase, 20-amp hardwired branch circuit power. Provide a main control panel circuit breaker disconnect and a dedicated circuit breaker for each motor.

G. All conduit and wiring from the polymer system control panel to the associated polymer system devices shall be factory-prewired or provided by Polymer Feed Equipment Supplier.

2.9 PIPING AND VALVES

A. All piping and valves shall conform to Division 40. Piping and fittings shall be Schedule 80 PVC. Solenoid valves shall be 316 or 316L stainless steel.

B. CONTRACTOR shall provide strainer and all unions, piping, fittings, and appurtenances to connect to the emulsion polymer tote, as shown on the Drawings, including 2-inch NPT connection, isolation ball valves, 1-inch quick-disconnect adapter, vent connection, and 20 feet of 1-inch clear, braided, PVC tubing.

2.10 SPARE PARTS

A. CONTRACTOR shall provide, along with the shop drawings, a list of the manufacturer’s recommended spare parts for the specified equipment. The list shall include a description of each spare part, current pricing, and expected delivery time for each part. No spare parts shall be provided by CONTRACTOR/manufacturer as part of this Contract.

B. Manufacturer to supply the following spare parts:

1. One (1) stator for the neat polymer progressive cavity pump

2. One (1) rotor for the neat polymer progressive cavity pump

3. One (1) progressive cavity pump shaft seal

C. These parts shall be identified, prepared, and packed for long-term storage.

2.11 FINISHES

A. It is the intent of these specifications that equipment, support, and accessories be furnished factory shop-primed and finish-painted. Equipment and appurtenances shall be prepared in accordance with commercial grade SSPC specifications No. 6. Priming and finish painting shall be as recommended by the manufacturer and shall be suitable for a corrosive atmosphere. Touch-up paint shall be provided by the manufacturer.

2.12 ANCHOR BOLTS

A. Provide all anchor bolts required for the equipment furnished. Anchor bolts shall be 316 stainless steel and shall be of ample strength for intended service. Provide anchor bolts in accordance with Division 5.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to requirements specified in Division 01 for equipment installation, quality control, testing, supervision, start-up, and operator training.

B. The complete system shall be fully factory tested prior to shipment. Testing shall include the setting and verification of all instrumentation and sensors, and the pressure testing of all skid-mounted plumbing systems as specified in Division 40. If leaks are found, they shall be fixed, and a new test shall be conducted until the plumbing system is verified leak-free. The system shall undergo factory verification of system design flow rates and complete functional operation. Documentation of each test shall be maintained and provided to the engineer as part of the shop drawing review.

C. Refer to Section 467331–Volute Dewatering Press for startup and performance testing requirements of the dewatering process, including performance of Polymer Blending and Feed Equipment.

END OF SECTION 463333

SECTION 467113 – SLUDGE THICKENER MECHANISM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Applicable reference standards, latest revisions, including:

1. American Society for Testing Materials (ASTM):
   a. A36 – Standard Specification for Structural Steel
   b. A48 – Cast Iron Specifications
   c. A83C – Steel Plate Specifications
   d. A325 – Fastener Specifications
   e. A304 – Bolt Specifications
2. American Iron and Steel Institute (AISI),
   a. A4142 – Heat Treated Steel Specification
3. AWWA C550 Protective Interior Coating for Valves and Hydrants
4. American Gear Manufacturers' Association (AGMA)
5. American Welding Society, Current Standards (AWS)
6. Anti-Friction Bearing Manufacturers' Association (AFBMA)
7. National Electrical Manufacturers' Association (NEMA)
8. American National Standards Institute (ANSI)

1.2 DESCRIPTION OF WORK

A. This section shall include the furnishing and installation of two (2) circular, center-driven gravity thickener mechanisms with segmented scraper shaft assembly, to be installed in the existing metal gravity thickener tanks.

B. The Manufacturer shall include, but not be limited to, the following equipment: the drive unit, vertical drive shaft, feedwell, full-radius rake arms with segmented blades, electrical control panel, anchor bolts & fasteners, and all other appurtenances necessary to provide a complete and operational system, as shown on the Contract Drawings and specified herein.

C. Two (2) existing gravity thickeners are located within the Sludge Handling Building. The gravity thickeners are above-ground metal tanks with a nominal diameter of 16 feet and a side water depth (SWD) of 13.66 feet. The gravity thickeners receive solids from the coagulation, flocculation, and settling basins and thicken the solids to approximately 5 percent concentration.

D. The Contractor shall field-verify the existing tank dimensions, elevations, and interface conditions prior to ordering the gravity thickener equipment.

E. The thickener mechanisms shall be capable of continuously collecting and conveying settled sludge solids from the tank floor to the central sludge hopper for removal from the thickener by the progressive cavity pumps.

F. The Contractor shall remove and properly dispose of the existing sludge thickener mechanism in accordance with all applicable regulatory requirements.

G. The Contractor shall remove the existing grout and replace it with the new 2-inch grout layer.

1.3 QUALITY ASSURANCE

A. To ensure quality, conformance, and reliability of the manufacturing and production of the equipment, the manufacturer shall meet all requirements listed hereafter.

B. The equipment supplier shall have at least 15 years of experience in the design, application, and supply of circular thickeners in water or wastewater treatment plants and shall submit a list of not less than 25 operating installations of thickeners with segmented rake blades as evidence of meeting the experience requirement.

C. Manufacturers shall show evidence of quality assurance in manufacturing and supplying equipment essential in detail to the equipment herein specified. This assurance will be met by certification of the quality system requirement of ISO 9001 or equivalent standard as accepted by the Engineer.

D. The Contractor shall obtain all equipment specified in this Section from one manufacturer to ensure proper coordination and functionality. The manufacturer shall have responsibility for the performance and compatibility of the entire system. This does in no way relieve the Contractor of responsibility under this Contract for equipment, coordination, installation, operation, and guarantee.

E. Shop Assembly and Inspection:

1. The equipment specified herein shall be factory assembled as far as practical to verify that all mating parts can be field assembled. All mating parts shall be trial fit and match-marked. The manufacturer shall submit certification of shop trial assembly and photographs of assembly before shipment.

2. Shop inspection shall be performed by a qualified inspector and certified by the manufacturer. The inspection shall be documented, and all deficiencies noted, corrected, re-inspected, and completion formally authorized.

3. Final shipment authorization shall be by the manufacturer to ensure completion of all fabrication, assembly, and inspection requirements. Inspection records and evidence of the inspector's qualification shall be submitted to the Owner upon request.

1.4 SUBMITTALS

A. Submit manufacturer's technical data and application instructions per Section 013323.

B. Submittals shall include the following:

1. Descriptive literature, bulletins, and/or catalogs of the equipment.
2. Certified general arrangement drawings showing all important details and materials of construction, all major tank and mechanism dimensions and elevations, loads on supporting structures, and anchor bolt locations.
3. Engineering calculations showing that the platform meets the design criteria (if applicable).
4. Complete data on motors and speed reducers.
5. Wiring diagrams and electrical schematics for all control equipment to be furnished.
6. Calculations documenting the AGMA rating of the drive unit and life of the main bearing; prepared and signed by a registered professional engineer.
7. Complete descriptive information and electrical schematic for the torque overload device.
8. Complete sludge transport calculations substantiating the rake blade design, rake tip speed, and floor slope.
9. Complete process calculations substantiating the sizing of the outer feedwell.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 016600, Product Handling and Protection for Packing, Shipping, Handling, and Unloading.

B. All equipment shall be shipped and delivered fully assembled, except where partial disassembly is required to conform to transportation regulations or for the protection of components.

C. All components shall be installed immediately upon receipt from the manufacturer or stored in strict conformance with storage recommendations per the manufacturer's recommendations.

D. Acceptance at Site.

1. Inspect all equipment and materials against the reviewed Shop Drawings at the time of delivery.
2. Equipment and materials damaged or not meeting the requirements of the reviewed Shop Drawings shall be immediately returned for replacement or repair.

E. Storage and Protection

1. Carefully prepare for storage and label all equipment and materials after they have been inspected.

2. Store all equipment and materials in a dry, covered, ventilated location and protect from harm according to the manufacturer's instructions.

1.6 WARRANTY

A. The mechanism shall be warranted for a minimum period of one (1) year from start-up or eighteen (18) months from time of delivery, whichever comes first. Such warranty shall cover all defects or failures of materials or workmanship which occur as the result of normal operation and service except for normal wear parts (i.e. squeegees, skimmer wipers, etc). The main drive bearing shall be warranted for ten (10) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. WesTech
2. Ovivo
3. Or an Engineer approved equal.

