SPECIFICATIONS AND CONTRACT DOCUMENTS

MOBILE AREA WATER & SEWER SYSTEM

ISSUED FOR BID

For the Construction of

MAWSS CC Williams Headworks Rehabilitation and Odor Control

MOBILE, ALABAMA

Garver Project No. 2402007

VOLUME 1 OF 4
CONTRACT DOCUMENTS, GENERAL REQUIREMENTS, AND TECHNICAL SPECIFICATIONS DIVISIONS 01 TO 23

PREPARED FOR

Mobile Area Water and Sewer System

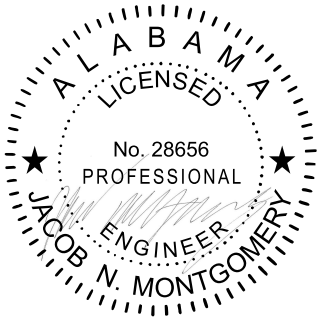
August 2026

GARVER

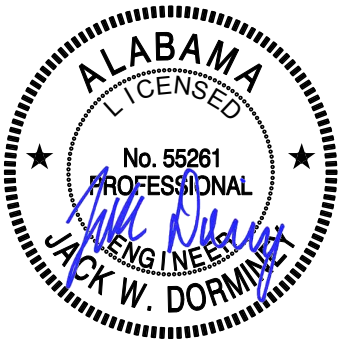
CERTIFICATIONS

MAWSS CC WILLIAMS HEADWORKS REHAB AND ODOR CONTROL
GARVER PROJECT NO. 2402007

I hereby certify that the applicable portions of this project's specifications, details, and plans were prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Alabama.

SEAL AND SIGNATURE	APPLICABLE DIVISION OR PROJECT RESPONSIBILITY
Lindsay I. Tucker, PE  Digitally Signed 08/10/2026	Division 01
Jacob N. Montgomery, PE  Digitally Signed 08/10/2026	Division 02 Division 03 Division 05 Division 06 Division 07 Division 09

CERTIFICATIONS

Jack W. Dorminey, PE  Digitally Signed 08/10/2026	Division 22 Division 23
Jonathan C. White, PE  Digitally Signed 08/10/2026	Division 26 Division 40 61 13 thru 40 76 20

CERTIFICATIONS

Samuel K. Johnson, PE  Digitally Signed 08/10/2026	Division 31 Division 32 Division 33
Russell D. Tate, PE  Digitally Signed 08/10/2026	Division 40 05 00 thru 40 42 00 Division 44 Division 46

GARVER, LLC CERTIFICATE OF AUTHORIZATION:
AL ENGINEERING COA NO. ECA500 Expiration Date: 01/31/2028

MAWSS CC WILLIAMS HEADWORKS REHAB AND ODOR CONTROL

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PART 1

MAWSS GENERAL INFORMATION AND REQUIREMENTS, INVITATION, PROPOSAL, AND CONTRACT DOCUMENTS

GENERAL INFORMATION AND REQUIREMENTS

1.0 BOARD'S STANDARD SPECIFICATIONS:

Copies of these Standard Specifications for Water Mains, Sanitary Sewers and Sewage Pumping Stations may be purchased from the offices of the Board of Water and Sewer Commissioners of the City of Mobile, Alabama, 4725 A Moffett Road, Mobile, AL 36618.

The standards are intended to provide a basis for system improvements that will result in facilities that will efficiently perform their intended purpose over a useful life that can be expected from the application of quality workmanship and the latest available materials and technology.

As such the standards will change from time to time. Suggestions for improving the Standards should be submitted to the Director. Complaints regarding Standards thought to be unreasonable should also be submitted to the Director, with proposed changes.

2.0 DISPOSITION OF PREVIOUS STANDARD SPECIFICATION:

Upon adoption of these Standard Specifications for Water Mains, Sanitary Sewers and Sewage Pumping Stations contained herein by the Board of Water and Sewer Commissioners of the city of Mobile, Alabama, all previously issued Standard Specifications for Water Mains, Sanitary Sewers and Sewage Pumping Stations shall be null and void. The previous Standard Specifications (dated January 1975) shall remain applicable to contracts that have been bid and for which an award has been or will be made on said Specifications.

3.0 JURISDICTION:

These standard specifications shall apply to all proposed water and wastewater mains to be owned, operated or maintained by the board of water and sewer commissioners of the city of Mobile, Alabama.

4.0 PURPOSE:

These Standards and Specifications are adopted to establish minimum acceptable standards for the design and construction of water distribution and transmission facilities and wastewater collection and transmission facilities owned, operated or maintained by the Board of Water and Sewer Commissioners of the City of Mobile, Alabama. Such facilities include water mains, gravity sewers, wastewater force mains, wastewater pump stations, and miscellaneous related appurtenances associated with such systems.

5.0 STANDARDS FOR PLANS:

Plans for water lines, sanitary sewers, and other appurtenances to the Board's water and sewer systems shall clearly define the Work and all details shall be in conformance with the Board's Standards.

A. Datum: All elevations on Plans are to refer to the NGV Datum, in lieu of the old Mobile City Datum. All plans submitted to the Board shall clearly state that the datum reference to NGV.

B. Locality Maps: Locality maps, showing the area of the City in which the project is located, shall be included in all sets of Plans.

C. Locality Maps: Locality maps, showing the area of the City in which the project is located, shall be included in all sets of Plans.

D. Record Drawings: On completion of the project, the Plans are to be revised to show the work as it was actually constructed. The locations of all tees, laterals, fire hydrants, valves and other appurtenances are to be clearly shown and dimensioned and their GPS coordinates provided. Copies of the record plans and videotape as described in Section 12 are to be furnished to the Board at the time of or prior to, the Board's acceptance of the facilities.

6.0 SUBDIVISION SUBMITTAL REQUIREMENTS:

The following requirements apply to water and sanitary sewer facilities for residential and commercial subdivisions submitted to the Board for review, approval and maintenance. The Board reserves the right to accept only those developments which are connected to both water and sewer provided by MAWSS. Consideration may be made for those areas where providing both services is deemed economically unfeasible.

A. General:

1. Submit three sets of Plans which have an Alabama Registered Engineer's Seal and/or Signature and Registration Number affixed to the cover sheet of each set.

2. All material and construction shall be in strict conformance with the Board's Standard Specifications, latest revision.

3. The Board shall be furnished with permanent easements for water and sewer facilities not located in public right-of-way. The easement shall be exclusively for the use of water and sewer lines and shall not be joint easements with drainage facilities or other utilities. The minimum width of easements shall be 20 feet for water, 30 feet for sewer, and a combined water and sewer minimum will be 30 feet. Easements shall be submitted in a form satisfactory to the Board. Easement descriptions shall be prepared by a professional land surveyor licensed in the State of Alabama and shall conform to the Minimum Surveying Technical Standards for Land Surveying as adopted by the Alabama Board of Registration for Professional Engineers and Land Surveyors.

4. Permits required for construction of water or sewer facilities located in public right-of-way shall be obtained from the city, county or state and a copy delivered to the Board's office. Permits are to be submitted and approved prior to the start of construction.

5. The following shall be provided on submittal cover sheet:

   a. The cover sheet of the Record Drawings submitted to the Board shall include a list indicating, by line size, the length of new water and sewer lines, and number of new fire hydrants and manholes actually installed. Also, calculated peak wastewater flows from the development shall be included on Preliminary and Record Drawings. Preliminary Drawings submitted to the Board shall include calculations showing how peak flows were derived.

   b. A vicinity map showing the location of the project shall be included on the Cover Sheet.

   c. An estimated construction cost for the Project.

6. Where future phases of construction are planned, two copies of the Master Development Plan shall be submitted to the Board.

7. The Board requires that water and sewer facilities serving commercial and residential properties be designed and constructed such that they may be extended to serve any future development as a result of cutouts from or additions to the initial and subsequent developments. The total cost of water and sewer facilities to serve such cutouts, subdivisions or additions shall be at the expense of the developer. Should redesign of these facilities be required, the revised Plans shall be submitted for review and approval by the Board.

8. Record Drawings shall be provided to the Board and shall include the certification of a professional engineer registered in the State of Alabama. This certification shall state that the Work is constructed in accordance with the Record Drawings and these Standard Specifications. Internal videotape documentation of sewers shall be provided, as specified in Paragraph 12.32, “Internal Video Inspection”, of these Specifications.

B. Water Facilities:

1. Adequate cover and clearance shall be provided for water lines where they cross sanitary and storm drainage lines. Horizontal separation provided between water and sewer lines shall comply with ADEM regulations. Maintain a 5-foot horizontal separation between water lines and storm drains.

2. Water line sizes shall be adequate for proposed and future service.

3. Fire flow calculations, and expected pressures in the line, for the proposed water system shall be submitted to the Board. The system shall be designed to maintain a minimum pressure of 20 psi at all points in the distribution system under all conditions of flow. The minimum design flow at fire hydrants in residential subdivisions shall be 1,000 GPM. Higher design flows may be required at commercial, industrial and high-density residential areas. The normal working pressure in the distribution system shall be approximately 55 psi, but in no case less than 35 psi on the downstream side of a meter. For pressures greater than 90 psi, special provisions may be required.

4. Location of fire hydrants shall be in accordance with AWWA Manual M31, latest edition.

5. Tapping of the water mains, installation of service tubing, curb stops and meter boxes in new subdivisions shall be performed by the developers Contractor and must be coordinated with the Board’s Water Service Engineer. Testing and disinfection shall be performed both on the mains and service lines. The Contractor shall perform all removing and replacing of pavement and incidentals necessary for the taps.

6. Where possible, looped water systems shall be considered rather than dead end runs.

7. Portable water supply lines shall not be tied into fire lines or 6-inch fire hydrant lines.

8. Valves shall be installed on all fire line branches off the water main.

9. In cases where individual water meters are installed by other than Board, they shall comply with current purchasing standards of the Board for domestic water meters. Where water meters are installed on private drinking water wells for purposes of calculating sewer bills, the meter location shall be accessible to the Board’s meter reading personnel.

10. Water pressure varies throughout the service area. Where water pressure within a building exceeds 80 psi (552kPa) static, an approved water-pressure reducing valve conforming to ASSE 1003 with strainer shall be installed to reduce the pressure in the building water distribution piping to 80 psi or less. (International Plumbing Code paragraph 604.8)

C. Sanitary Sewer Facilities:

1. Sanitary Sewer Design

Corrosion control measures should be addressed in the design of sanitary sewer facilities. A Best Management Practice (BMP) for design of new sanitary sewer systems is to control corrosion by reducing buildup of sulfides or preventing formation of Hydrogen Sulfide. The purpose of this BMP is to emphasize proactive solutions to potential corrosion in sanitary sewer systems. Limiting the use and length of force mains is probably the single most important factor in minimizing sulfide in collection systems. Closed conduit systems, e.g. force mains, siphons, and surcharged sewers are prime generators of the reduced sulfur compounds that can lead to sulfide buildup and hydrogen sulfide formation. Often times limiting the lengths of force mains is not an option; consequently, force mains should be designed with properly placed air release and/or vacuum valves.

The most significant factor in successful interceptor design is the velocity of the wastewater. Adequate velocity is necessary to assure that deposits do not form in interceptors. The slope of gravity sewer lines shall be sufficient to provide a velocity of 2.1 fps. Minimum slopes are identified in the “Ten States Standards”; however, slopes greater than those (and velocities higher than 2.1 fps) are desirable. The pipe diameter and slope shall be selected to obtain the greatest practicable velocities to minimize settling problems. Oversize sewers will not be approved to justify using flatter slopes.

Turbulence can improve the oxygenation of wastewater flowing through a sewer system and consequently oxidize sulfide to dilute sulfate, rendering it harmless within the flow. However, turbulence can also result in severe localized sulfide release when significant concentrations of sulfide are already present in the wastewater. Turbulence in gravity sewers should generally be avoided. Potential sources of turbulence include manholes with sewer pipe discharges (both gravity and force main) above the invert, manholes with colliding flows from opposite directions, manholes with sharp bends, and sections with slopes producing critical or near-critical flow.

Odor control is not necessarily the same as corrosion control. Localized hydrogen sulfide control can be effective in controlling odors without effective, total control of sulfides downstream of the odor problem. There are numerous different chemicals that can be utilized to control hydrogen sulfide in sanitary sewer systems, and there are several different chemical reactions by which hydrogen sulfide can be controlled. However, there are two general ways to control hydrogen sulfide with chemicals: prevent sulfide formation or react with sulfides in the stream to prevent the release of hydrogen sulfide. When designing a new gravity sewer or force main, consider the route and detention time of flow from the new sewer facilities through the existing collection system and evaluate the benefits of chemical addition for corrosion control.

2. Pipe Materials

Where potentially corrosive situations cannot be avoided due to constraints of a particular application, the Best Management Practice (BMP) is to control corrosion with corrosion-resistant materials. Section 12 identifies 4 different pipe materials for use in sanitary sewers.