B. The thickener equipment specified in this section is based on WesTech Model THS10P. Substitute equipment must be modified as necessary to provide the specified features and to meet the specified operating conditions.

2.2 DESIGN CRITERIA

A. General Design Criteria:

Plant Flow Rates	
Minimum Flow Average Day Flow Maximum Day Flow	5.4 MGD 6.5 MGD 12 MGD
Operating Parameters per Gravity Thickener	
Influent TSS Concentration	0.5%
Influent Flow Rates Design Flow: Max Flow:	 57,500 gpd 106,100 gpd
Solids Loading Rates (SLR) Design SLR: Max SLR:	 2,396 lbs/day 4,424 lbs/day
No. of Units	2
Tank Diameter	16 ft
Tank Side Wall Depth	15.16

Side Water Depth	13.66 ft
Freeboard	1.5 ft
Area, each	201 sf
Bottom Slope	2.75 in/ft
Influent pipe	8-inch
Feedwell	4 ft dia x 3.5 ft deep
Collector Tip Speed	8 fpm
Torque Continuous Torque: Momentary Peak Torque:	 3,200 ft-lbs 6,400 ft-lbs
Motor Size	1 HP, 460V/60 Hz/3-Ph
Electrical Control Panel	304 SS NEMA 4X
Drive Type	Shaft Drive w/Precision Bearing
House Material	Fabricated Steel
Main Gear and Pinion Lubrication	Oil
Main Bearing & Reducer Lubrication	Grease

2.3 GENERAL REQUIREMENTS

A. The thickener mechanism shall be of the shaft drive type, supported by the full-span bridge, with the flow entering via a side influent pipe into the feedwell. The thickener shall be designed to remove settled sludge from the bottom of the tank and floating scum from around the periphery of the tank.

B. Thickener shall perform the following integrated function:

1. Dissipate energy and control localized currents.
2. Separate solids from the clear liquid.
3. Evenly withdraw the clear liquid.
4. Transport and thicken the settled sludge
5. Prevent sludge dilution at the withdrawal point.

C. The flow shall then proceed into the feedwell through gates arranged for impinged flow near the water level for further energy dissipation and settling. The thickener shall be designed to remove settled sludge uniformly from the bottom of the tank and floating scum from around the periphery of the tank.

D. Major components of the thickening equipment shall include, but not be limited to:

1. Center drive mechanism, gear motor, and overload alarm
2. Center drive shaft
3. Bridge-supported Feedwell

4. Feedwell and supports
5. Truss rake arms with pickets and squeegees
6. Fasteners and anchor bolts
7. And all other components necessary for a complete operating system.

2.4 MATERIALS

A. Structural Steel:

a. All structural steel shall conform to AISC – Steel Construction Manual, latest edition, and the International Building Code (IBC), latest edition.
b. All structural plates shall conform to ASTM A36.
c. All structural steel shall (shape series of M, MT, S, ST, C, MC, and L) conform to ASTM A36.
d. All structural steel shall (shape series of W, WT, HP) conform to ASTM A992/A572.
e. All pipe shall be ASTM A53, Grade B.
f. All square and rectangular tubing shall be ASTM A500, Grade C, unless otherwise noted.
g. Steel members in contact with liquids, either continuously or intermittently, shall have a minimum thickness of 1/4 inch unless otherwise noted.
h. All aluminum shall be type 5052, 6061, 6063, or 2014 alloy unless noted.
i. All stainless steel shall be ASTM A276 for rolled shapes, ASTM A1069 for laser-fused shapes, ASTM A312 for pipe, ASTM AA554 for HSS, and ASTM A240 for plate, type carbon steel unless noted.

Component Location	Material of Construction
Submerged	Carbon Steel
Non-Submerged	Carbon Steel

B. Fabrication

1. Shop fabrication and welding of structural members shall be in accordance with the latest edition of the "Structural Welding Code", AWS D1.1 (AWS D1.2-Aluminum, AWS D1.6-Stainless Steel), of the American Welding Society. All joined or lapped surfaces shall be completely seal-welded with a minimum 3/16-inch fillet weld. Intermittent welding shall not be allowed, except for non-ferrous metals.

C. Edge Griding

1. Sharp projections of cut or sheared edges of ferrous metals shall be ground to a radius by multiple passes of a power grinder as required to ensure satisfactory coating adhesion.

2.5 DRIVE UNIT

A. Design Parameters:

1. The drive unit shall be designed and manufactured by the thickener equipment supplier to ensure unit responsibility.
2. The drive unit shall be designed for the torque values of:
3. Continuous Torque: 3,200 ft-lbs
4. Momentary Peak Torque: 6,400 ft-lbs
5. The drive unit shall be capable of producing and withstanding momentary peak torque while starting.
6. The drive unit shall turn the mechanism at the design collector's tip speed of 8 fpm.
7. The drive main bearing shall be designed for the total rotating mechanism loads with a minimum L-10 life of 50 years or 438,000 hours.
8. The drive main gear shall be designed to a minimum AGMA 6 rating when rated in accordance with the latest AGMA standard.
9. Gear teeth shall be designed for proper load distribution and sharing. Stub tooth design and surface hardening of the main gear shall not be allowed.
10. The main bearing shall be capable of withstanding the listed overturning moment without the aid of any underwater guides or bearings to ensure correct tooth contact for AGMA rating of the main gear.

B. Physical Characteristics

1. The drive unit shall consist of a motor, a secondary speed reducer, and a support base. The drive shall be mounted on the walkway and support the entire rotating load of the mechanism. All speed reducers shall be fully enclosed and running in oil. The support base for the drive shall be welded steel to assure rigidity. Lubricant and dust seals shall be provided. Lubrication fittings shall be readily accessible.

C. Overload Protection

1. An overload device shall be provided in a stainless steel, weatherproof enclosure.
2. The device shall be actuated by torque generated from the main drive, which shall operate two independently adjustable switches (the alarm switch at 100 percent of design running torque and the motor cutout switch at 120 percent of design running torque).

Alarm	100% - 3,200 ft-lbs of Continuous
Motor Cut-Off	120% - 3,840 ft-lbs of Continuous
Momentary Peak	200% -6,400 ft-lbs of Continuous
Torque overload with the secondary cutout switch	< 140% of Continuous

3. The switches shall be factory adjusted to accurately calibrate the alarm torque value and the overload position.

4. A visual torque indicator shall be provided and oriented so that it may be read from the walkway. It shall be calibrated from 0 to 160 percent of the design running torque.

5. Devices that require the worm to float and measure the thrust of the worm gear shall not be acceptable.

D. Speed Reducing Unit

1. The speed-reducing unit shall consist of cycloidal, helical, or planetary speed reducers directly connected to a motor without the use of chains or V-belts.

2. The main ring gear of cycloidal drives shall be made of high-carbon chromium bearing steel and be fixed to the drive casing. An eccentric bearing on the high-speed shaft shall roll cycloidal discs of the same material around the internal circumference of this main ring gear. The lobes of the cycloid disc shall engage successively with pins in the fixed ring gear. The movement of the cycloid discs shall then be transmitted by pins to the low-speed shaft. Speed reducer efficiency shall be a minimum of 90% per reduction stage.

3. Speed reducer helical or planetary gearing shall be manufactured to AGMA standards and shall provide at least 95% power transmission efficiency per stage. The speed reducer shall have a minimum service factor of 1.25 based on the output torque rating of the drive.

4. The reducers shall be fitted with radial and thrust bearings of proper size for all mechanism loads and be oil- or grease-lubricated. As a safety feature, the speed reducer shall be back drivable to release any stored energy as a result of an over torque condition.

E. Motor

1. The motor shall be a squirrel cage, induction type, TEFC, ball bearing heavy-duty unit of ample power for starting and operating the mechanism without overload, with a minimum service factor of 1.15.