- Ductile Iron Pipe
- PVC Pipe
- Reinforced Concrete Pipe
- Polyethylene Pipe

Ductile Iron Pipe can be used in gravity sewers and force mains. Ductile Iron Pipe and fittings for gravity sewers and force mains must have a corrosion-resistant interior lining in accordance with specification in Section 12. Ductile Iron Pipe is suitable for many gravity sewer and force main applications. Ductile Iron Pipe is specifically required for all gravity sewers and force mains more than 14 feet deep, for all gravity sewers with slopes greater than 10 percent and gravity sewers and force mains located in easements not adjacent to Rights of Way which pass between existing structures or is reasonably anticipated to pass between future structures.

The PVC Pipe material specified for gravity sewers is for 8-inch, 10-inch, 12-inch, and 15-inch diameters only. PVC Pipe can be used for all gravity sewers in these diameters in applications where Ductile Iron Pipe is not required. C900 PVC Pipe may be used in easement provided the depth and slope do not exceed requirements mandating ductile iron use.

The PVC Pipe material specified for force mains is for diameters 4 inches through 12 inches. PVC Pipe can be used for all force mains in these diameters in applications where Ductile Iron Pipe is not required. Because PVC will not corrode, it is a good choice of materials for force mains that convey less than full pipe flow. Fittings for PVC Pipe, if necessary, are the same as Ductile Iron Pipe fittings. Fittings in any portion of a force main that conveys less than full pipe flow should have the same corrosion-resistant interior lining required for gravity sewers.

Reinforced Concrete Pipe (RCP) can be used in large diameter gravity sewers. The calcareous aggregate specified for all RCP will extend the time necessary to corrode a given thickness of concrete wall. The use of calcareous aggregate is not a substitute for a corrosion-resistant lining. The ceramic epoxy lining specified for all RCP is a corrosion-resistant interior lining similar to that specified for Ductile Iron Pipe. PVC lining is a corrosion-resistant lining installed in 270 degrees of arc rather than the full circumference of the RCP. PVC lining can be a substitute for ceramic epoxy lining in applications where interior corrosion is anticipated above the normal water surface. If the wastewater contains chlorides, for example, corrosion can be anticipated over the full circumference of the pipe and a full circumference lining such as ceramic epoxy is preferred. A holiday test is required for each type of lining, and it is necessary to perform field welding and subsequent testing at each joint in an RCP sewer. In order to provide sufficient space for a worker inside the pipeline, RCP smaller than 36 inches in diameter should not be used for gravity sewers.

Polyethylene (PE) Plastic Pipe can be used in gravity sewers and force mains. Where pipelines are installed by Horizontal Directional Drilling, PE Plastic Pipe is the material of choice. PE plastic pipe is also the material of choice for gravity sewer rehabilitation by the Pipe Bursting and Trenchless Pipe Replacement Method. Butt fusion welding is used to join PE Plastic Pipe into one continuous pipeline which is ideal for Horizontal Directional Drilling and Pipe Bursting. Depending on the circumstances of installation, this material might be appropriate for installation in an open-cut trench. If pipe sections are joined on top of the ground, the length of open trench is greater than for pipe sections joined in the trench. The trench depth and proposed method of protecting workers in the excavation, e.g. shoring system, trench shield, benching, etc. should be considered when evaluating PE plastic pipe for installation in an open-cut trench.

3. Manhole Materials

Section 12 specifies that all manholes are precast concrete with calcareous aggregates. The calcareous aggregate specified for all precast concrete manholes will extend the time necessary to corrode a given thickness of concrete wall. The use of calcareous aggregate is not a substitute for a corrosion-resistant lining, but a corrosion-resistant lining is not necessary in all manholes. Turbulence and splashing are almost impossible to avoid in manholes with discharges from force mains. Where turbulence cannot be avoided, manholes should have a corrosion-resistant lining. Per section 12.1.10 of specifications, the urethane based material specified for rehabilitation of manholes in Section 19 is also an acceptable corrosion resistant lining for new precast concrete manholes.

4. Additional Requirements

   a. Adequate cover and clearance shall be provided for sanitary sewers where they cross water and storm drainage lines. Where vertical clearance between sanitary and storm drainage lines is less than 1.5 feet, one section of ductile iron sanitary sewer pipe shall be installed.

   b. Sewer lines shall be on grade to allow for future expansion.

   c. Manholes shall be a minimum depth of 4 feet.

   d. Where a drop occurs between the influent and effluent inverts at a manhole, a full joint section of ductile iron pipe shall be installed on the influent side of the manhole.

   e. Where applicable, stub outs of adequate size shall be provided for future expansion.

   f. A maximum of 2 laterals may be connected to any manhole, provided that the invert elevation of said laterals matches the invert elevation of the terminating manhole.

   g. The Board will accept only 8-inch gravity sewer lines and larger for maintenance.

   h. Where a new sewer line connects to an existing manhole, a wing nut plug shall be required in the end of the new pipe. When construction is complete, the manhole shall be plugged upstream and downstream and all debris and water pumped out of the manhole prior to placing it into service.

i. Air testing of sewer lines shall be performed at the time of the Board's final acceptance inspection in the presence of the Board's inspector and after installation of all other utilities.

j. Some lots in subdivisions may be subject to sewage back-ups. The following verbiage, as found in the standard plumbing code, shall be placed on subdivision plats and be recorded as subdivision covenants. "Where a plumbing drainage system may be subject to backflow of sewage (e.g., below the level of the nearest upstream manhole cover), suitable provisions shall be made to prevent its overflow in the building. It shall be the property owner's responsibility to install and maintain suitable devices in accordance with the plumbing code."

k. All new subdivision sewers shall be inspected by internal video in accordance with the construction specifications to document lateral locations. Where developers use existing sewers, the internal video inspection shall also include existing sewers to document lateral location.

7.0 PRIVATE FIRE PROTECTION SYSTEMS:

Fire protection systems shall generally consist of fire hydrants, standpipes or sprinkler systems which are connected to the municipal water supply by means of fire lines. Fire hydrants have threaded outlets for fire department connection, are free standing and are usually located around a building. Standpipes are constructed within a building and provide fire department hose connections. Sprinkler systems can be either connected to standpipes or connected directly to fire lines. Sprinkler systems can be either wet type or dry type.

Fire protection systems constructed on private property for the protection of privately owned commercial or industrial facilities are generally not eligible for acceptance by the Board for maintenance. Under certain circumstances, the Board will consider acceptance of privately constructed water lines serving commercial or industrial development for maintenance. To be considered for acceptance, the water line shall be of some benefit to the Board, shall be constructed in accordance with Board's standards, shall be provided with an easement, and shall have no dead ends. Water service connections installed on such a line shall be subject to trunk water line service charges, as set forth in the Board's published rates.

Any water line which serves fire protection systems and which connects to the existing municipal water supply, or which connects to a private water line proposed for acceptance by the Board, shall be a fire line and shall be subject to the fire line connection fee as set forth in the Board's published rates. All fire sprinkler systems, standpipes and fire hydrants are subject to annual rates as set forth in the Board's published rates.

All requests for fire line connections shall be made in writing to the Board. The requests shall be accompanied by drawings showing the connection of the fire line to the municipal water supply, the proposed fire line, and any proposed fire hydrants, standpipes, or connections to sprinkler systems. The requests shall also be accompanied by data sheets showing the number of sprinkler heads, the required fire flow and required minimum pressure. The drawings and data sheets shall bear the seal and/or the signature and registration number of a professional engineer in the State of Alabama.

All fire lines, fire hydrants and standpipe hose connections shall comply with, as a minimum, the materials standards published by the Board. The developer shall bear the responsibility to comply with the local, state or federal regulations which apply to fire protection systems.

All fire lines shall be provided with backflow prevention devices and with fire line master detection meters, all meeting FM and UL approval. Backflow prevention devices shall be either double check valve type or reduced pressure principal type in accordance with the Board's Cross-Connection Policy, see Appendix G.

8.0 ACCEPTABLE PRODUCTS AND APPROVED MANUFACTURERS:

A list of materials and approved manufacturers for the various products specified in this manual is included in Appendix A. It is the intent of the Board to review and update Appendix A, as appropriate, to ensure efficient operation of the services and facilities under the jurisdiction of these Standard Specifications. For this purpose, the Board shall evaluate technical submittals from interested manufacturers or suppliers periodically.

9.0 STANDARD FORMS FOR INVITATION, PROPOSAL AND CONTRACT DOCUMENTS:

Copies of the latest version of these forms will be included in the Bid Documents issued for each project.

INVITATION FOR BIDS

Sealed bids will be received by the Board of Water and Sewer Commissioners of the City of Mobile, Alabama ("Board"), at the Wesley A. James Operations Center, 4725 Moffett Road, Suite A, Mobile, AL 36618-0249 until. **12:00 p.m**., Local Time, September 14, 2026, and then publicly opened and read at **1:00 p.m.** for furnishing all labor, materials, and performing all work for the following project: Contract No: W10-2402007, Project Name: **C.C. Williams Headworks Rehabilitation and Odor Control**.

Plans and Specifications may be inspected at the Board's offices at 4725 Moffett Road, Suite A, Mobile, AL, or at the office of Garver, LLC, Consulting Engineers, 11 N. Water Street, Suite 10290, Office 1080, Mobile, AL. Electronic Plans and Specifications may be obtained via e-mail for review only from Lindsay Tucker, Email: Litucker@garverusa.com or Telephone: (251) 895-7594.

Copies of the Plans, Specifications, and other Contract Documents may be obtained from the Garver Planroom with QuestCDN at http://planroom.garverusa.com for upon a non-refundable payment of $22.00 per set. Use Quest Project Number 10290392 on the "Browse Project" page. For assistance and free membership registration, contact QuestCDN at 952.233.1632 or info@questcdn.com. Addenda to the bid package will be issued through the Garver online Plan Holders List; therefore, all bidders shall be responsible for downloading the bid documents from the Garver online plan room in order to be included in the Plan Holders list. No Contract Documents will be issued later than twenty-four (24) hours prior to bid submission time.

A MANDATORY Pre-bid Conference will be held at 4725 Moffett Road, Mobile, AL 36602 on August 24 at 1:00 p.m. Local Time, to discuss bidding and project requirements. Prospective bidders and subcontractors should attend.

Bids must be submitted on the standard forms included with the Contract Documents.

Envelopes containing bids must be sealed and delivered to the Director, Board of Water and Sewer Commissioners of the City of Mobile, Alabama, 4725A Moffett Road, Mobile, Alabama 36618-0249: "Bid for constructing W10-2402007 C.C. Williams Headworks Rehabilitation and Odor Control System" is to be opened at 1:00 p.m., Local Time, September 14, 2026". The Bidder's Alabama State Contractor's License Number and discipline shall be on the envelope.

Bid guarantee in the form of certified check, bid bond, or irrevocable Letter of Credit acceptable to the Board will be required for at least 5% of the bid amount, not to exceed $10,000.

The Board reserves the right to reject any and all bids and to waive any informality in bids received.

THIS INVITATION FOR BIDS IS CONDENSED FOR ADVERTISING PURPOSES. ADDITIONAL INFORMATION/REQUIREMENTS FOR BIDDERS CAN BE FOUND IN THE CONTRACT DOCUMENTS.

THE BOARD OF WATER AND SEWER COMMISSIONERS

OF THE CITY OF MOBILE, ALABAMA

BIDDER'S CHECKLIST OF REQUIRED ITEMS

This Bidder's Checklist is provided to ensure all required forms are completed and returned as part of the bid submission. All forms must be included as indicated for a bid to be considered a complete, responsive bid. Appropriate signatures and date are required on each document. If an item is missing, the bid may be declared unresponsive and therefore rejected.

	Completed
Qualifications Statement	
a. General Information (7 Pages)	☐
b. Schedule A – Current Experience (1 Page)	☐
c. Schedule B – Previous Experience (2 Pages)	☐
d. Schedule C – List of Major Equipment Available (1 Page)	☐
Proposal	
a. Proposal Forms (2 Pages)	☐
b. Acknowledgement of all Addenda (On Page 2 of Proposal)	☐
c. Bid Form (1 Page)	☐
d. SSO and Unpermitted Discharge Prevention Notification (1 Page)	☐
Sucontracting Plan & SDP Policy	
a. Proposed Subcontracting Plan – List of Proposed Subcontractors (2 Pages)	☐
b. SDP Policy Acknowledgement Form (1 Page)	☐
c. Subcontracting Plan/Good Faith Effort Aknowledgement/Affidavit (2 pages)	☐
Bid Bond Form (1 Page) & Associated Documents	☐
*Check when filled out, signed and/or notarized, and included with submission of bid packet.	