2.6 INFLUENT AND SLUDGE REMOVAL

A. Rotating Center Drive Shaft and Cone Scraper

1. A rotating steel drive shaft of 1/4 inch minimum wall thickness shall be provided. The shaft shall be suspended vertically from and receive its rotational power from the center drive unit mounted on the operating platform. The shaft shall extend down to a sludge cone in the center of the tank floor.
   a. The shaft shall have a steel cone scraper attached to its lower end to prevent the deposit of solids in the sludge cone.
   b. The shaft shall be provided with connections for the two sludge rake arms and feedwell supports. The shaft shall be bolted to the drive unit, which shall rotate the shaft with the attached arms and feedwell. The shaft and each arm shall be designed to withstand 150 percent of the design running torque of the drive without over stressing the members. Loading to develop the torque shall be considered as uniform loads applied to each arm individually.

c. The rotating shaft shall have adequate structural strength to support the entire rotating mechanism, including rake arms, cone scraper, scum scraper and support, scum skimmer, and feedwell. Design shall accommodate dead load plus live load and torque with an adequate factor of safety to eliminate deflection or vibration

B. Feedwell

1. The flocculating feedwell shall diffuse the liquid into the tank without disturbance or formation of velocity currents. Baffled openings shall be provided near the water surface to allow scum to exit the feedwell.
   a. The supports for the feedwell shall be located either above the liquid extending from the shaft or bridge, or on the rake arms. Submerged supports from the rake arms shall be designed to minimize horizontal flow disruption.
   b. No feedwell support or feedwell spliced connection shall be contained within the annular space formed within the feedwell. The depth of the feedwell shall be such as to provide proper detention time and an exit velocity at maximum flow that will not scour the settled sludge. The diameter, depth, detention time, and exit velocities shall match the process application calculations as evidenced by the required successful operating installations.
   c. The feedwell shall be made of not less than 3/16 inch thick steel plate with necessary stiffening angles.

C. Segmented Blade Rake Arms

1. The mechanism shall include two segmented sludge rake arms of steel channel construction with steel scraper blades and adjustable stainless steel squeegees. Squeegees shall be fastened to the rake blades with stainless steel fasteners. The blades shall be properly sized to ensure complete raking of the bottom twice per revolution. The blades shall rake the heavy sludge to a center sludge hopper. The arms shall be adjustable at the shaft to assure an even grout thickness over the tank bottom.

2.7 ELECTRICAL

A. The thickener manufacturer shall provide a NEMA 4X, 304 stainless steel control panel to control and protect the thickener mechanism. The control panel shall be wired to accept a 480-volt power feed, a control power transformer shall be provided to power all internal controls. The control panel shall be built in a UL508A/698 certified panel shop. The thickener control panel shall be provided by the Manufacturer and be installed by the Electrical Contractor.

B. The control panel shall be provided with the following devices mounted on the exterior of the enclosure:

1. Top-mounted amber strobing alarm light, Federal Signal LP3P.
2. Top-mounted alarm horn, Federal Signal 350B.
3. Door-mounted rotary disconnect handle, manufactured by Square D.
4. Door-mounted red rake running light, Idec 30.5 mm.

5. Door-mounted amber torque cutout light, Idec 30.5 mm.
6. Door-mounted amber motor overload light, Idec 30.5 mm.
7. Door-mounted rake hand/off/auto 3-position selector switch, 30.5mm.
8. Door-mounted red alarm silence pushbutton, Idec 30.5 mm.
9. Door-mounted black reset pushbutton, Idec 30.5 mm.

C. The control panel shall be provided with the following devices mounted on the interior of the enclosure:
1. Molded case main breaker, Square D HDL series.
2. 250 VA control power transformer, Acme.
3. NEMA size 1, FVNR motor starter, Square D TeSys N series.
4. Control relays, Idec series RH.
5. Time delay relay, Idec series RTE.
6. Terminal blocks, Phoenix Contact series UT4.

D. The following signals shall be made available as dry contacts for remote monitoring by the plant SCADA:
1. Rake drive running.
2. Rake drive overload.
3. Rake drive in auto.
4. High torque alarm.
5. Cutout torque alarm

E. Workmanship shall be of the highest quality, with all wiring on the enclosure back panel routed through plastic wireway and all door-routed wire securely fastened with adhesive feet and nylon ty-wraps. Wires that cross enclosure hinges shall be protected with nylon spiral wrap and must have adequate slack to allow the door to open 180 degrees. All components on the back panel shall be mounted using #14 machine screws. Rivets and self-tapping screws are not acceptable.

F. The control panel shall be mounted by the electrical contractor on the platform handrail adjacent to the thickener drive unit. All conduit and wiring between the thickener control panel, drive torque monitor, power distribution system, and the SCADA system shall be provided and installed by the electrical contractor.

2.8 ANCHORS AND FASTENERS

A. Anchor Bolts
1. All anchor bolts shall be a minimum of 1/2 inch diameter and made of type 304 stainless steel. The equipment supplier shall furnish all anchor bolts, nuts, and washers required for the equipment.

A. Fasteners

1. All structural fasteners shall be a minimum of 1/2 inch diameter and made of type 304 stainless steel. The equipment supplier shall furnish all fasteners required for the assembly of the equipment.

2.9 SURFACE PREPARATION AND COATING

A. Shop Preparation and Coating

1. Carbon-steel portions of the sludge thickener mechanism shall be shop-prepared and factory-coated with a complete epoxy coating system complying with AWWA C550.

2. The coating system shall consist of a compatible primer and not less than two finish coats of Tnemec Series 21 Epoxoline applied to the coating manufacturer’s recommended total dry-film thickness for the intended service.

3. Gear motors shall be furnished with manufacturer's standard enamel.

B. Field Painting

1. The Contractor shall clean and repair damaged areas of the shop-applied coating after installation. Prepare exposed steel in accordance with the coating manufacturer’s written requirements and apply Tnemec Series 37-77 Chem-Prime, Kop-Coat 340 Gold Primer, or a compatible primer approved by the equipment and coating manufacturers, followed by the specified finish coats.

2. Restore the repaired coating to the required total dry-film thickness. Do not field-coat galvanized steel, stainless steel, aluminum, plastic, machined surfaces, lubrication fittings, or identification plates.

2.10 SPARE PARTS

A. Spare parts to be provided for each set of pumps supplied:

1. One (1) set of squeegees for the rake arms.

2. One (1) cutout switch

PART 3 - EXECUTION

3.1 INSTALLATION

A. The equipment shall be installed properly to provide a complete working system. Installation shall follow the supplier’s recommendations.

B. Lubricants of the type recommended by the equipment manufacturer shall be furnished and applied by the Contractor.

3.2 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance (O&M) manuals shall be submitted in accordance with Section 017823.

B. The manual shall include, but not be limited to, the supplier's erection and detailed installation instructions, warranty, start-up instructions, and a complete list of recommended spare parts.

3.3 FIELD TESTING

A. Operation Tests

1. The contractor shall operate the mechanism in a dry tank for a minimum of 4 continuous hours before flow is allowed to enter the system. There shall be no binding, jerky, or unusual motion exhibited during this run-in period. Motor amperage shall be checked at least hourly for any unusual or abnormally high readings. After the unit has successfully passed this initial test, flow shall be introduced into the tank and the same 4-hour observation test run. If the unit should fail under any of these conditions, the test shall be halted and the problem corrected. If, after several attempts, the unit does not successfully pass the field test, the faulty portion of the equipment shall be repaired or replaced and the test re-run.

B. After erection, the sludge collector mechanisms shall be field tested in the presence of the Engineer to confirm and verify the structural and mechanical compliance to the torque requirements specified by loading each collector mechanism with 100%, 120%, and 140% of the rated continuous torque specified.

C. All labor, materials, and test apparatus necessary for conducting the above tests shall be furnished by the Contractor at no additional cost to the Owner.

D. The following torque field testing shall be performed:

1. The Gravity Thickener mechanism shall be field torque tested. The purpose of the torque test is to verify the structural integrity of the mechanism, structural steel design, and center drive unit. The testing shall be carried out under the supervision of the equipment manufacturer's representative and as approved by the Engineer before the mechanisms are accepted and placed into operation.

2. The torque test shall consist of securing the rake arm by cables to anchor bolts installed by the contractor on the tank floor at locations specified by the equipment manufacturer. A load shall be applied gradually to the scraper arm by means of a ratchet lever and cylinder connected to the cable assembly.

3. The magnitude of the applied load shall be measured by calculating the torque from the distance of the line of action of each cable to the center line of the mechanism. A reading shall be taken at the 100% value of the drive design torque.

4. The manufacturer's service representative shall verify that the alarm, motor cut-out, and shear pin are properly set and are in proper operation to protect the clarifier mechanism as specified.

3.4 FIELD SERVICE

A. The equipment supplier shall provide the service of a qualified representative for two (2) trips, one day per trip, to inspect the mechanism installation, assist in start-up, and instruct plant personnel in the proper operation and maintenance of the mechanism.

1. The equipment manufacturer shall be present for Start-up and Commissioning of equipment per Section 017517.

2. When the equipment is capable of being operated, the manufacturer shall provide a representative to check the installation, make final adjustments, supervise the initial startup of each drive, and prepare a written report thereof for the Owner. A written inspection report shall include the representative's findings, any noted deficiencies, and installation approval.

END OF SECTION 467113

SECTION 467331 – DEWATERING MULTI-DISK SCREW PRESS

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.

B. Related Section:

1. Division 26 – Electrical
2. Section 432110 – Progressive Cavity Pumps
3. Section 463333 – Polymer System

C. This section contains references to the following documents:

1. American National Standards Institute (ANSI)
2. American Society of Testing and Materials (ASTM)
3. American Iron and Steel Institute (AISI)
4. American Welding Society (AWS)
5. American Institute of Steel Construction (AISC)
6. American Bearing Manufacturers Association (ABMA)
7. American Gear Manufacturers Association (AGMA)
8. National Electrical Manufacturers Association (NEMA)
9. Underwriters Laboratory (UL).
10. National Electrical Code (NEC)

1.2 DESCRIPTION OF WORK

A. All equipment furnished under this Section shall be provided by a single Manufacturer, who shall be responsible for fabricating or procuring individual components, integrating the complete system, performing factory testing, and delivering the equipment to the Project site. The Manufacturer shall be responsible for coordinating all equipment, components, and interfaces necessary to provide a complete, properly functioning, and integrated sludge dewatering system.

B. The Manufacturer shall furnish a complete sludge dewatering packaged system, as specified in the Contract Documents, capable of meeting the specified performance requirements and providing a fully functional and coordinated sludge dewatering system. The packaged system shall include, at a minimum, the following components:

1. Multi-Disc Screw Press (hereinafter Screw Press) dewatering unit with sludge conditioning (flocculation) tank, including Local and Main Control Panels
2. Polymer Feed Skid System

3. Two (2) Sludge Feed progressive cavity pumps
4. Flowmeter
5. Access platform(s), as shown in the Contract Drawings

C. The screw press shall include a structural frame capable of accommodating three (3) dewatering drums. Two (2) dewatering drums shall be furnished and installed to meet the ultimate current capacity. Provisions shall be made for a third (3rd) dewatering drum for future capacity expansion.

D. The Dewatering Screw Press unit provided must include the capacity to add an additional dewatering drum and increase the throughput capacity of the unit by 50% with no structural modifications. If a unit is offered without this capacity, a second identical unit must be provided under this section. A single larger unit is not acceptable, as the additional dewatering drum provides redundancy and extra capacity.

E. The Contractor shall provide all labor, materials, equipment, and incidentals as specified. The Screw Press system has been designed based on the Esmil Group Multi-Disc Screw Press, Model MDQ-403(2)CLS, which serves as the Basis of Design. Other manufacturers may be considered only if the proposed equipment meets or exceeds all specified design, performance, and operational requirements and fully complies with the site constraints identified in the following paragraph. Named or approved equal equipment may differ in structural configuration, electrical power characteristics, or control systems, provided such differences do not require modifications to the existing facility or supporting systems and comply with all Contract requirements.

F. Equipment Access, Packaging, and/or Engineer-approved as Equal Requirements for the existing Building:

1. Access and Equipment Fit: The Contractor shall demonstrate at the time of bid that all proposed equipment components can be transported and installed within the existing building access limitations. Equipment requiring field modification, disassembly beyond the manufacturer's standard procedures, or alteration of building features to fit shall not be accepted. Any non-compliant equipment furnished shall be corrected entirely at the Contractor's expense, with no adjustment to the Contract Price or Contract Times.

2. Packaged and Coordinated System: All dewatering equipment shall be furnished as a fully coordinated, complete packaged system. Interface gaps, undefined scope, or missing components necessary for a complete and operable system shall be the sole responsibility of the Contractor and shall be provided at no additional cost to the Owner.

3. Performance and Future Capacity: The dewatering equipment shall meet the design and operational requirements specified in Paragraph 1.3 and shall be capable of accommodating a minimum of thirty percent (30%) future increase in capacity without structural modification to the equipment, building, or supporting structure. Equipment requiring external aging tanks, oversized vessels, or supplemental process units to meet capacity or performance requirements shall not be accepted.

4. Equipment Removal and Clearance: The Contractor shall verify all overhead and access clearances for the installation and maintenance requirements as part of the bid.

5. Solids Discharge Alignment: Dewatered solids discharge shall align with the existing cake chute location as shown on the Drawings. New floor penetrations, beam modifications, chute relocation, or structural alterations shall not be permitted.

6. Approved Equal Requirements: All changes in structural, electrical, mechanical, instrumentation, or plumbing requirements resulting from a proposed "or Engineer-approved equal" shall be the sole responsibility of the Contractor. This shall include the cost of redesign by the Engineer or the Engineer's subconsultants, as well as any additional costs incurred by affected subcontractors. All revised drawings shall be sealed by a professional engineer licensed in the State of West Virginia. No additional compensation shall be made by the Owner.

7. Burden of Proof: The burden of proving equivalency shall rest entirely with the Contractor. Claims of equivalency based solely on performance, capacity, or advertised ratings will not be accepted.

G. All welding shall conform to the American Welding Society Structural Welding Code.

H. All construction shall allow easy access and visual inspection of all internal components.

I. All electrical work, motors, and drives shall comply with all relevant NEMA standards.

1.3 SYSTEM DESCRIPTION

A. The sludge dewatering system shall consist of the Dewatering Screw Press sized to dewater thickened solids from Flocculation & Coagulation:

Type of Influent Solids	Thickened solids from Flocculation & Coagulation	
Influent Dry Solids Concentration	5%	2%
Total Solids Loading Capacity	450 lbs/hr (for 2 drums)	
Maximum Hydraulic Capacity	19 gpm	47 gpm

B. The Dewatering Screw Press shall be a complete, prefabricated sludge dewatering system, as described herein and shown on the Drawings, consisting of the following:

1. Flocculation and dosing chamber used for flocculation/mixing of the polymer and influent sludge. This tank shall be equipped with a sludge inlet, drainage outlet, polymer (flocculant) inlet, an electric agitator, and a mixer. The feed tubes connect the mixing tank with the dewatering drums.

2. Two (2) dewatering drums shall be initially provided and run by gearmotors equipped with an individual rinsing water system with nozzles. Each dewatering drum shall have individual fixing elements that can be removed separately while the other screw is in operation. An additional section for the third (3rd) dewatering drum shall be left empty for future expansion needs.

3. The filtrate collection tray shall be provided with flanges for filtrate removal. Side walls of the filtrate collection tray are an integral part of the frame base.

4. A self-contained electrical and control panel, including control for ancillary equipment such as feed pumps and polymer feed.

C. The dewatering system shall integrate all appurtenances necessary for a complete, functional dewatering system operation, including but not limited to the following:

1. Liquid Polymer Blending System

2. Sludge Feed Pumps

3. Flowmeter

1.4 PERFORMANCE TESTING

A. Performance testing must demonstrate that the performance of the dewatering equipment can simultaneously achieve:

B. Sludge processing capacity of up to 470 dry pounds per hour, or 235 dry pounds per hour per dewatering drum. It shall be capable of dewatering thickened sludge with a concentration ranging from 2 to 5 percent of total solids to a dewatered cake with an average solids concentration of not less than 22 percent. The specified capacity and performance shall be achieved at or below the drum rotation speed specified herein.

1. Minimum solids capture rate shall be 98% at the rated capacity of the Screw Press.

2. Stated average performance criteria shall be obtained with a maximum cationic emulsion polymer, with active polymer concentration ≥ 39%, dosage of 2-3 gallons per dry ton of solids (17-26 lbs of polymer/dry ton).

3. If a different configuration of drums is provided, the total sludge processing capacity, solids capture, and polymer dose shall be met without exceeding the specified maximum drum speed.

1.5 QUALITY ASSURANCE

A. All equipment and components shall be furnished as complete standard type assemblies in accordance with the standards of the industry.

B. All equipment furnished under this section shall be of a single manufacturer who has been regularly engaged in the design and manufacture of the specified equipment.