If the percentage of work for this contract to be awarded to DBE's is less than 15% of the contract total, then the following shall be included:

1. **Affidavit of Contractor's Good Faith Effort to Meet SubContractor/Vendor Diversity Goals** (and supporting documents)

QUALIFICATIONS STATEMENT

THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS

1. SUBMITTED BY:

Official Name of Firm: _____

Address: _____

_____

_____

2. SUBMITTED TO: _____

3. SUBMITTED FOR: _____

Owner: _____

Project Name: _____

_____

_____

_____

TYPE OF WORK: _____

_____

_____

4. CONTRACTOR'S CONTACT INFORMATION

Contact Person: _____

Title: _____

Phone: _____

Email: _____

5. AFFILIATED COMPANIES:

Name: _____

Address: _____

_____

_____

6. TYPE OF ORGANIZATION:

☐ SOLE PROPRIETORSHIP

Name of Owner: _____

Doing Business As: _____

Date of Organization: _____

☐ PARTNERSHIP

Date of Organization: _____

Type of Partnership: _____

Name of General Partner(s): _____

_____

_____

☐ CORPORATION

State of Organization: _____

Date of Organization: _____

Executive Officers:

- President: _____

- Vice President(s): _____

_____

_____

- Treasurer: _____

- Secretary: _____

☐ LIMITED LIABILITY COMPANY

State of Organization: _____

Date of Organization: _____

Members: _____

_____

_____

_____

☐ JOINT VENTURE

State of Organization: _____

Date of Organization: _____

Form of Organization: _____

Joint Venture Managing Partner

- Name: _____
- Address: _____

_____

_____

Joint Venture Managing Partner

- Name: _____
- Address: _____

_____

Joint Venture Managing Partner

- Name: _____
- Address: _____

_____

7. LICENSING

Jurisdiction: _____

Type of License: _____

License Number: _____

Jurisdiction: _____

Type of License: _____

License Number: _____

Has firm listed in Section 1 ever been fined or suspended by a Contractor's licensing board?

☐YES ☐ NO

If YES, attach as an Attachment details including where and why.

8. CERTIFICATIONS CERTIFIED BY:

Disadvantage Business Enterprise: _____

Minority Business Enterprise: _____

Woman Owned Enterprise: _____

Small Business Enterprise: _____

Other (_____): _____

9. BONDING INFORMATION

Bonding Company: _____

Address: _____

_____

Bonding Agent: _____

Address: _____

_____

_____

Contact Name: _____

Phone: _____

Aggregate Bonding Capacity: _____

Available Bonding Capacity as of date of this submittal: _____

10. FINANCIAL INFORMATION

Financial Institution: _____

Address: _____

_____

Account Manager: _____

Phone: _____

Credit available: $_____

11. CONSTRUCTION EXPERIENCE:

Current Experience:

List on **Schedule A** all uncompleted projects currently under contract (If Joint Venture list each participant's projects separately).

Previous Experience:

List on **Schedule B** all projects completed within the last 5 Years (If Joint Venture list each participant's projects separately).

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

☐YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

12. SAFETY PROGRAM:

Name of Contractor's Safety Officer:_____

Include the following as attachments:

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) OSHA No. 300- Log & Summary of Occupational Injuries & Illnesses for the past 5 years.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all OSHA Citations & Notifications of Penalty (monetary or other) received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all safety citations or violations under any state all received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide the following for the firm listed in Section V (and for each proposed Subcontractor furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) the following (attach additional sheets as necessary):

Workers' compensation Experience Modification Rate (EMR) for the last 5 years:

YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____

Total Recordable Frequency Rate (TRFR) for the last 5 years:

YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____
YEAR	_____	TRFR	_____

Total number of man-hours worked for the last 5 Years:

YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____
YEAR	_____	TOTAL NUMBER OF MAN-HOURS	_____

Provide Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) Days Away From Work, Days of Restricted Work Activity or Job Transfer (DART) incidence rate for the particular industry or type of Work to be performed by Contractor and each of Contractor's proposed Subcontractors and Suppliers) for the last 5 years:

YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____
YEAR	_____	DART	_____

13. EQUIPMENT:

MAJOR EQUIPMENT:

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

THIS _____ DAY OF _____, 20___

NOTARY PUBLIC - STATE OF _____

MY COMMISSION EXPIRES:_____

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Evidence of authority for individuals listed in Section 7 to bind organization to an agreement.
5. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.
6. Required safety program submittals listed in Section 12.
7. **[Additional items as pertinent.]**

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SCHEDULE A

CURRENT EXPERIENCE

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

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SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

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SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

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SCHEDULE C - LIST OF MAJOR EQUIPMENT AVAILABLE

ITEM	PURCHASE DATE	CONDITION	ACQUIRED VALUE

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PROPOSAL

TO: BOARD OF WATER AND SEWER COMMISSIONERS OF THE CITY OF MOBILE ALABAMA

Submitted: _____

(Date)

The undersigned, as Bidder, hereby declares that he has examined the site of the Work and informed himself fully in regard to all conditions pertaining to the place where the Work is to be done; that he has examined the Plans and Specifications for the Work and all Contract Documents relative thereto, and has read the Board's Standard Specifications and all General Conditions and Special Provisions furnished; and that he has satisfied himself relative to the Work to be performed.

The Bidder proposes and agrees, if this Proposal is accepted, to contract with the Board of Water and Sewer Commissioners of the City of Mobile, Alabama, in the form of contract specified to furnish all materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the following Work:

CC WILLIAMS HEADWORKS REHABILITATION AND ODOR CONTROL
GARVER PROJECT NO. W10-2402007

in full and complete accordance with the shown, noted, described and reasonably intended requirements of the Plans, Specifications and all other Contract Documents to the full and entire satisfaction of the Board of Water and Sewer Commissioners of the City of Mobile, Alabama with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and other Contract Documents for the lump sum or unit prices listed opposite each item.

It is agreed that the description under each item, being briefly stated, implies, although it does not mention, all incidentals and that the prices stated are intended to cover all such work, materials and incidentals as constitute Bidder's obligations as described in the Specifications and any details not specifically mentioned, but evidently included in the Contract shall be compensated for the item in which it most logically is included.

The quantities for bid items listed on the Proposal sheet are estimated quantities only for the purpose of comparing bids. Any differences between these estimated quantities and actual quantities required for this Contract shall not be taken as a basis for claims

by the Contractor for extra compensation. Compensation will be based on the lump sum or unit prices and actual construction quantities.

The Bidder further proposes and agrees hereby to commence the Work with an adequate force, plant and equipment at the time stated in the notice to the Contractor from the Engineers to proceed, and reach Substantial Completion of the work within 270 consecutive calendar days from and after the date stated in said notice and to achieve Final Completion of the work within an additional 30 days after Substantial Completion.

The undersigned further agrees that, in case of failure on his part to execute the said Contract and the bond within 10 consecutive calendar days after written notice being given of the award of the Contract, the check or bid bond in the amount of 5 percent of this bid accompanying this bid, and the monies payable thereon, shall be paid into the funds of the Board of Water and Sewer Commissioners of the City of Mobile, Alabama as liquidated damages for such failure; otherwise the check or bid bond accompanying this Proposal shall be returned to the undersigned:

Attached hereto is a certified check on the _____ _____ Bank of _____ or a Bid Bond for the sum of _____ Dollars ($_____) made payable to the Board of Water and Sewer Commissioners of the City of Mobile Alabama.

By _____

(Legal Signature)

_____

(Printed Name and Title)

Witness: _____

(Legal Signature)

Witness: _____

(Legal Signature)

ADDRESS:

_____

_____

CONTRACTOR’S LICENSE NO:

_____

BIDDER acknowledges receipt of the following ADDENDA:

_____

_____

_____

BID FORM

MAWSS CC WILLIAMS HEADWORKS REHABILITATION AND ODOR CONTROL

BASE BID

Base Bid No.	Item	Unit	Qty	Unit Price	Total Item Price
1	Mobilization and Demobilization (not to exceed 5% of total base bid)	1	LS	N/A	
2	All Work as defined in the Contract Documents for the Facility 05 – Site Civil improvements except for those listed separately below.	1	LS	N/A	
3	All Work as defined in the Contract Documents for the Facility 10 – Odor Control improvements except for those listed separately below.	1	LS	N/A	
4	All Work as defined in the Contract Documents for the Facility 20 – Headworks improvements except for those listed separately below.	1	LS	N/A	
5	All Work to furnish and install Toxic Gas Detection System as specified in Section 40 76 20.	1	LS	N/A	
6	All Work to furnish and install Stacked Tray Vortex Grit Removal improvements as specified in Section 46 23 23.16.	1	LS	N/A	
7	Additional System 2 submerged metal coating above the quantity required by the Contract Documents as specified in Section 09 96 00.	100	SF		
8	Additional System 3 exposed metal coating above the quantity required by the Contract Documents as specified in Section 09 96 00.	100	SF		
9	Additional Concrete Paving including compacted base above the quantity required by Contract Documents.	10	CY		
10	Additional Asphalt Paving including compacted base above the quantity required by Contract Documents.	10	CY		

11	Additional Fencing above amount quantity required by Contract Documents as specified in Section 32 31 13.	20	LF		
12	Pre-negotiated firm price for the Headcell Inlet Chutes as defined by Section 46 23 23.16 for the lump sum of: $178,000 Dollars	1	LS	N/A	$178,000
13	Owner Contingency Allowance	1	LS	N/A	$200,000

TOTAL BASE BID AMOUNT $_____

ADDITIVE ALTERNATES

Alternate No.	Item	Unit	Qty	Unit Price	Total Item Price
1	All Work as defined in the Contract Documents for the Facility 30 – Primary Effluent Pump Station improvements.	LS	1	N/A	
2	Work as defined in the Contract Documents for the Facility 25 – Primary Clarifiers improvements concrete coating repairs	LS	1	N/A	
3	Work as defined in the Contract Documents for the Facility 25 – Primary Clarifiers improvements mechanism center column coating	LS	1	N/A	

BASE BID PLUS ADDITIVE ALTERNATES AMOUNT $_____

All bid alternate prices shall be filled in. The acceptance or rejection of any or all these bid alternates is at the option of the Owner.

FAILURE TO FULLY COMPLETE THIS PAGE AND INCLUDE A HANDWRITTEN SIGNATURE MAY BE CAUSE FOR REJECTION OF BID.

SSO AND UNPERMITTED DISCHARGE PREVENTION NOTIFICATION:

Sanitary Sewer Overflows (SSOs) and unpermitted discharges of wastewater to the environment are a violation of Federal and State laws, as well as a breach of this Contract. The Contractor and associated subcontractors, vendors, and other entities and persons chosen to complete this Work shall not, through act or omission, discharge untreated wastewater to the environment or cause wastewater to back up into a building. The Contractor hereby agrees to indemnify the Owner if the Owner is assessed penalties or fines, receives regulatory actions, or has claims, actions, or suits filed against it by any person or entity as a result of SSOs or unpermitted discharges caused by act or omission of the Contractor and/or any entity or person performing Work in the Contractor's behalf under this Contract. The Contractor shall reimburse the Owner for all damages, losses, penalties, fines, judgments, interest, costs, and expenses of every nature incurred by the Owner, including but not limited to reasonable attorney's fees, arising from or associated with each SSO or unpermitted discharge. In addition, the Contractor shall pay the following penalties to the Owner for SSOs and unpermitted discharges caused by the Contractor or any entity or person performing Work in the Contractor's behalf, regardless of whether such SSOs or discharges reach waters of the State.

ESTIMATED VOLUME SPILLED	PENALTY AMOUNT
0 to 10,000 gallons	$1,000
10,001 to 25,000 gallons	$2,000
25,001 to 50,000 gallons	$2,500
50,001 to 150,000 gallons	$3,000
More than 150,000 gallons	$6,000

I, having authority to execute this document, have reviewed the above Notification, therein.

_____

Contractor Name

_____

Street City

_____

Signature

PROPOSED SUBCONTRACTING PLAN

I, the undersigned General Contractor, hereby certify that proposals from the following Subcontractors were used in the preparation of my bid. I agree that if I am the successful Bidder and if the following subcontracts are approved, I will not enter into contracts with others for these divisions of the work without prior written approval from the Engineer and the Owner.

Type of Work: .....

Subcontractor's Name:.....

License No.: .....

Address: .....

Type of Work: .....

Subcontractor's Name:.....

License No.: .....

Address: .....

Type of Work: .....

Subcontractor's Name:.....

License No.: .....

Address: .....

Type of Work: .....

Subcontractor's Name:.....

License No.: .....

Address: .....

Type of Work: .....

Subcontractor's Name:.....

License No.: .....

Address: .....

Bidder (General Contractor): .....

License No.: .....

By: .....*

Title:.....

*Signature must be the same as on the Bid Form.

SUBCONTRACTING PLAN

In order for your proposal to be considered, you, as Bidder, must complete all blanks in this Subcontracting Plan and sign with a handwritten signature where indicated below.

Failure to fill in the blanks on this Subcontracting Plan and/or to include a handwritten signature will be cause for rejection of your bid.

It is MAWSS's goal that in all contracts, contractors shall make a demonstrated good faith effort to award 15% of the contract amount to certified Disadvantages Business Entities [DBE's] / Diverse Suppliers as subcontractors and/or suppliers performing commercially useful functions which are consistent with contract requirements.

Copies of MAWSS DBE Policy 16-01 [for public works projects], DBE/Supplier Diversity Policy 17-01 [for contracts for other goods and services], MAWSS's list of certified Disadvantaged Business Enterprises [DBE's] / Diverse Suppliers, and lists of organizations that have information on DBE's / Diverse Suppliers are available from MAWSS's Supplier Diversity Office (251-694-3194) or from the MAWSS website, www.mawss.com.

PLEASE STATE WHAT PERCENTAGE OF THE WORK FOR THIS CONTRACT YOU PLAN TO AWARD TO DBE/DIVERSE SUPPLIER SUBCONTRACTORS AND/OR VENDORS:	**(Total %)**_____
ESTIMATED TOTAL DOLLAR AMOUNT TO BE AWARDED TO DBE/DIVERSE SUPPLIER:	**(Total $)**_____
AMOUNT BID FOR THIS CONTRACT:	**(Total $)**_____

If the above percentage is zero or is less than 15%, be sure to include your Affidavit of Contractor's Good Faith Efforts to Meet Subcontractor / Vendor Diversity Goals and all supporting documentation in your bid package.

Please list below all subcontractors and suppliers which you plan to use for this contract. Also indicate which of these are DBE's / Diverse Supplier by writing "yes" or "no" where indicated. Also list for each the percentage of the total contract amount to be performed by each and the certification group the DBE / Diverse Supplier is certified with. Attach additional sheets if needed. [If you are not using any subcontractors or vendors, you will need to write "zero" below and sign the form.]

SUBCONTRACTOR/ VENDOR NAME	DBE / Diverse Supplier? Yes or No	% OF CONTRACT AMT.	CERTIFICATION GROUP (MAWSS, ALDOT, ADECA, SRMSDC, BCIA)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

CAUTION: ACCURATELY COMPLETE ALL PARTS OF THIS FORM AND SIGN BELOW:

WE WILL EXERCISE GOOD FAITH TO COMPLY WITH THIS PLAN AND MAWSS'S DBE REQUIREMENTS.

_____
BIDDER

By: _____

SDP POLICY ACKNOWLEDGEMENT*

A copy of the SDP (Supplier Diversity Program) policy that applies to this Invitation for Bid has been included in this package. It is the responsibility of the bidder to read and make efforts to meet the goals of this policy. Please contact the Supplier Diversity Department at supplier.diversity@mawss.com for any questions regarding this policy. Bidders MUST acknowledge receipt of this policy and submit the documentation with the bid proposal.

Bidders shall take all necessary and reasonable steps in accordance with this Policy to ensure that Diverse Contractors/Suppliers have the maximum allowable opportunity to compete for subcontracts and contracts for services, supplies, or other goods. Bidders shall not discriminate in awarding subcontracts and supplier contracts on the basis of race, color, national origin, ethnicity, or sex, during the bid process as well as during performance of a MAWSS contract.

The following documentation must be included in the bid proposal.

- SDP Policy Acknowledgement **and**
- Subcontracting Plan

Please refer to the attached policy for more information regarding these requirements as well as all other requirements, if participating in the SDP Program.

The signer declares under penalty of perjury that she/he is authorized to sign this document and bind the company or organization to all the requirements of this policy.

Company Name _____

Submitted By _____ Title _____

Signature _____ Date _____

Signature _____ Date _____

***Required to sign and return with bid.**

SUBCONTRACTING PLAN/GOOD FAITH EFFORT*

In order for your proposal to be considered, must complete all blanks in this Subcontracting Plan and sign with a handwritten signature where indicated below and include this form in your proposal.

Failure to fill in the blanks on this Subcontracting Plan and/or to include a handwritten signature may cause for rejection of your bid.

It is MAWSS's goal that in all contracts, contractors shall make a demonstrated good faith effort to award 15% of the contract amount to certified Diverse Contractors/Suppliers as subcontractors and/or suppliers performing commercially useful functions which are consistent with contract requirements.

Copies of MAWSS SDP Policy 16-01 (for public works projects), SDP/Supplier Diversity Policy 17-01 (for contracts for other goods and services), MAWSS's list of certified Disadvantaged Business Enterprises (SDPs) / Diverse Suppliers, and lists of organizations that have information on SDPs/Diverse Suppliers are available from MAWSS's Supplier Diversity Office by emailing supplier.diversity@mawss.com.

State what percentage of the work for this contract you plan to award to SDP/diverse subcontractors and/or vendors	**Total %**
Estimated total dollar amount to be awarded to SDP/Diverse Supplier	**Total $**
Amount bid for this contract	**Total $**

Please list below all subcontractors and suppliers which you plan to use for this contract. Also indicate which of these are SDPs / Diverse Suppliers by writing "Yes" or "No" where indicated. Also list for each the percentage of the total contract amount to be performed by each and the certification group the SDP / Diverse Supplier is certified with. Attach additional sheets if needed.

Subcontractor/Vendor Name	SDP/Diverse Supplier (Yes or No)	% of Contract	Certification Group (ALDOT, ADECA, SRMSDC, BCIA)

CAUTION: ACCURATELY COMPLETE ALL PARTS OF THIS FORM AND SIGN BELOW.

GOOD FAITH EFFORT AKNOWLEDGEMENT/AFFIDAVIT

I/WE EXERCISED GOOD FAITH TO COMPLY WITH THIS PLAN AND MAWSS' SDP REQUIREMENTS.

_____

Bidder/Company

_____

By (Signature)

***Required to sign and return with bid.**

CHANGE OF SUB-CONTRACTOR FORM

In accordance with MAWSS DBE 16-01

JOB NAME_____Location_____

Name of General Contractor_____

Name of Original Sub-Contractor_____

Name of New Sub-Contractor_____

Reason for Change

_____

_____

This instrument is for the purpose of advising all persons involved of a change being made on the contract and job-site.

_____ _____

General Contractor DBE Office

_____

Asst. Director

BID BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, _____
(Name of Bidder)

_____, as Principal,
(Address)

and _____
(Name of Surety)

of _____, as Surety,
(Address)

jointly and severally, hereby bind ourselves, our heirs, executors, administrators, successors, and assigns to the **Board of Water and Sewer Commissioners of the City of Mobile, Alabama**, as the Owner, in the **PENAL SUM of five percent (5%) of the amount of the Principal's bid, but in no event more than Ten Thousand Dollars ($10,000.00)**.

THE CONDITION OF THIS OBLIGATION is that the Principal has submitted to the Owner the attached bid, which is incorporated herein by reference, for the Project identified as:

_____Project No._____

NOW, THEREFORE, if, within the terms of the Bid Documents, the Owner accepts the Principal's bid and the Principal thereafter either:

a) executes and delivers a Construction Contract with the required Contract and Labor and Material Bonds (each in the form contained in the Bid Documents and properly completed in accordance with the bid) and delivers evidence of insurance as prescribed in the Bid Documents, or

b) fails to execute and deliver such Construction Contract with such Bonds and evidence of insurance, but pays the Owner the difference, not to exceed the Penal Sum of this Bond, between the amount of the Principal's Bid and the larger amount for which the Owner may award a Construction Contract for the same Work to another bidder,

then, this obligation shall be null and void, otherwise it shall remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligation of the Surety under this Bond shall not in any manner be impaired or affected by any extension of the time within which the Owner may accept the Principal's bid, and the Surety does hereby waive notice of any such extension.

SIGNED AND SEALED this_____ day of_____

ATTEST: PRINCIPAL:

_____

_____ By _____

Name and Title

ATTEST SURETY:

_____

_____ By _____

Name and Title

CONTRACT

THIS CONTRACT is made and entered into the _____day _____of 20_____, by and between

_____,

(Contractor)

Hereinafter "Contractor," and the Board of Water and Sewer Commissioners of the City of Mobile, Alabama, hereinafter "Owner."

WITNESSETH:

The Contractor, for the consideration hereinafter fully set out hereby agrees with the Owner, as follows:

1. The Contractor shall furnish all materials and perform all Work as set forth in the following Contract Documents: Invitation for Bids, and any Addenda thereto; Proposal and all Documents submitted therewith; Standard Specifications of the Board of Water and Sewer Commissioners of the City of Mobile, Alabama; any Specifications of the Owner provided with the Invitation for Bids which are specific to this Contract; General Conditions; Special Provisions; Detailed Specifications; this Contract form; Bonds; Drawings and Addenda; all of which are attached hereto and made a part of the parties' Contract, as if fully set forth herein:

   CC WILLIAMS WWTP HEADWORKS REHABILITATION AND ODOR CONTROL

   PROJECT NO. W10-2402007

2. The Contractor shall commence performance of this Contract on a date to be specified in a written order of the Owner and shall fully complete all Work hereunder within 270 consecutive calendar days from and after said date. "Work" shall include all construction, delivery of materials and items, and other obligations of the Contractor under this Contract.

3. The Owner hereby agrees to pay to the Contractor for the faithful performance of the Contract, subject to additions and deductions as provided in the Specifications or Proposal, in lawful money of the United States, as follows:

Approximately_____Dollars

($_____), in accordance with lump sum and unit prices set forth in the Proposal.

4. The Owner shall make monthly partial payments to the Contractor on the basis of a duly certified and approved estimate of Work performed during the preceding calendar month by the Contractor. The Owner may retain five percent (5%) of the amount of such estimate until fifty percent (50%) of the Work has been completed. The Owner may hold this retainage until all Work has been performed strictly in accordance with this Contract and until all Work has been accepted by the Owner and all obligations of the Contractor under this Contract have been satisfied.

5. Upon submission by the Contractor of evidence satisfactory to the Owner that all payrolls, material bills, and other costs incurred by the Contractor in connection with the performance of this Contract have been paid in full, and upon satisfaction by the Contractor of all other obligations under this Contract, final payment on account of this Contract shall be made within thirty (30) days after the

completion by the Contractor of all Work covered by this Contract and the acceptance thereof by the Owner.

6. The parties hereto acknowledge and agree that time is of the essence for performance of this Contract. The parties agree that in the event the Work is not completed within the time herein specified, the Owner may retain from the compensation otherwise to be paid to the Contractor the sum of $500 per day for each day thereafter, Sundays and holidays included, that the Work remains uncompleted. The parties agree that this dollar amount represents their agreed upon stipulation as to the damages which the Owner will have sustained per day due to the failure of the Contractor to complete the Work within the time stipulated, and that this amount is not a penalty.

7. Sanitary Sewer Overflows (SSOs) and unpermitted discharges of wastewater to the environment are a violation of Federal and State laws, as well as a breach of this Contract. The Contractor and associated subcontractors, vendors, and other entities and persons chosen to complete this Work shall not, through act or omission, discharge untreated wastewater to the environment or cause wastewater to back up into a building. The Contractor hereby agrees to indemnify the Owner if the Owner is assessed penalties or fines, receives regulatory actions, or has actions, suits, or claims filed against it by any person or entity as a result of SSOs or unpermitted discharges caused by act or omission of the Contractor and/or any entity or person performing work in the Contractor's behalf under this Contract. The Contractor shall reimburse the Owner for all damages, losses, penalties, fines, judgments, interest, costs, and expenses of every nature incurred by the Owner, including but not limited to reasonable attorney's fees, arising from or associated with each SSO or unpermitted discharge. In addition, the Contractor shall pay the penalties identified in the Contract Documents to the Owner for SSOs and unpermitted discharges caused by the Contractor and/or any entity or person performing Work in the Contractor's behalf, regardless of whether such SSOs or discharges reach waters of the State.

8. The parties hereto further agree hereto that if at any time after the execution of this Contract and the Contract Bond hereto attached for its faithful performance, the Owner shall deem the surety or sureties upon such bond to be unsatisfactory, or if, for any reason, such bond ceases to be adequate to cover the performance of the Work, the Contractor shall at its expense, within five (5) days after the receipt of notice from the Owner to do so, furnish additional bond or bonds in such form and amount and with such surety or sureties as shall be satisfactory to the Owner. In such event, no further payment to the Contractor shall be due under this Contract until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the Owner.

9. The parties acknowledge that the Contract Documents governing the Contract between them for this project include, but may not be limited to, this Contract form; all other materials furnished with the Invitation for Bids; the Contractor’s Proposal and all documents and items submitted with Contractor’s bid for this project; the Owner’s Standard Specifications, General Conditions, and Special Conditions; all plans and drawings for the project; other documents which may be incorporated into any of the foregoing by reference; and Change Orders for the project, if any.

10. In addition to the Indemnity obligations set forth in the Contract Documents, in the event that legal action is brought by any person or entity against the Owner, its employees, or agents, asserting negligent act(s) or omission(s), violation of law or regulation, or other legally culpable conduct of the Contractor, the Contractor’s employees, subcontractors, successors, or anyone for whose acts or omissions the Contractor may be legally liable, whether said action be for property damage, personal or bodily injury, wrongful death, environmental harm, or anything else, the Contractor shall reimburse the Owner for the Owner’s reasonable attorneys’ fees, costs, and expenses incurred in

defending against same, through all trial and appeals relative to thereto, including but not limited to cost of bonds and interest in the event of an appeal, whether filed by the Owner or by another party.

11. Should the Owner employ legal counsel to prevent a breach of this Contract, or to otherwise assert or protect its rights under this Contract, the Contractor shall reimburse the Owner for the Owner's reasonable attorneys' fees, costs, and expenses incurred, including those incurred through any appeal, if the Owner is the prevailing party.

12. The Contractor acknowledges that the Contractor has had an opportunity to fully review with Contractor's legal counsel all requirements of this Contract, including this Contract form and all other Contract Documents. The Contractor acknowledges that the Contractor is fully familiar with the requirements for the project which is the subject hereof.