C. To ensure unity of responsibility, the Screw Press, supporting frames, polymer mixing and feeding blend unit, sludge feed pumps, and control systems shall be furnished and coordinated by a single supplier. The Contractor shall assume full responsibility for the satisfactory installation and operation of the entire dewatering system package.

D. The Supplier shall have at least ten (10) full-scale systems utilizing the exact technology at the same scale size proposed for this project operating successfully for at least three (3) years in North America at the water and wastewater treatment plants that were furnished under the manufacturer’s own name.

E. Before shipment, the Dewatering Screw Press and control panel shall be factory tested at the place of assembly. Factory test each pre-assembled, pre-wired, Multi-Disc Dewatering Screw Press and its associated control panel to be supplied to the job site. Before shipment, verify through a one-hour continuous operating test that the Multi-Disc Dewatering Screw Press and associated equipment operate smoothly, noiselessly, vibration-free, and without overheating of any bearing or motor.

F. The Owner/Engineer shall, at their option, be permitted to witness the factory quality control test at the manufacturer’s facility. The manufacturer shall give the owner/engineer a minimum of two (2) weeks' notice before testing.

G. The Contractor shall install the dewatering equipment strictly in accordance with the manufacturer’s detailed installation instructions and shall coordinate all details and components necessary to provide a complete and properly functioning dewatering system.

H. The equipment furnished shall be fabricated, assembled, installed, and placed in proper operating condition in full conformity with approved drawings, specifications, engineering data, and/or recommendations furnished by the equipment manufacturer. The equipment manufacturer shall, in addition to the Contractor, assume the responsibility for the proper installation and functioning of the equipment.

I. In addition to the requirements of these specifications, comply with the manufacturer's instructions and recommendations for work. All equipment shall perform as specified, and accessories shall be provided as required for satisfactory operation.

1.6 SUBMITTALS

A. Submit manufacturer's technical data and application instructions per Section 013323.

B. Product Data: Submit manufacturer's technical data and application instructions.

C. Shop Drawings: The Contractor shall submit complete shop drawings of all equipment furnished for this project as covered by these specifications. All shop drawings shall clearly identify the specific equipment and material being supplied, the quantity being supplied, and all accessories, dimensions, descriptions, dimensional/orientation layout drawings, mounting and connection details, electrical control diagrams, wiring schematics, and any other information required by the Engineer/Owner to determine compliance with the plans and specifications. The summary, as a minimum, shall include the above data, drawings, and other related materials. The shop drawings shall be reviewed by the Contractor for completeness and compliance with the project and so acknowledge this before the review by the Engineer.

D. Shop Drawings: Submit for review the following:

1. Dimensional drawings depicting all mechanical and electrical equipment dimensions and required overhead clearances.

2. Equipment layout, principal dimensions with related verifications required for installation, including anchorage location.

3. Details on connectors for solids discharge chutes.
4. Equipment weight
5. Electrical control drawings
6. Drive motor data
7. A list of recommended Spare Parts, including any Special Tools required for routine maintenance of the equipment.
8. Certified copies of performance shop test data and reports shall be supplied for approval before shipment from the factory.

E. Operation and Maintenance (O& M) manuals shall describe the theory of the dewatering system, start-up, optimization, and maintenance operations for the equipment furnished and installed under this Section. The final O & M manuals shall be provided in digital format after equipment start-up in the close-out submittal process. The O & M manuals shall meet the requirements of Sections 013323 and 017823, including the following additional information:

1. As-Built Drawings of the Multi-Disc Screw Press.
2. Electrical diagrams
3. Controls and Accessories
4. Explanation of operating safety considerations
5. Repair Parts and maintenance materials
6. Troubleshooting data
7. Repair data

F. Warranty: The Equipment Manufacturer shall submit a warranty certificate for review. The warranty period begins after commissioning and operational demonstration and will be determined in the field by the Owner's Engineer.

1.7 WARRANTY

A. The manufacturer shall warrant, in writing, that all equipment supplied by them shall be free from defects in material and workmanship, for a period of twelve (12) months from the date of startup, not to exceed eighteen (18) months from the date of delivery, unless noted otherwise within the specifications.

B. Any defects found within the warranty period shall be replaced if damaged or defective in the normal use of the equipment at no cost to the Owner.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 016600, Product Handling and Protection.

B. Equipment shall be shipped and delivered fully assembled, except where partial disassembly is required to conform to transportation regulations or for the protection of components.

C. Handling, delivery, and storage of the equipment shall be in accordance with the Manufacturer's recommendations. No extra cost shall be charged to the Owner for the handling, delivery, or storage of the equipment.

D. Contractors shall be responsible for unloading and shall have equipment on-site at the time of delivery, permitting proper hoisting of the equipment.

E. Acceptance at Site:

1. Inspect all equipment and materials against the reviewed Shop Drawings at the time of delivery.

2. Equipment and materials damaged or not meeting the requirements of the reviewed Shop Drawings shall be immediately returned for replacement or repair.

3. The Contractor shall notify the Manufacturer of any damages to equipment within 5 days to effect proper remedial action. Failure to notify the Manufacturer of damage to equipment before unloading shall void all warranties pertaining to the subject equipment.

F. Storage and Protection: Store all equipment and materials in a dry, covered, ventilated location and protect from harm according to the manufacturer's instructions. Carefully prepare for storage and label all equipment and materials after they have been inspected.

1.9 SEQUENCING

A. Comply with Section 011100, Summary of Work.

B. The Contractor shall take special note that the City of Wheeling WWTP must remain in operation at all times unless outages are approved by the Owner.

1.10 SPARE PARTS

A. Furnish the following spare parts:

1. Spray wash system solenoid valve.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with specified requirements, provide equipment supplied by one of the following manufacturers:

1. Esmil Group, Multi-Disc Screw Press, Model 403(2) CLS

2. Or an Engineer approved equal.

B. The sludge dewatering process, electrical, controls, and structural design are based on the Esmil Group, Multi-Disc Screw Press, which serves as the Basis of Design. Approved equal equipment may differ in structural support requirements, electrical characteristics,

and control system architecture. The Contractor shall be responsible for identifying and accommodating all deviation from the Basis of Design and providing any modifications necessary to ensure a complete and fully functional installation. All proposed equipment shall comply with the site-specific constraints identified in the Description of Work Paragraph 1.2.

2.2 EQUIPMENT DESCRIPTION

A. Design Criteria

1. The Screw Press shall be designed to adequately condition and dewater the sludge such that a dewatered sludge cake is produced that easily discharges from the dewatering drum, without binding or plugging.
2. The system shall be designed to operate in the environment for which it is intended, continuously or intermittently on demand, and shall perform the required dewatering operations without spillage of water or sludge beyond the nominal machine envelope.
3. The system shall operate without the need for operator attention other than periodic inspection and chemical replenishment.
4. The dewatering press shall allow a 50% capacity increase without any structural modifications by adding drum number three (3) to the installed dewatering press frame. Adding a drum number three (3) shall not require any type of drum frame structural modification or drum disassembling/assembling onsite. The additional drum shall be equipped with a drum cover.

B. General:

1. The flocculated sludge is fed into the dewatering drum by self-flowing through feeding tubes. Filtrate seeps between the moving and fixed drum disks and drains out into the filtrate tray below the dewatering drum. Next, the filtrate is discharged from the drums through a filtrate discharge pipe and returned to the plant.
2. As the sludge moves through the drum, the water is removed through the gaps between the movable and fixed disks. In the thickening zone, water is removed from sludge by the gravity and pressure of the screw flights. In the dewatering area, sludge is compressed due to the reduction of the space between the screw flights and the conical shape of the shaft.
3. The final compression of sludge occurs at the end of the dewatering area by an adjustable dam plate mounted on the outlet end of the screw. Through a gap between the plate and the drum end, the dewatered sludge is squeezed out of the drum into a container.

C. The Dewatering Screw Press shall be a complete prefabricated system as described herein and shown on the Drawings, consisting of the following:

1. Flocculation and dosing Chamber:
   a. Installed on the separated frame.
   b. The mixing tank shall be equipped with sludge and polymer inlets, a drainage outlet, and an electric agitator.

c. The mixing tank shall be equipped with four (4) lifting eyes for transportation and come preassembled with a separate frame-base, which has four bolt holes for installation
d. The flocculation and dosing chamber shall be equipped with steps to facilitate operator access to the top of the tank for effective supervision of the flocculation process.
e. The flocculation and dosing chamber shall be equipped with a junction box to enable the connection to the main screw press control panel.