13. The Contractor shall comply with all laws, ordinances, and regulations applicable to the project.

14. The Contractor shall maintain in full force and effect all insurance required by the Contract Documents.

15. The parties hereto acknowledge that the Contract Documents reflect their complete understanding as to the provisions of this Contract and shall supersede all prior understandings, representations, and communications between them, whether oral or written, as to its subject matter.

IN WITNESS WHEREOF, the representatives of the parties hereto have executed this Contract by signing below, with full authority as the act of each party, to be effective as of the day and date first above written in two (2) counterparts, each of which shall, without proof or accounting for the other counterpart, be deemed an original Contract.

BOARD OF WATER AND SEWER COMMISSIONERS OF THE CITY OF MOBILE, ALABAMA

ATTEST

By_____ By _____

(Legal Signature) (Legal Signature)

_____ _____

(Printed Name and Title) (Printed Name and Title)

CONTRACTOR: _____

By_____ By_____

(Legal Signature) (Legal Signature)

_____ _____

(Printed Name and Title) (Printed Name and Title)

(SEAL)

NOTARY ACKNOWLEDGEMENTS

STATE OF_____

COUNTY OF_____

Before me, the undersigned Notary Public in and for the above County and State, personally appeared_____, whose name as_____ for the above Owner is signed above, and who, after being by me first duly sworn, acknowledged before me that he/she signs this Contract with full authority as the act of the Owner.

Given under my hand and seal this _____ day of_____, 20_____.

_____

Print Name: _____

My Commission Expires: _____

STATE OF_____

COUNTY OF_____

Before me, the undersigned Notary Public in and for the above County and State, personally appeared _____, whose name as _____ for the above Contractor is signed above, and who, after being by me first duly sworn, acknowledged before me that he/she signs this Contract with full authority as the act of the Contractor.

Given under my hand and seal this _____ day of _____, 20_____.

_____

Print Name: _____

My Commission Expires: _____

CONTRACT BOND

KNOW ALL MEN BY THESE PRESENTS that we

_____

_____

_____

(hereinafter the “Principal”)

and

_____

_____

(hereinafter the “Surety”)

are held and firmly bound unto the Board of Water and Sewer Commissioners of the City of Mobile, Alabama (hereinafter the “Board”) in the penal sum of

_____

_____

_____ _____Dollars

($_____) for the faithful performance of a certain written Contract dated the ____ day of _____, 20_____, entered into between the Principal and the Board, for the following construction project or other work (hereinafter the “Contract”):

_____

_____

PROJECT NO. W10-2402007

a copy of which said Contract is incorporated herein by reference and made a part hereof as if fully set out.

NOW THEREFORE, this Bond and all obligations hereof shall remain in full force and effect until all covenants, terms, and conditions of the Contract for the work referenced above have been fully performed. The conditions of this Bond and its obligations are further described as follows:

The Principal shall faithfully perform all terms and conditions of the Contract and shall fully pay all obligations incurred in connection therewith. The Principal shall honor all obligations of every nature relative to the Contract.

The Principal shall save the Board harmless from any and all liability of every nature, kind, and character which may be incurred in connection with the performance or fulfill-

ment of the Contract and from any and all other such liability resulting from negligence or otherwise on the part of the Principal and/or any entity performing work or providing materials on the Principal's behalf for the Contract. The Principal shall further save the Board harmless from all costs and damages which may be suffered by reason of the failure to fully and completely perform said Contract. The Principal shall fully reimburse and repay the Board for all expenditures of every kind and description which may be incurred by the Board in making good any and every default which may exist on the part of the Principal in connection with the performance of said Contract. The Principal shall pay all lawful claims of persons, firms, partnerships, corporations, and other entities for all labor performed and material furnished in connection with the performance of the Contract. Failure to pay any such claims of persons, firms, partnerships, or corporations shall give them a direct right of action against the Principal and Surety under this obligation.

Any alterations or additions which may be made under the Contract or in the Work to be done under it, or the giving by the Board of any extensions of time for the performance of the Contract, or any other forbearance on the part of either the Board or the Principal shall not, in any way, release the Principal and Surety, or either of them, their heirs, executors, administrators, successors, or assigns for their liability hereunder, notice to the Surety of any such alteration, extension, or forbearance being expressly waived.

All obligations of this Bond shall remain in full force and effect until the performance of all covenants, terms, and conditions herein stipulated, and after such performance in full, it shall become null and void.

IN TESTIMONY WHEREOF witness the hands and seal of the parties hereto on this _____ day of _____, 20_____.

Executed in two (2) counterparts.

By _____

(Principal)

Witness: _____

_____

(Legal Signature) (Printed Name and Title)

_____ By

_____

(Surety)

Witness: _____
_____

(Legal Signature) (Printed Name and Title)

LABOR AND MATERIAL BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____, as Principal, and _____and _____, as Surety, are held and firmly bound unto the Board of Water and Sewer Commissioners of the city of Mobile, Alabama, hereafter called the "Obligee", in the penal sum of _____Dollars ($_____), lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has entered into a certain Contract with said Obligee, dated the _____, day of _____ 20_____, (hereinafter called the "Contract) for the construction of:

C.C.Williams WWTF

Headworks Rehabilitation & Odor Control

PROJECT No.___W10-2402007_____

which Contract and the Specifications for said Work shall be deemed a part hereof as fully as if set out herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal and all subcontractors to whom any portion of work provided for in said Contract is sublet and all assignees of said Principal and of such subcontractors, shall promptly make payments to all persons supplying him or them with labor, materials, feed-stuffs or supplies for or in the prosecution of the Work provided for in such Contract, or in any amendment or extension of or additions to said Contract, and for the payment of reasonable attorney's fees, incurred by the claimant or claimants in suits on each bond, then the above obligations shall be void; otherwise to remain in full force and effect. PROVIDED, however that this bond is subject to the following conditions and limitations.

a) Any person, firm or corporation that has furnished labor, materials, feed-stuffs, or supplies for or in the prosecution of the Work provided for in said Contract shall have a direct right of action against the Principal and Surety on this bond, which right of action shall be asserted in a proceeding instituted in the County in which the Work provided for in said Contract is to be performed or in any county in which said Principal and Surety does business. Such right of action shall be asserted in a proceeding instituted in the name of the claimant or claimants for his or their use and benefit against said Principal and Surety or either of them (but not later than one year after the final settlement, including warranties, of said Contract) in which action such claim or claims shall be adjudicated and judgment rendered thereon.

b) The Principal and Surety hereby designate and appoint

_____

(Chief Executive Officer of Surety Company)

as the agent of each of them to receive and accept service of process or other pleading issued or filed in any proceeding instituted on this bond and hereby consent that such service shall be the same as personal service on the Principal and/or Surety.

c) The Surety shall not be liable hereunder for damage or compensation recoverable under any Workmen's Compensation or Employer's Liability Statute.

d) In no event shall the Surety be liable for a greater sum than the obligation of this bond, or subject to any suit, action or proceeding thereon that is instituted later than one year after the final settlement, including warranties, of said Contract.

e) This bond is given pursuant to the terms of Act No. 39, General Laws of Alabama, approved February 8, 1935, entitled “An Act to Further Provide for Bonds of Contractors on State and Other Public Works and Suits Thereon.”

Executed in two (2) counterparts.

SIGNED, SEALED AND DELIVERED THIS _____day of _____, 20_____.

By_____

(Principal)

(Seal)

Witness: _____ _____

(Legal Signature) (Printed Name and Title)

By _____

(Surety)

Witness: _____ _____

(Legal Signature) (Printed Name and Title)

By _____

(Resident Agent)

_____

(Printed Name and Title)

State of Alabama
Alabama Department of Environmental Management
State Revolving Fund (SRF) Loan Program

SRF Section
Permits and Services Division
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

(334) 271-7793
(334) 271-7950 FAX

Supplemental General Conditions

for SRF Assisted

Public Drinking Water and Wastewater
Facilities Construction Contracts

Clean Water
State Revolving Fund

Protect Our Health from Source to Tap
Drinking Water State Revolving Fund

SRF Project Number: _____

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I – ADEM Special Conditions

1. Construction within State rights-of-way shall be in accordance with the Alabama Department of Transportation policies and procedures.

2. Construction is to be carried out in compliance with applicable NPDES permits and in a manner that prevents bypassing of raw wastewater flows during construction. If bypassing is anticipated, the ADEM NPDES Enforcement Branch (334-271-7975) shall be advised in advance and the contractor shall take all necessary steps to minimize the impacts of bypassing.

3. Siltation and soil erosion shall be minimized during construction. The contractor shall obtain an NPDES storm water permit for construction if required.

4. The owner shall provide and maintain competent and adequate supervision and inspection.

5. ADEM and EPA shall have access to the site and the project work at all times.

6. These Special Conditions shall supersede any conflicting provisions of this contract.

7. **A project sign is required.** See **Parts XVII and XVIII, pages SGC-36 – SGC-37**, for more information.

II – Bonds and Insurance

Bonding requirements shall comply with Alabama Act No. 97-225. Provisions of the Act are summarized below:

1. Bid Bond – Not less than 5% of either the owner's estimated cost or of the proposed prime contractor's bid up to a maximum of $10,000. The bid guarantee shall consist of a cashier's check drawn on an Alabama bank or a bid bond executed by a surety company duly authorized and qualified to make bonds in the State of Alabama.

2. Performance Bond – In an amount not less than 100% of the contract price.

3. Payment Bond – Payable to the awarding authority, shall be executed in an amount not less than 50% of the contract price.

In addition to the insurance requirements elsewhere in the specifications, the owner or the contractor, as appropriate, must acquire any flood insurance made available by the Federal Emergency Management Agency as required by 40 CFR 30.600 (b), if construction will take place in a flood hazard area identified by the Federal Emergency Management Agency.

III – Utilization of Disadvantaged Businesses Enterprises (DBEs)

It is the policy of the State Revolving Loan Fund (SRF) to promote a "fair share" of sub-agreement awards to **small, minority, and/or women-owned businesses** for equipment, supplies, construction, and services. Compliance with these contract provisions is required in order for project costs to be eligible for SRF funding. *The "fair share" objective is a goal, not a quota.* DBE (Disadvantaged Business Enterprise) is an all-inclusive business classification, which includes MBE (minority business enterprises and/or WBE (women business enterprises) and is used synonymously when these entities are referenced individually or collectively.

Failure on the part of the apparent successful bidder to submit required information to the Loan Recipient (Owner) may be considered (by the Loan Recipient (Owner)) in evaluating whether the bidder is responsive to the bid requirements. The project objectives for utilization of Minority Business Enterprises (MBEs) and Women's Business Enterprises (WBEs) are as follows:

Commodities (Supplies)	MBE 4%	WBE 11%
Contractual (Services)	MBE 8%	WBE 30%
Equipment	MBE 5%	WBE 20%
Construction	MBE 2.5%	WBE 3%

For purposes of clarification:

- This objective applies to any Federally assisted procurement agreement in excess of $10,000.
- This objective necessitates three responsibilities; separate solicitations must be made of small and minority and women's business enterprises.
- A minority business is a business, at least 51 percent of which is owned and controlled by minority group members (Black; Hispanic; Asian American; American Indian; and, any other designations approved by the Office of Management and Budget).
- A women's business is a business, at least 51 percent of which is owned and controlled by one or more women.
- The control determination will revolve around the minority or woman owner's involvement in the day-to-day management of the business enterprise.
- Solicitation should allow adequate time for price analysis. ADEM recommends that contact be made no later than 15 days before bid opening.
- Efforts taken to comply with this objective must be documented in detail; maintain records of firms contacted, including any negotiation efforts to reach competitive price levels, and awards to the designated firms.
- ADEM recommends that the Loan Recipient (Owner) or proposed Prime Contractor utilizes the services of the Minority Business Development Service Centers. These Centers are funded by the U.S. Department of Commerce to provide technical, financial and contracting assistance to minority and women's business enterprises. These Centers are located in a number of Regional cities.
- Use of the services provided by these Centers does not absolve the Loan Recipient (Owner) or proposed Prime Contractor from pursuing additional efforts to meet this objective.

IV – Six Affirmative Steps for Good Faith DBE (MBE-WBE) Solicitation

The Loan Recipient (Owner) shall follow the six affirmative steps found in the SRF application when using loan funds to procure sources of supplies, construction and services.

If the successful bidder plans to subcontract a portion of the project, the bidder must submit to the owner within 10 days after bid opening, evidence of the affirmative steps taken to utilize small, minority and women's businesses. These six affirmative steps or ‘good faith efforts’ are required methods to ensure that DBEs have the opportunity to compete for procurements funded by EPA financial assistance dollars. Such affirmative steps are described as follows:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. This will include placing DBEs on solicitation lists and soliciting them whenever there are potential sources.

2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. This will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

5. Use the resources, services, and assistance of the AL Department of Transportation (ALDOT), Small Business Administration (SBA), and the Minority Business Development Agency of the Department of Commerce (MBDA).

6. If the Contractor awards subcontracts, it must take the steps described in items (1) through (5) listed above.

V – Documentation Required from Loan Recipient (Owner) and Contractor

The low, responsive, responsible bidder must forward the following items, in duplicate, to the loan recipient (owner) no later than 10 days after bid opening. The Loan Recipient (Owner) shall transmit one (1) copy of its DBE documentation of the prime contractor solicitation and one (1) copy of the prime contractor's/bidder's DBE documentation of all subcontractor solicitation to the SRF Section within 14 days after bid opening.

1. SRF project number and project name/loan name*. (*not contract name)

2. List of **all** subcontractors (DBE **and** non-DBE) with name, address, telephone number, estimated contract dollar amount and duration. If there are to be no subcontractors, please indicate such in a letter on company letterhead.

3. List of any subcontract work yet to be committed with estimate of dollar amount and duration of contract.

4. MBE-WBE (DBE) Documents - See **Part V, page SGC-6**.

5. Debarred Firms Certification – See **Part XIV, page SGC-25**.

6. Certification Regarding Equal Employment Opportunity – See **Part XIII, page SGC-24.**

The Loan Recipient (Owner) shall submit annual MBE/WBE Utilization Reports (EPA Form 5700-52A, **pages SGC-16 - SGC-17**) within 30 days of the end of the annual reporting period **(October 30th, i.e. by November 30th)**. Submit reports directly to:

Laketa Ross, Accountant
Administrative Section
Fiscal Branch
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

The proposed Prime Contractor must submit the following items to the Loan Recipient (Owner):

1) DBE Compliance Form. The Loan Recipient (Owner) must submit this information to the SRF Section to demonstratecompliance with the DBE requirements. ADEM's approval is required prior to award of the construction contract and commencement of any SRF-funded construction. **(Page SGC-8)**

2) Certification Regarding Equal Employment Opportunity. This form is required of the proposed prime contractor(re: all subcontracts executed) and should be submitted with the prime proposed contractor's MBE-WBE solicitation submittal to the Loan Recipient (Owner). (**Page SGC-24**)

3) Debarred Firms Certification. This form is required of the proposed prime contractor (re: all subcontracts executed) and should be submitted with the prime proposed contractor's MBE-WBE solicitation submittal to the Loan Recipient (Owner). (**Page SGC-25**)

4) EPA Form 6100-2 DBE Subcontractor Participation Form. This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the proposed prime contractor, how much the DBE subcontractor was paid, and any other concerns the DBE subcontractor might have. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-10)**

5) EPA Form 6100-3 DBE Subcontractor Performance Form. This form captures an intended DBE subcontractor's description of work to be performed for the proposed prime contractor and the price of the work. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-12)**

6) EPA Form 6100-4 DBE Subcontractor Utilization Form. This form captures the proposed prime contractor's intended use of all identified DBE subcontractors and the estimated dollar amount of the work. The proposed prime contractor must provide this form to each DBE subcontractor for the DBE subcontractor's submittal to the SRF Section's MBE-WBE Compliance Staff (to be forwarded to EPA's DBE Coordinator). **(Page SGC-14)**

7) EPA Form 5700-52 A MBE/WBE Utilization Reports (DBE Annual Report), if applicable. The Loan Recipient (Owner) must submit this information to the SRF Section within 30 days of the end of the annual reporting period (October 30th), i.e., **by November 30th)**. **(Pages SGC-16 - SGC-17)**

8) Changes to Approved DBE Compliance Form, if applicable. If any changes, substitutions, or additions are proposed to the subcontractors included in previous Department approvals, the Owner must submit this information to the Department for prior approval in order for the affected subcontract work to be eligible for SRF funding. **(Page SGC-23)**

9) Certified Payrolls. These should be submitted to the Loan Recipient (Owner), at least, monthly for the prime contractor and all subcontractors. The Loan Recipient (Owner) must maintain payroll records and make these available for inspection

Please note that DBEs, MBEs, and WBEs must be certified **in writing** by EPA, SBA, or DOT (or by state, local, Tribal, or private entities whose certification criteria match EPA's). Depending upon the certifying agency, a DBE may be classified as a Disadvantaged Business Enterprise (DBE), a Minority Business Enterprise (MBE), or a Women's Business Enterprise (WBE). Written certification as a DBE (MBE or WBE) is required in order to be counted toward the Loan Recipient/Owner's MBE-WBE accomplishments.

The documentation of these good faith solicitation efforts must be detailed in order to allow for satisfactory review. Such documentation might include fax confirmation sheets, copies of solicitation letters/emails, printouts of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The proposed prime contractor is strongly encouraged to follow up each written, fax, or email solicitation with, at least, 1 logged phone call.

The proposed prime contractor must employ the six affirmative steps to subcontract with DBEs, even if the proposed prime contractor has achieved its fair share objectives.

The prime contractor must employ the six affirmative steps to subcontract with DBEs, even if the proposed prime contractor has achieved its fair share objectives. If a DBE subcontractor fails to complete work under the subcontract for any reason, the proposed prime contractor must notify the Loan Recipient (Owner) in writing prior to any termination and must employ the six 'good faith efforts' described above if using a replacement subcontractor. Any proposed changes from an approved DBE subcontractor must be reported to the Loan Recipient (Owner) and to the SRF Section on the Changes to Approved Subcontractors Form prior to initiation of the action. EPA Forms Nos. 6100-3 and 6100-4 must also be submitted to the SRF Section for new DBE subcontracts.

VI – Resources for Identifying MBE-WBE (DBE) Contractors/Subcontractors

The following organizations may provide assistance in soliciting DBE participation:

City of Birmingham
Office of Economic Development
ATTN: **Monique Shorts**, Economic Specialist
710 20th Street North
Birmingham, Alabama 35203
Ph: (205) 254-2799
Fax: (205) 254-7741
Monique.shorts@birmingham.gov

U.S. Small Business Administration
http://www.pro-net.sba.gov

National Association of Minority Contractors (NAMC)
https://namcatlanta.org/

Alabama Department of Transportation
ATTN: **John Huffman**
1409 Coliseum Boulevard
Montgomery, Alabama 36130
Ph: (334) 244-6261
http://www.dot.state.al.us

U.S. Department of Commerce
Minority Business Development Agency
ATTN: **Donna Ennis**
75 5th Street NW,
Suite 300
Atlanta, Georgia 30308
Ph: (404) 894-2096
http://www.mbda.gov/

Governor's Office of Minority and Women's Business Enterprises
Hilda Lockhart, STEP Project Director
401 Adams Avenue
Suite 360
Montgomery, Alabama 36130
Ph: (334) 242-2220

Birmingham Construction Industrial Authority ATTN: **Ashley Orl** or **Kimberly Bivins**
601 37th Street South
Birmingham, Alabama 35222
Ph: (205) 324-6202
aorl@bcia1.org
kbaylorbivins@bcia1.org

NOTE:

(1) The Loan Recipient (Owner) and the proposed Prime Contractor shall use the necessary resources to identify and directly solicit no less than three (3) certified DBE/MBE/WBE companies to bid in each expected contract/subcontract area. If a diligent and documented search of ALDOT, SBA, and MBDA directories does not identify three (3) potential certified DBE/MBE/WBE firms, then the proposed Prime Contractor shall post an advertisement in, at least, one (1) of the other online or print resources. Whenever possible, post solicitation for bids or proposals should be posted/advertised for a minimum of 30 calendar days before the bid or proposal closing date.

(2) Expenditures to a DBE that acts merely as a broker or passive conduit of funds, without performing, managing, or supervising the work of its subcontract in a manner consistent with normal business practices may not be counted.

(3) The proposed Prime Contractor should attempt to identify and first solicit DBEs in the geographic proximity of the project before soliciting those located farther away.

(4) In addition, our SRF DBE Compliance Staff is readily available for assistance, as follows: Laketa Ross at (334) 271-7727 or laketa.ross@adem.alabama.gov OR Diane Lockwood (DBE Coordinator) at (334) 271-7815 or dpl@adem.alabama.gov.

VII – DBE Compliance Form

NOTE: FOR DBE COMPLIANCE, ONE (1) COPY OF THIS FORM (WITH ALL INFORMATION OUTLINED) IS REQUIRED (WITH THE LOAN RECIPIENT (OWNER)'S DBE SUBMITTAL) FOR EACH PR&CS REVIEW. THE LOAN RECIPIENT (OWNER) AND PROPOSED PRIME CONTRACTOR SHOULD ENSURE THAT THIS INFORMATION IS COMPLETE *PRIOR TO THE PR&CS SUBMITTAL TO THE SRF SECTION*.

Loan Recipient: _____ SRF Loan (Project) Number: _____

CERTIFICATIONS:

I certify that the information submitted on and with this form is true and accurate and that this company has met and will continue to meet the conditions of this construction contract regarding DBE solicitation and utilization. I further certify that criteria used in selecting subcontractors and suppliers were applied equally to all potential participants and that EPA Forms 6100-2 and 6100-3 were distributed to all DBE subcontractors.

_____ Date_____
(Proposed Prime Contractor Signature)

_____
(Printed Name and Title)

I certify that I have reviewed the information submitted on and with this form and that it meets the requirements of the Loan Recipient's/Owner's State Revolving Fund loan contract.

(Only ONE (1) signature required below.)**

_____ Date_____
(Signature of Loan Recipient (Owner))

OR**

_____ Date_____
(Loan Recipient's (Owner's) Representative's Signature, (**P.E.**))

_____
(Printed Name and Title)

GENERAL INFORMATION:

Loan Recipient (Owner) Contact: _____

Loan Recipient (Owner) Phone Number/Email: _____

Consulting Engineer Contact: _____

Consulting Engineer Phone Number/Email: _____

Proposed Prime Contractor: _____

Proposed Prime Contractor Contact: _____

Proposed Prime Contractor Phone Number/Email:_____

Proposed Prime Contract Amount: $ _____

Proposed Total DBE/MBE Participation: $ _____ Percentage: ____% Goal: 2.5%

Proposed Total WBE Participation: $ _____ Percentage: ____% Goal: 3.0%

_____

Please ensure the following is submitted in the *full* DBE submittal (with the DBE COMPLIANCE FORM (page SGC-8)):

(1) **List of all committed and uncommitted subcontractors** by trade, including company name, address, telephone number, contact person, dollar amount of subcontract, and DBE/MBE/WBE status. Indicate in writing if no solicitations were made because the contractor intends to use only its own forces to accomplish the work.

(2) **Proof of certification (certificate or letter)** by EPA, SBA, DOT (or by state, local, Tribal, or private entities whose certification criteria match EPA's) for each subcontractor listed as a DBE, MBE, or WBE.

(3) **Documentation of solicitation effort for prospective DBE firms**, such as fax confirmation sheets, copies of solicitation letters/emails, printout of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The prime contractor is strongly encouraged to follow up each written, fax, or email solicitation with at least 1 logged phone call. Whenever possible, post solicitation for bids or proposals should be for a minimum of 30 calendar days before the bid or proposal closing date.

(4) **Justification for not selecting a certified DBE subcontractor** that submitted a low bid for any subcontract area.

(5) **Certification By Proposed Prime Contractor or Subcontractor Regarding Equal Opportunity Employment. (Page SGC-24**)

(6) **Debarred Firms Certification**. (**Page SGC-25**)

(7) **EPA Form 6100-2 DBE Subcontractor Participation Form** for **each** proposed **certified** DBE subcontractor.* (**Page SGC-10**) (*This form is completed by the proposed prime contractor. It is signed by **each** proposed subcontractor **only**.)

(8) **EPA Form 6100-3 DBE Subcontractor Performance Form** for each DBE subcontractor.** (**Page SGC-12**) (**This form is completed by the proposed prime contractor and signed by each proposed certified subcontractor and the proposed prime contractor per subcontract.)

(9) **EPA Form 6100-4 DBE Subcontractor Utilization Form** to summarize all DBE subcontracts/subcontractors.*** (**Page SGC-14**) (***This form is completed and signed by the proposed prime contractor **only**.)

NOTE:

ALL DBE contractors selected must have a current DBE certificate or letter of certification by an approved certifying agency.

Loan Recipient (Owner) DBE Submittal

At minimum, the Loan Recipient (Owner)'s DBE submittal should **always** consist of **a cover letter** (*preferred, but optional*) **and a VII - DBE Compliance Form (page SGC-8) and DBE solicitation documentation** (i.e., DBE solicitation list(s) with source(s) of list(s) clearly identified, contractor contact information and results/outcomes of each solicitation (or of the overall solicitation effort, if all results/outcomes were the same), documentation of solicitation method (i.e., copies of emails, phone logs, faxes, etc.).

Prime Contractor DBE Submittal

At minimum, the Prime Contractor's DBE submittal should **always** consist of **a cover letter** (*preferred, but optional*) **and DBE solicitation documentation** (i.e., DBE solicitation list(s) with source(s) of list(s) clearly identified, subcontractor contact information and results/outcomes of each solicitation (or of the overall solicitation effort, if all results/outcomes were the same), documentation of solicitation method (i.e., copies of emails, phone logs, faxes, etc.) **OR** a "No Subcontractors" Letter (*if none will be utilized*) **and** a List of ***ALL*** *(DBE/non-DBE) subcontractors* contracted/yet to be contracted **and** ***ALL EPA 6100 Forms*** *described above* (*DBE subcontractors selected **or not***) **and** Certification Regarding Equal Employment Opportunity **and** Debarred Firms Certification.