2. Screw Press
a. The Screw Press shall include two (2) horizontal dewatering drums with drive motors, including an individual rinsing water system with nozzles. ultimate capacity. Each dewatering drum shall have individual fixing elements that can be removed separately while other screws are in operation.
b. An additional section for the installation of the third (3rd) dewatering drum shall be provided, with the 304 stainless steel cover designed for a combined load of 50 pounds per square foot, and with the rinsing water valve already in place for the future expansion.
c. The feed tubes connect the mixing tank with the dewatering drums.
d. The dewatering drum consists of a variable flight pitch screw located within a support frame of alternating fixed and moving discs. Fixed discs are equipped with spacers that hold the fixed discs apart and provide a gap for moving discs between them.
e. A spring-loaded dam plate at the end of the drum sets the gap from where the cake exits, providing the back pressure that forces final sludge dewatering.
f. Machine frame structure for the dewatering drums includes a filtrate collection tray and outlet flanges. The frame is equipped on both sides with eyelets for transportation and holes for anchoring to the concrete base.
g. A self-contained electrical and control panel shall be supplied together with the Screw Press and an adjacent control box with control elements, including the control and monitoring of ancillary equipment such as sludge feed pump, polymer feed, and a flowmeter.

D. Manufacturer shall provide a Flowmeter to control influent sludge flow to the screw press, installed as shown on the Drawing. The Flowmeter shall be the electromagnetic type, Endress Promag W400, or equivalent. The flowmeter shall have 4-inch flanges, ANSI 150 lbs, and an NEMA 4X enclosure.

2.3 MATERIALS OF CONSTRUCTION

A. All materials utilized in the construction of the sludge dewatering equipment shall be entirely suitable in every respect for the service required. All metals in contact with polyelectrolyte or sludge, and all other metal components other than those specified in the table below, shall be stainless steel, type 304 or 316, or plastic.

B. The following table indicates the materials and coatings that shall be provided for the Screw Press and related components unless specified otherwise herein:

Equipment	Material
Mixing tank with frame base	Type AISI 304 stainless steel
Rinsing water spray pipes	Type AISI 304 stainless steel, plastic
Technological pipes	Type AISI 304 stainless steel, plastic
Dewatering drum	Type AISI 304 stainless steel
Dewatering drums enclosure and cover	Type AISI 316L stainless steel
Dewatering drum screw	Type AISI 304 stainless steel with FREA-metal blade edge
Gearmotor	Cast iron
Gearmotor coating	Acrylic paint
Spray nozzles	Plastic
Electrical enclosure	Carbon steel with acrylic paint or AISI 304 stainless steel
Electrical wiring housing	Non-metallic flexible liquid-tight conduit and fittings
Valves: wetted sections	Stainless steel or brass, EPDM seating

C. No carbon steel shall be used for any part of the Screw Press.

2.4 STRUCTURAL COMPONENTS

A. The structural support frame shall be fabricated of type 304 stainless steel. It shall be a rigid structure, adequately braced to withstand intended loads without excessive vibration or deflection.

B. The framework shall be of welded and/or bolted construction. The structure shall be designed for installation on a prepared concrete foundation and secured with anchor bolts.

2.5 DEWATERING DRUMS

A. The dewatering drums shall be constructed of ASTM type 304 Stainless Steel. All circular components shall be laser-cut to ensure maximum uniformity of wear and operating life. The dewatering drum consists of a screw shaft that rotates at a variable speed within the cylindrical body. The body consists of a support structure and a series of alternating fixed and movable disks with gaps between them. The width of the gap decreases towards the discharge zone, from 0.02” in the thickening area up to 0.011” in the dewatering area and up to 0.0059” at the end of the drum. Nominal drum size shall be 18 inches.

B. The dewatering drums must have a minimum internal volume of 45 cubic feet. The maximum operational speed of the dewatering drums must not exceed 2.5 RPM at the design loading.

C. Screw flights side shall be protected by welded hard metal strips “Frea-Metal” with a thickness of not less than 0.05 inches. Vickers hardness of the metal strips shall be not less than 600 HV or Brinell hardness of 534 HB.

D. Screws shaft shall have a conical form with diameter increasing from the initial sludge inlet zone to the cake discharge zone for increasing DS content in the dewatered sludge.

E. Assembly shall be undertaken in such a way that all fixed discs shall be concentric and parallel. Fixed and movable discs thickness shall not be less than 0.12 in. All fixed discs shall be supported by a common support frame and be equally spaced apart for each section of the dewatering drum. Spacers must be fixed into fixed discs by thread connection. Any separate spacers are not allowed. Fixed and movable discs shall be made of AISI 304 Stainless Steel, using of plastic discs is not allowed. Movable discs shall be changeable with a life period of not less than 15,000 operation hours.

F. The dewatering drum shall be installed in a horizontal position with two mounting points to the unit's frame – at the initial sludge inlet zone and at the cake discharge zone. Intermediate fixation points along the drum are not allowed.

G. Cake Dam Plate shall be spring-loaded, self-adjusting, and fabricated from AISI 304.

H. Each Dewatering Drum shall be equipped with an individual spray bar. Each spray bar shall consist of a spray pipe fitted with spray nozzles, located above the dewatering drum. The spray pipe and spray nozzle assembly shall be readily removable. Nozzle spacing and spray pattern shall be such that the sprays from adjacent nozzles overlap one another on the dewatering drum surface. The sprays shall operate periodically and shall partly remove solids built up externally on the drum, such that over time no significant buildup of solids occurs on the drum. Each spray bar must be equipped with a solenoid valve.

1. Nominal rinsing water consumption: 23.2 gpm
2. Nominal rinsing water pressure: 30-60 psi
3. Typical total consumption: 46.4 gph for two (2) drums and 69.6 gpm with three (3) drums installed

I. Each Dewatering Drum shall have a drive motor:

1. The Dewatering Drum drive motor shall be a one-piece gear-motor.
2. Gear-motors shall be hollow shaft design, designed to drive the dewatering drum screws with no additional couplings or joints. Motors shall be filled with grease on assembly and sealed for life. Screw rotational speed shall be obtained through a reduction gear. Input power to the dewatering drum drive shall be supplied through an A.C. variable frequency drive unit.
3. Drive Motor Data:

a.	Quantity installed:	2, with 3rd drum installed in the future
b.	Maximum Horsepower:	1 Hp
c.	Power Requirements:	460 VAC, 3-phase, 60 Hz
d.	No-load motor speed:	1765 RPM, VFD
e.	Gear Reduction:	435.50:1
f.	Max output shaft speed:	4.1 RPM @ 60Hz
g.	Insulation Class:	NEMA 4
h.	Enclosure:	TEFC
i.	Enclosure material:	Painted Cast Iron

2.6 FLOCCULATION CHAMBER

A. The Screw Press shall have a mixing system which consists of a flocculation chamber equipped with an agitator with a drive motor. Chamber sizing and design shall ensure adequate residence times and mixing conditions to ensure complete flocculation and satisfactory dewatering performance. Chamber design shall minimize the possibility of any short-circuiting of flow.

B. Design and manufacture of the chamber shall ensure no leakage of fluids under normal working conditions.

C. The flocculation chamber shall be manufactured in type AISI 304 Stainless Steel.

D. The flocculation chamber shall be equipped with a maximum level sensor and a pressure sensor.

E. Each Agitator shall have a drive motor:

1. The flocculation chamber drive motor shall be a one-piece gear-motor.

2. Gear-motors shall be hollow shaft design, designed to drive the agitator with no additional couplings or joints. Motors shall be filled with grease on assembly and sealed for life. Input power to the agitator drive shall be supplied through an AC variable frequency drive unit.

3. Flocculation chamber drive motor data:
   a. Maximum Horsepower: 2 Hp
   b. Power Requirements: 460 VAC, 3-phase, 60 Hz
   c. No-load motor speed: 1765 RPM, VFD
   d. Gear Reduction: 93.5:1
   e. Output shaft speed: 19 RPM @ 60Hz
   f. Insulation Class: NEMA 4
   g. Enclosure: TEFC
   h. Enclosure material: Painted Cast Iron

2.7 PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. The Screw Press shall be provided with a PLC, installed, wired, and programmed to perform the listed functions. The PLC shall be a standard unit with no specialist hardware or firmware modifications. Full application software will be generated by the Screw Press manufacturer to operate the dewatering system using the PLC manufacturer's proprietary software package.