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE[1] subcontractor[2] the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Prime Contractor Name		Issuing/Funding Entity:

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services , Equipment or Supplies	Amount Received by Prime Contractor

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

This form is intended to capture the DBE[1] subcontractor's[2] description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Prime Contractor Name		Issuing/Funding Entity:

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: O DOT O SBA O Other: _____	Meets/ exceeds EPA certification standards? O YES O NO O Unknown	

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

Subcontractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE[1] subcontractors[2] and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
Address		
Telephone No.		Email Address
Issuing/Funding Entity:		

I have identified potential DBE certified subcontractors	○ YES	◉ NO
If yes, please complete the table below. If no, please explain:		

Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified?

Continue on back if needed

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

EPA United States Environmental Protection Agency

OMB Control No: 2090-0030

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

U.S. ENVIRONMENTAL PROTECTION AGENCY
MBE/WBE UTILIZATION UNDER FEDERAL GRANTS AND COOPERATIVE AGREEMENTS

PART I OF II
(PAGES SGC-16 & SGC-17)

FOR COOPERATIVE AGREEMENTS OR OTHER FEDERAL FINANCIAL ASSISTANCE WHERE THE COMBINED TOTAL OF FUNDS BUDGETED FOR PROCURING SUPPLIES, EQUIPMENT, CONSTRUCTION OR SERVICES EXCEED $150,000.

PART 1: PLEASE REVIEW INSTRUCTIONS BEFORE COMPLETING

1A. FEDERAL FISCAL YEAR (Oct 1- Sep 30)	1B. REPORT TYPE
20_____	☐ Annual ☐ Last Report (Project completed)

1C: REVISION OF A PRIOR YEAR REPORT? ◯ No ◯ Yes, Year_____

IF YES, BRIEFLY DESCRIBE THE REVISIONS YOU ARE MAKING:

2A. EPA FINANCIAL ASSISTANCE OFFICE ADDRESS (ATTN: DBE COORDINATOR)	3A. RECIPIENT NAME AND ADDRESS
2B. EPA DBE COORDINATOR Name: Email: Phone: Fax:	3B. RECIPIENT REPORTING CONTACT Name: Address: Phone: Email:
4A. FINANCIAL ASSISTANCE AGREEMENT ID NUMBER (SRF State Recipients, refer to Instructions for Completion of blocks 4A, 5A and 5C)	4B. FEDERAL FINANCIAL ASSISTANCE PROGRAM TITLE OR CFDA NUMBER:
5A. TOTAL ASSISTANCE AGREEMENT AMOUNT EPA Share: $ _____ Recipient Share: $ _____ ☐ **N/A (SRF Recipient)/Loan Amount: $_____**	5B. If NO procurements and NO accomplishments were made this reporting period (by the recipients, sub-recipients, loan recipients, and prime contractors), **CHECK and SKIP to Block No. 7**. (Procurements are all expenditures through contract, order, purchase, lease or barter of supplies, equipment, construction, or services needed to complete Federal assistance programs. Accomplishments, in this context, are procurements made with MBEs and/or WBEs.) ☐

5C. Total Procurements This Reporting Period (Only include amount not reported in any prior reporting period)

Total Procurement Amount $_____

(Include total dollar values awarded by recipient, sub-recipients and SRF loan recipients, including MBE/WBE expenditures.)

5D. Were sub-awards issued under this assistance agreement? Yes ◯ No ◯

Were contracts issued under this assistance agreement? Yes ◯ No ◯

5E. MBE/WBE Accomplishments This Reporting Period

Actual MBE/WBE Procurement Accomplished (Include total dollar values awarded by recipient, sub-recipients, SRF loan recipients and Prime Contractors.)

	Construction	Equipment	Services	Supplies	Total
$MBE:	_____	_____	_____	_____	0.00
$WBE:	_____	_____	_____	_____	0.00

6. COMMENTS: (If no MBE/WBE procurements, please summarize how certified MBEs/WBEs were notified of the opportunities to compete for the procurement dollars entered in Block 5C and why certified MBEs /WBEs were not awarded any procurements during this reporting period.)

7. NAME OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	TITLE
8. SIGNATURE OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	DATE

EPA FORM 5700-52A available electronically at https://www.epa.gov/sites/production/files/2014-09/documents/epa_form_5700_52a.pdf

If reporting DBE procurement, please enter the Loan Project Number and the information in the grid below, as applicable.
If no additional DBE procurement to report, please enter the Loan Project Number and enter 'N/A' in the black box below.

PART II OF II
(PAGES SGC-16 & SGC-17)

PART II.

MBE/WBE PROCUREMENTS MADE DURING REPORTING PERIOD

SRF Financial Assistance Agreement Number: _____

1. Procurement Made By			2. Business Enterprise		3. $ Value of Procurement	4. Date of Procurement MM/DD/YY	5. Type of Product or Service (Enter Code)	6. Name/Address/Phone Number of MBE/WBE Contractor or Vendor
Recipient	Sub-Recipient and/or SRF Loan Recipient	Prime	Minority	Women				

Type of Product or Service Codes: 1 = Construction 2 = Supplies 3 = Services 4 = Equipment

Note: Recipients are required to submit MBE/WBE reports to EPA beginning with the Federal fiscal year the recipients receive the award, continuing until the project is completed.

Instructions:

A. General Instructions:

MBE/WBE utilization is based on 40 CFR Part 33. The reporting requirement reflects the class deviation issued on November 8, 2013, clarified on January 9, 2014 and modified on December 2, 2014. EPA Form 5700-52A must be completed annually by recipients of financial assistance agreements where the combined total of funds budgeted for procuring supplies, equipment, construction or services exceeds $150,000.This reporting requirement applies to all new and existing awards and voids all previous reporting requirements.

In determining whether the $150,000 threshold is exceeded for a particular assistance agreement, the analysis must focus on funds budgeted for procurement under the supplies, equipment, construction, services or "other" categories, and include funds budgeted for procurement under sub-awards or loans

Reporting will also be required in cases where the details of the budgets of sub-awards/loans are not clear at the time of the grant awards and the combined total of the procurement and sub-awards and/or loans exceeds the $150,000 threshold.

When reporting is required, all procurement actions are reportable, not just the portion which exceeds $150,000.

If at the time of award the budgeted funds exceed $150,000 but actual expenditures fall below, a report is still required.

If at the time of award, the combined total of funds budgeted for procurements in any category is less than or equal to $150,000 and is maintained below the threshold, no DBE report is required to be submitted.

Recipients are required to report 30 days after the end of each federal year, per the terms and conditions of the financial assistance agreement.

Last reports are due October 30th or 90 days after the end of the project period, whichever comes first.

MBE/WBE program requirements, including reporting, are material terms and conditions of the financial assistance agreement.

B. Definitions:

Procurement is the acquisition through contract, order, purchase, lease or barter of supplies, equipment, construction or services needed to accomplish Federal assistance programs.

A ***contract*** is a written agreement between an EPA recipient and another party (also considered "prime contracts") and any lower tier agreement (also considered "subcontracts") for equipment, services, supplies, or construction necessary to complete the project. This definition excludes written agreements with another public agency. This definition includes personal and professional services, agreements with consultants, and purchase orders.

A ***minority business enterprise*** **(MBE)** is a business concern that is (1) at least 51 percent owned by one or more minority individuals, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority

individuals; and (2) whose daily business operations are managed and directed by one or more of the minority owners. In order to qualify and participate as an MBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

U.S. citizenship is required. Recipients shall presume that minority individuals include Black Americans, Hispanic Americans, Native Americans, Asian Pacific Americans, or other groups whose members are found to be disadvantaged by the Small Business Act or by the Secretary of Commerce under section 5 of Executive order 11625. The reporting contact at EPA can provide additional information.

*A **woman business enterprise*** **(WBE)** is a business concern that is, (1) at least 51 percent owned by one or more women, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more women and (2) whose daily business operations are managed and directed by one or more of the women owners. In order to qualify and participate as a WBE prime or subcontractor for EPA recipients under EPA's DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

Business firms which are 51 percent owned by minorities or women, but are in fact not managed and operated by minorities or females do not qualify for meeting MBE/WBE procurement goals. U.S. Citizenship is required.

Good Faith Efforts

A recipient is required to make the following good faith efforts whenever procuring construction, equipment, services, and supplies under an EPA financial assistance agreement. These good faith efforts for utilizing MBEs and WBEs must be documented. Such documentation is subject to EPA review upon request:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

5. Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

6. If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.

C. Instructions for Part I:

1A. Specify Federal fiscal year this report covers. The Federal fiscal year runs from October 1st through September 30th (**e.g. November 29, 2014 falls within Federal fiscal year 2015**)

1B. Specify report type. Check the annual reporting box. Also indicate if the project is completed.

1C. Indicate if this is a revision to a previous year and provide a brief description of the revision you are making.

2A-B. Please refer to your financial assistance agreement for the mailing address of the EPA financial assistance office for your agreement.

The "EPA DBE Reporting Contact" is the DBE Coordinator for the EPA Region from which your financial assistance agreement was originated. For a list of DBE Coordinators please refer to the EPA OSBP website at http://epa.gov/osbp/dbe_cord.

3A-B. Identify the agency, state authority, university or other organization which is the recipient of the Federal financial assistance and the person to contact concerning this report.

4A. Provide the Assistance Agreement number assigned by EPA. A separate report must be submitted for each Assistance Agreement.

***For SRF recipients**: In box 4a list numbers for ALL OPEN Assistance Agreements being reported on this form.

4B. Refer back to Assistance Agreement document for this information.

5A. Provide the total amount of the Assistance Agreement which includes Federal funds plus recipient matching funds and funds from other sources.

***For SRF recipients only**: SRF recipients will not enter an amount in 5a. SRF recipients should check the "N/A" box.

5B. Self-explanatory.

5C. Provide the total dollar amount of **ALL** procurements awarded this reporting period by the recipient, sub-recipients, and SRF loan recipients, **including** MBE/WBE expenditures, not just the portion which exceeds $150,000. For example: Actual dollars for procurement from the procuring office; actual contracts let from the contracts office; actual goods, services, supplies, etc., from other sources including the central purchasing/ procurement centers).

***NOTE**: To prevent double counting on line 5C, if any amount on 5E is for a subcontract and the prime contract has already been included on Line 5C in a prior reporting period, then report the amount going to MBE or WBE subcontractor on line 5E, but exclude the amount from Line 5C. To include the amount on 5C again would result in double counting because the prime contract, which includes the subcontract, would have already been reported.

***For SRF recipients only**: In 5c please enter the total annual procurement amount under all of your SRF Assistance Agreements. The figure reported in this section is **not** directly tied to an individual Assistance Agreement identification number. **(SRF state recipients report state procurements in this section)**

5D. State whether or not sub-awards and/or subcontracts have been issued under the financial assistance agreements by indicating “yes” or “no”.

5E. Where requested, also provide the total dollar amount of all MBE/WBE procurement awarded during this reporting period by the recipient, sub-recipients, SRF loan recipients, and prime contractors in the categories of construction, equipment, services and supplies. These amounts include Federal funds plus recipient matching funds and funds from other sources.

6. If there were no MBE/WBE accomplishments this reporting period, please briefly how certified MBEs/WBEs were notified of the opportunities to compete for the procurement dollars entered in Block 5C and why certified MBEs /WBEs were not awarded any procurements during this reporting period.

7. Name and title of official administrator or designated reporting official.

8. Signature, month, day, and year report submitted.

D. Instructions for Part II:

For each MBE/WBE procurement made under this financial assistance agreements during the reporting period, provide the following information:

1. Check whether this procurement was made by the recipient, sub-recipient/SRF loan recipient, or the prime contractor.

2. Check either the MBE or WBE column. If a firm is both an MBE and WBE, the recipient may choose to count the entire procurement towards EITHER its MBE or WBE accomplishments. The recipient may also divide the total amount of the procurement (using any ratio it so chooses) and count those divided amounts toward its MBE and WBE accomplishments. If the recipient chooses to divide the procurement amount and count portions toward its MBE and WBE accomplishments, please state the appropriate amounts under the MBE and WBE columns on the form. **The combined MBE and WBE amounts for that MBE/WBE contractor must not exceed the “Value of the Procurement” reported in column #3**

3. Dollar value of procurement.

4. Date of procurement, shown as month, day, year. Date of procurement is defined as the date the contract or procurement was awarded, **not** the date the contractor received payment under the awarded contract or procurement, unless payment occurred on the date of award. **(Where direct purchasing is the procurement method, the date of procurement is the date the purchase was made)**

5. Using codes at the bottom of the form, identify type of product or service acquired through this procurement (e.g., enter 1 if construction, 2 if supplies, etc.).

6. Name, address, and telephone number of MBE/WBE firm.

**This data is requested to comply with provisions mandated by: statute or regulations (40 CFR Parts 30, 31, and 33 and/or 2 CFR Parts 200 and 1500); OMB Circulars; or added by EPA to ensure sound and effective assistance management. Accurate, complete data are required to obtain funding, while no pledge of confidentiality is provided.