1. Operational Control:
   a. Control of all components of the dewatering system, including the ability to set times, operation, and operating speeds or capacities for the sludge dewatering press feed pump, dewatering drums, mixer, polymer feed system, and wash-down sprays.

2. System Tuning:
   a. PLC shall allow suitably qualified operators to adjust operating parameters such as delay timers for fault alarms and system calibration constants.

3. Monitoring Operation:
    a. PLC shall allow the operator to inspect the operation of all the components, including indicators such as output speed or capacity, elapsed operating times, and any faults present.
    b. Operators shall be able to view approximated readouts of all operational speeds and flow rates relevant to the operation of the system.
4. Manual Operation of Components:
    a. Operators shall be able to operate each item of equipment manually from the PLC/HMI interface for inspection and maintenance reasons.
5. Time Clocks:
    a. Operators shall be able to set the unit to operate at a specific time or on specific days with no operators present.
6. The PLC panel shall include a network switch for communications from/to the plant SCADA system over Fiber/Ethernet import and export of all dewatering system equipment data.
7. The PLC shall be capable of monitoring, recording, and outputting all input and output status parameters noted herein to the HMI and the plant SCADA system.
8. The PLC shall be capable of monitoring, recording, and outputting all alarm conditions to the plant SCADA system.

2.8 FUNCTIONAL DESCRIPTION

A. The control panel shall undertake the following operations:

1. Auto-Manual Operation: The Screw Press system shall be able to be set to either AUTO, MANUAL, or OFF on the control panel.
    a. When set to manual, all items must be switched ON and OFF at the control panel by the switches on the HMI unit.
    b. When set to OFF, no items shall work whether switched ON or OFF, either at the control panel or anywhere else.
    c. When set to AUTO, all items of equipment shall be turned ON into work as per the following descriptions:
        1) Under this mode of operation, the Screw Press will run constantly and will shut itself down in the event of any malfunctions detected by the control system. The Screw Press should always be run in automatic mode.
        2) Turn automatic mode on by switching the three-position selector switch H-O-A to the automatic position and pressing the automatic mode button on the touch panel.
        3) A mixer drive in the flocculation chamber switches “ON” in automatic mode.
        4) The screws’ drives are switched on when the preset sludge level in the flocculation chamber is reached.
        5) Also, after the screws’ drives are switched on and subsequently operated in the automatic mode, rinsing valves will be activated periodically, according to the predefined stop and start intervals. If

there is more than one valve, only one valve opens at a time to reduce the instantaneous water requirement.

d. Additionally, to "AUTO" mode operation activated by the personnel, there must be automatic, auto mode activation scenarios:
   1) AUTO mode: sludge level control.
   2) AUTO mode: flow control.
   3) AUTO mode: Polymer

e. Influent sludge feed pump and polymer feeder switch "ON" after the predetermined delay time, counting from the moment of turning automatic mode "ON".

B. The control panel shall provide signals to allow for all input and output parameters and alarms to be taken directly from the Screw Press control panel to the plant SCADA system. Provide a list of addresses for all parameters and alarms. The Plant SCADA system will not monitor the system parameters as a part of this scope, but shall provide the capability for future use.

2.9 ELECTRICAL HARDWARE

A. Power wiring shall be 460VAC, type SIS insulation, stranded copper, and shall be sized for the required load, 12AWG minimum.

B. Control wiring shall be 24VDC, type SIS insulation, stranded copper, and shall be sized for the required load, 18AWG minimum.

C. Main three-pole switch disconnectors GA series Lovato Electric. Circuit breakers shall be iC60N C series Schneider Electric or equal.

D. Motor starters shall be full voltage, non-reversing, IEC style across-the-line units. Coils shall be 24VDC. Schneider Electric type or equivalent.

E. Selector switches shall be heavy-duty, corrosion-resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10A continuous service. Selector switches shall be Harmony XB4 series Schneider Electric or equal.

F. Pilot lights shall be heavy-duty, corrosion-resistant units rated for NEMA 4X service. Units shall be 24VDC full-voltage incandescent type. Pilot lights shall be Harmony XB7 series Schneider Electric or equal.

G. Terminal blocks shall be high-density, solderless box lug style, with a 600-volt rating. Terminal blocks shall be Wago, Wieland type, or equal.

H. Control relays shall be general-purpose type with a 6A contact rating, miniature square base, and an internal on status pilot light. Relays shall be Schneider Electric Type RXM4 Series or equal.

I. Programmable Logic Controller (PLC) shall be Allen-Bradley.

J. Variable Frequency Drives (VFD) shall be UL-listed and shall be manufactured by Allen-Bradley.

PART 3 - EXECUTION

3.1 DELIVERY

A. All equipment shall be shipped and delivered fully assembled, except where partial disassembly is required to conform to transportation regulations or for the protection of components.

3.2 INSTALLATION

A. Equipment shall be installed in accordance with the Manufacturer's recommendations to provide a complete installation.

B. All lubrication required for initial operation shall be furnished and applied in accordance with the Manufacturer's recommendations.

C. It is the intent of this Contract that the final installation shall be complete in all respects and the Contractor shall be responsible for minor details and any necessary special construction not specifically included in the drawings or specifications.

D. Equipment shall be installed in strict conformance with the manufacturer’s installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals, and/or any pre-installation checklists.

E. Anchor bolts size shall be per the manufacturer's recommendation. Anchors, anchor bolts, nuts, and washers shall be 316 stainless steel and furnished for each item of equipment by the Contractor.

1. Anchor bolt template drawings shall be included in the submittal to permit verification of the location of structural elements, new or existing, in the concrete.

2. Equipment manufacturers shall specify the ample size and strength required to securely anchor each item of equipment. Anchor bolt template drawings shall be included in the submittal to permit verification of the location of structural elements, new or existing, in the concrete.

3. Equipment shall be placed on the foundations, leveled, shimmed, bolted down, and grouted with a non-shrinking grout.

3.3 ELECTRICAL CONNECTIONS AND CONTROLS

A. Wiring and conduits for electrical power, control, and instrumentation will be provided as shown in the Drawings and under Division 26 – Electrical and Division 40 – Process Integration Specifications.

3.4 TESTING

A. After completion of the installation, the equipment shall be tested by the Contractor in the presence of the Engineer under actual operating conditions. The test shall be conducted under the supervision of the manufacturer's technical representative and shall

demonstrate that the equipment is fully operational by picking up and depositing materials into the specified containment.

B. Field certification shall include inspection of the following:

1. Verify equipment is properly aligned and anchored per the installation instructions and drawings. Assure all piping and valves are installed and properly connected, and the dewatering equipment is unobstructed with required clearances maintained.

2. Assure controls and instrumentation work in all modes.

3. Check equipment for proper operation as well as completion of the Start-Up requirements in the installation guide.

C. Performance Testing.

3.5 EQUIPMENT MANUFACTURER'S SERVICE REPRESENTATIVE

A. After completion of the installation, the equipment shall be tested by the Contractor in the presence of the Engineer under actual operating conditions. The test shall be conducted under the supervision of the manufacturer's technical representative.

B. The equipment system supplier shall furnish the services at the site of a factory-trained representative for a period of three eight-hour working days to the jobsite. Service shall be provided after the Contractor has installed the equipment. These services shall be furnished for:

1. The equipment manufacturer’s inspection of the equipment following installation by others, and to certify that the equipment has been properly installed and is ready to operate.

2. Conduct the equipment Performance Testing.

3. To train the Owner’s personnel in the operation and maintenance of the equipment, and to observe and supervise the initial operation of the equipment.

C. If additional service is required due to the mechanisms not being fully operational, at the time of service requested by the contractor, the additional service days will be at the contractor's expense.

D. After inspection of the installed equipment, the Supplier shall furnish a written report certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchorage, has been operated under full load conditions, and that it operates satisfactorily.

3.6 DEMONSTRATION AND INSTRUCTIONS

A. Provide the services of a qualified factory-trained manufacturer’s representative to conduct training covering operation, mechanical maintenance, electrical requirements, troubleshooting, etc.

3.7 OPERATION AND MAINTENANCE MANUALS

A. Before 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.

B. Provide a complete P&ID in an 11 x 17 PFD of the system.

END OF SECTION 467331

SECTION 6
SPECIFIC PROJECT REQUIREMENTS

SPECIFIC PROJECT REQUIREMENTS

1 - CONTACT DURING BIDDING

1.1 All questions during bidding should be addressed to Marina Sher, Project Engineer III, at Verdantas LLC, 6397 Emerald Parkway, Suite 200, Dublin, OH 43016, at msher@verdantas.com.

2 - TAXES

2.1 This project is sales-tax exempt, but there is a 2% B&O tax.

2.2 This project shall be Class Code 6611-6630. Refer to Business & Occupation Tax Return Form.

2.3 The Contractor shall pay the City Service Fee. Refer to City Service Fee Overview sheet.

2.4 Tax releases from both City and State must be received before the release of the final payment will be made.

3 - INSURANCE

3.1 Section SC-5.04(D) of the Supplementary Conditions shall be deleted and no "all risk builders risk" or "installation floater" insurance need be purchased by the Contractor.

3.2 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

4 - WORKING HOURS

4.1 No work shall be performed between the hours of 7:30 p.m. and 7:30 a.m. nor on Saturday, Sunday, or legal Holidays, without written permission of the Owner.

5 - PROJECT COMPLETION

5.1 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.

END OF SECTION

CITY OF WHEELING 1500 Chapline Street Room 115, Wheeling WV 26003-3553 / Phone (304) 234-3653

(QUARTERLY / ANNUAL) BUSINESS & OCCUPATION TAX RETURN

- THE TAXPAYER LISTED BELOW IS REQUIRED TO FILE (even if no income is received during this tax period) AND TO PAY BUSINESS & OCCUPATION (B&O) TAXES DUE. TAXES ARE DUE WITHIN (30) DAYS AFTER TAX PERIOD ENDS.
- BUSINESS CLASSIFICATIONS AND TAX RATES ARE LISTED ON THE BACK SIDE OF THIS FORM FOR YOUR INFORMATION.
- PENALTY: TO BE CALCULATED AT 5% FOR THE 1ST MONTH PAST DUE OR FRACTION THEREOF, AND AN ADDITIONAL 1% FOR EACH SUCCEEDING MONTH OR FRACTION THEREOF.
- COMPLETE (PART 1) OF THE B&O TAX RETURN FORM FOR YOUR RECORDS.
- COMPLETE (PART 2) OF THE B&O TAX RETURN FORM, SIGN AND RETURN WITH YOUR PAYMENT.
- IF REPORTING UNDER "CONTRACTOR" and/or "RENTAL" - COMPLETE FORM ON REVERSE SIDE OF (PART 2).
- IF REPORTING TAX CREDIT - COMPLETE FORM ON REVERSE SIDE

MESSAGE:

CITY OF WHEELING BUSINESS & OCCUPATION TAX RETURN
1500 Chapline St Room 115, Wheeling WV 26003-3553 / Phone (304) 234-3653

(_____QTR _____YEAR)

DATE BUSINESS BEGAN IN CITY: _____
DATE BUSINESS QUIT IN CITY: _____
IF BUSINESS SOLD, DATE OF SALE: _____
FURNISH NAME & ADDRESS OF NEW OWNER:

_____
_____

CLASS CODE	BUSINESS CLASSIFICATION	TAXABLE AMOUNT	RATE PER $100	TAX DUE

NET TAX DUE	
TAX CREDITS (LIST ON BACK) -	
PENALTY ADD PENALTY OF 5% FOR FIRST MONTH OR FRACTION THEREOF AND 1% FOR EACH SUCCEEDING MONTH OR FRACTION THEREOF. +	
PAST DUE BALANCE +	
TOTAL AMOUNT DUE	
TOTAL AMOUNT ENCLOSED	

(PART 1) ⬆ COMPLETE AND RETAIN UPPER PORTION FOR YOUR RECORDS.

(PART 2) ⬇ COMPLETE LOWER PORTION, SIGN AND RETURN WITH PAYMENT MADE PAYABLE TO "CITY OF WHEELING".

CITY OF WHEELING BUSINESS & OCCUPATION TAX RETURN
1500 Chapline St Room 115, Wheeling WV 26003-3553
Phone (304) 234-3653

(_____QTR _____YEAR)

DATE BUSINESS BEGAN IN CITY: _____
DATE BUSINESS QUIT IN CITY: _____
IF BUSINESS SOLD, DATE OF SALE: _____
FURNISH NAME & ADDRESS OF NEW OWNER:

_____
_____

CLASS CODE	BUSINESS CLASSIFICATION	TAXABLE AMOUNT	RATE PER $100	TAX DUE

NET TAX DUE	
TAX CREDITS (LIST ON BACK) -	
PENALTY ADD PENALTY OF 5% FOR FIRST MONTH OR FRACTION THEREOF AND 1% FOR EACH SUCCEEDING MONTH OR FRACTION THEREOF +	
PAST DUE BALANCE +	
TOTAL AMOUNT DUE	
TOTAL AMOUNT ENCLOSED	

_____ AUTHORIZED SIGNATURE

_____ DATE

CLASS CODE	BUSINESS CLASSIFICATIONS	RATE PER $100
1000	OTHER NATURAL RESOURCE PRODUCTS	1.00
2111-3999	MANUFACTURED PRODUCTS	.28
5212-5999	RETAILERS AND OTHERS	.365
5111-5199	WHOLESALERS	.15
*6611-6630	CONTRACTING BUSINESS * (List Specific Project/s in excess of $5,000 Separately)	2.00
*6147-6151	RENTAL/LEASE INCOME PROPERTY FOR HIRE * (List all Rental Property Owned within City Limits)	.73
6211-6599	SERVICES AND ALL OTHER BUSINESS	.88
6111-6152	BANKING AND OTHER FINANCIAL INSTITUTIONS	.94
6600	SHARED SERVICES	.15

EXEMPTION TYPE	AMOUNT	EXEMPTION TYPE	AMOUNT

*IF REPORTING INCOME UNDER CLASS 6611-6630 (CONTRACTING BUSINESS) IT IS NECESSARY FOR YOU TO SEPARATELY LIST SPECIFIC PROJECT(S) IN EXCESS OF $5000

PROJECT NAME (ADDRESS OR JOB SITE)	Completion date, if complete	Gross Amount
1) _____	_____	$ _____
2) _____	_____	$ _____
3) TOTAL OF ALL OTHER GROSS CONTRACTING INCOME RECEIVED (FOR JOBS LESS THAN $5000)		$ _____
TOTAL REVENUE THIS QUARTER FOR "CONTRACTING BUSINESS"		$ _____

(CARRY TOTAL AMOUNT RECEIVED TO FRONT OF FORM UNDER "TAXABLE AMOUNT" COLUMN-CLASS 6611-6630

*IF REPORTING INCOME UNDER CLASS 6151 "RENTAL BUSINESS" IT IS NECESSARY FOR YOU TO UPDATE AND LIST ALL RENTAL PROPERTY YOU OWN WITHIN THE CITY LIMITS OF WHEELING (USE SEPARATE SHEET IF NECESSARY)

PROPERTY ADDRESS	# OF UNITS	(Circle One)	GROSS RENT COLLECTED
1) _____	_____	Commercial (or) Residential	$) _____
2) _____	_____	Commercial (or) Residential	$) _____
3) _____	_____	Commercial (or) Residential	$) _____
4) _____	_____	Commercial (or) Residential	$) _____

CITY SERVICE FEE OVERVIEW

The City of Wheeling imposes a two dollar ($2.00) per week City Service Fee ("CSF") upon all full-time employees, part-time employees, and self-employed individuals who regularly report to work at a physical location or work from home within the City of Wheeling. Employers are required to withhold $2.00 per week from each employee's pay. Withheld fees are remitted quarterly to the City Finance Department. Self-employed individuals are responsible for remitting their own fees. CSF payments not received within one month following the end of the calendar quarter will be subject to penalties.

If you work multiple jobs in Wheeling, and the fee is being deducted by more than one employer, complete a *Prior Payment Form* (CSF-1). Fill out areas one (1) and two (2) and sign area three (3). Your primary employer must sign area four (4). Once the form is completed, it should then be given to your secondary employer(s) and retained by them. ***THE PRIOR PAYMENT FORM SHOULD NOT BE SENT TO THE CITY FINANCE DEPARTMENT.***

If the fee is withheld from your pay in error, complete *a Refund Claim Form* (CSF-4), attach a copy of your pay stub or other employer-provided documentation showing the fee was deducted in error, and return the form to the City Finance Department. This form must be received within thirty (30) days following the receipt of payment from your employer.

Businesses exempt from Wheeling Business & Occupation Tax, but that maintain offices / locations in Wheeling, are required to withhold the fee from employees.