The public reporting and recording burden for this collection of information is estimated to average l hour per response annually. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclosure or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, OPPE Regulatory Information Division, U.S. Environmental Protection Agency (2136), 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB Control number in any correspondence. Do not send the completed form to this address.

XII – Changes to Approved DBE Compliance Form

NOTE: THIS FORM IS REQUIRED OF THE LOAN RECIPIENT (OWNER) (WITH THE PRIME CONTRACTOR'S INPUT) FOR DBE COMPLIANCE ONLY IF A SUBCONTRACTOR/SUPPLIER/VENDOR IS SOUGHT AND/OR PROCURED AFTER THE CONTRACT ATA (APPROVAL-TO-AWARD) HAS BEEN ISSUED. IT IS SIMILAR TO THE DBE COMPLIANCE FORM (PAGE SGC-8) IN THAT IT IS THE COVER/SUMMARY FORM USED TO DOCUMENT THE ADDITIONAL DBE SOLICITATION AND/OR REVISE THE ORIGINAL DBE APPROVAL STATUS.

Loan Recipient: _____ Loan (Project) Number: _____

CERTIFICATIONS:

I certify that the information submitted on and with this form is true and accurate and that this company has met and will continue to meet the conditions of this construction contract regarding DBE solicitation and utilization. I further certify that criteria used in selecting subcontractors and suppliers were applied equally to all potential participants and that EPA Forms 6100-2 and 6100-3 were distributed to all DBE subcontractors.

_____ Date_____
(Prime Contractor Signature)

_____
(Printed Name and Title)

I certify that I have reviewed the information submitted on and with this form and that it meets the requirements of the Loan Recipient's/Owner's State Revolving Fund loan contract. **(*Only ONE (1) signature required below.)**

_____ Date_____
(Signature of Loan Recipient (Owner))

OR*

_____ Date_____
(Loan Recipient's (Owner's) Representative's Signature, (**P.E.**))

_____
(Printed Name and Title)

GENERAL INFORMATION: **(Please attach additional pages to address 1 through 5, as needed.)**

(1) If an approved subcontractor is terminated or replaced, please identify this company and briefly state the reason.

(2) For new or additional subcontractors, list name, trade, address, telephone number, contact person, dollar amount of subcontract and DBE status.

(3) Attach proof of certification by EPA, SBA, DOT (or by state, local, Tribal or private entities whose certification criteria match EPA's) for each subcontractor listed as a DBE, MBE or WBE.

(4) Attach documentation of solicitation effort for prospective DBE firms, such as fax confirmation sheets, copies of solicitation letters/emails, printouts of the online solicitations, printouts of online search results, affidavits of publication in newspapers, etc. The prime contractor is strongly encouraged to follow up each solicitation with, at least, one (1) logged phone call. Whenever possible, post solicitation for bids or proposals should be for a minimum of 30 calendar days before the bid or proposal closing date.

(5) Provide justification for not selecting a certified DBE subcontractor that submitted a low bid for any subcontract area.

_____

XIII – Certification Regarding Equal Employment Opportunity

The prime contractor is required to comply with Executive Order 112-46 of September 24, 1965 entitled "Equal Employment Opportunity" as amended by Executive Order 11375 of October 13, 1967.

The contract for the work under this proposal will obligate the prime contractor and its subcontractors not to discriminate in employment practices.

The prime contractor shall not maintain or provide for his/her employees the facilities, which are segregated on a basis of race, creed, color or national origin, whether such facilities are segregated by directive or on a de facto basis.

The prime contractor must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain his/her eligibility to receive the award of the contract.

The prime contractor must be prepared to comply in all respects with any contract provisions regarding non-discrimination stipulated in conjunction with labor standards.

PRIME CONTRACTOR'S CERTIFICATION:

Prime Contractor's Name: _____

Address: _____

_____

_____

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. Yes____ No____
2. Compliance Reports were required to be filed in connection with such contract or subcontract. Yes____ No____
3. Bidder has filed all compliance reports due under applicable contract requirements. Yes____ No____

If answer to item 3 is "No", please explain in detail on reverse side of this certification.

Certification - The information above is true and complete to the best of my knowledge and belief.

Signature of Prime Contractor: _____

Title: _____

Date: _____

XIV – Debarred Firms Certification

All prime construction contractors shall certify that Subcontracts have not and will not be awarded to any firm that is currently on the General Service Administration's Master List of Debarred, Suspended and Voluntarily Excluded Persons, in accordance with the provisions of ADEM Administrative Code 335-6-14-.35. Debarment action is taken against a firm for noncompliance with Federal Law.

All bidders shall complete this certification in duplicate and submit both copies to the Loan Recipient (Owner) with the bid proposal. The Loan Recipient (Owner) shall transmit one copy to the SRF Section within 14 days after the bid opening.

Project Name/Loan Name*: _____
(*not **Contract** Name)

SRF Project No.: _____

The undersigned hereby certifies that the firm of _____

_____ has not and will not award a subcontract, in connection with any contract awarded to it as the result of this bid, to any firm that is currently on the General Service Administration's Master List of Debarred, Suspended, and Voluntarily Excluded Persons.

Signature of Prime Contractor: _____

Title: _____

Date: _____

XV – Davis-Bacon and Related Acts

Labor Standards Provisions for Federally Assisted Contracts

Wage Rate Requirements Under FY 2013 Continuing Appropriation

I. Requirements under the Consolidated and Further Continuing Appropriations Act. 2013 (P.L. 113-6) For Subrecipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2013 Continuing Resolution with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Cynthia Y. Edwards at Edwards.Cynthiay@epa.gov or at 404-562-9340 of EPA, Region 4 Grants and SRF Management Section, for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at http://www.dol.gov/whd/

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.

Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract Subcontract Provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2010 appropriation , the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov.

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

(2) Withholding.

The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at https://www.dol.gov/agencies/whd/forms/wh347 or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

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

(4) Apprentices and trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program.

If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

(5) Compliance with Copeland Act requirements.

The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment.

A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of $100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages.

In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages.

The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing hat the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the subrecipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information
indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract . Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at https://www.dol.gov/agencies/whd/contact/local-offices.

(Insert applicable wage rate determination here.)

Wage Rates are county specific for *Heavy Construction* and can be found at:
https://sam.gov/content/wage-determinations

"General Decision Number: AL20250092 08/08/2025

Superseded General Decision Number: AL20240092

State: Alabama

Construction Type: Building
BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories)

County: Mobile County in Alabama.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed

	on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025
1	03/14/2025
2	08/08/2025

ASBE0078-001 10/01/2024

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR	$ 31.10	16.40

BOIL0108-001 01/01/2025

	Rates	Fringes
BOILERMAKER	$ 34.21	23.92

ELEC0505-002 09/01/2023

	Rates	Fringes
ELECTRICIAN	$ 30.90	3%+9.41

ENGI0653-017 10/01/2023

	Rates	Fringes
POWER EQUIPMENT OPERATOR		

```
     Bulldozer.....................$ 29.90            14.55
     Crane.........................$ 31.75            14.55
------------------------------------------------------------------
* PLUM0119-001 07/23/2025

                                    Rates          Fringes

PLUMBER.............................$ 35.20            13.51
------------------------------------------------------------------
 SHEE0441-009 07/01/2023

                                    Rates          Fringes

SHEET METAL WORKER (Includes
HVAC Duct Installation).............$ 27.22            13.98
------------------------------------------------------------------
*  SUAL2015-020 08/02/2017

                                    Rates          Fringes

BRICKLAYER..........................$ 19.81             0.00

CARPENTER, Includes Form Work....$ 18.16             0.00

CEMENT MASON/CONCRETE FINISHER...$ 16.00 **          0.00

IRONWORKER, REINFORCING.............$ 22.86             7.94

IRONWORKER, STRUCTURAL..............$ 19.73             1.15

LABORER:  Common or General......$ 11.94 **          0.00

LABORER:  Mason Tender - Brick...$ 11.00 **          0.00

LABORER:  Mason Tender -
Cement/Concrete.....................$ 12.16 **          0.00

LABORER:  Pipelayer.................$ 12.58 **          0.00

OPERATOR:
Backhoe/Excavator/Trackhoe.........$ 21.07            11.78

OPERATOR:  Forklift.................$ 20.69             0.00

OPERATOR:  Grader/Blade.............$ 17.52 **          0.89

OPERATOR:  Loader...................$ 14.69 **          0.00
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OPERATOR: Roller.....$ 14.00 ** 1.78

PAINTER (Brush and Roller).....$ 15.41 ** 0.00

PAINTER: Spray.....$ 14.31 ** 0.00

PIPEFITTER.....$ 20.78 5.04

ROOFER.....$ 13.61 ** 0.00

SPRINKLER FITTER (Fire Sprinklers).....$ 21.50 0.00

TILE SETTER.....$ 15.86 ** 0.00

TRUCK DRIVER: Dump Truck.....$ 13.18 ** 0.00

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.75) or 13658 ($13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic

violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE:

UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

XVI – American Iron and Steel Requirement

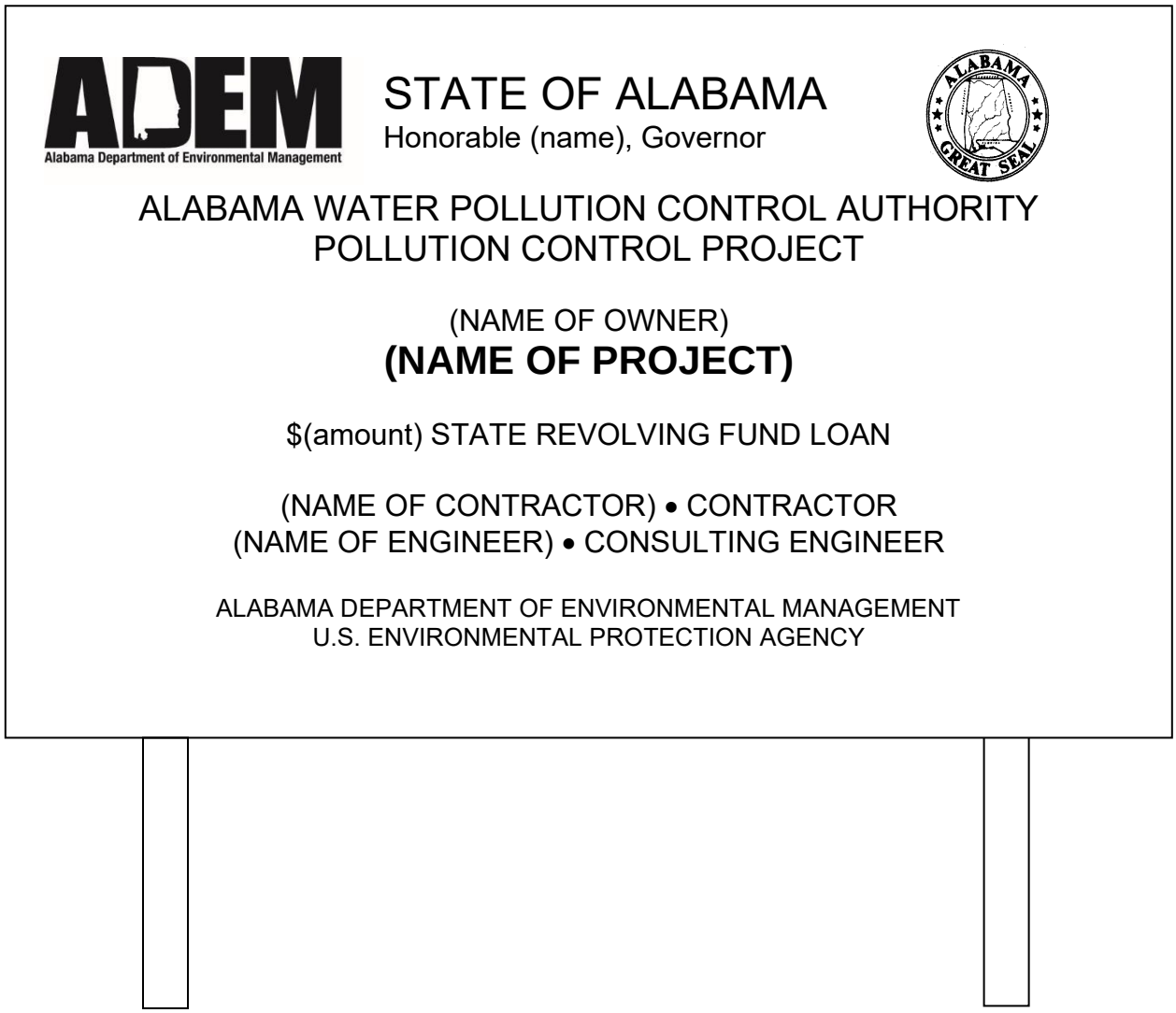
Section 4.13 Compliance with 2014 Appropriations Act. (a) The Loan Recipient agrees to comply with all federal requirements applicable to the Authority Loan (including those imposed by P.L. 113-76, Consolidated Appropriations Act (the "2014 Appropriations Act") and related SRF Policy Guidelines) which the Loan Recipient understands includes, among other things, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel") unless (i) the Loan Recipient has requested and obtained a waiver from the U.S. Environmental Protection Agency pertaining to the Project or (ii) the Authority has otherwise advised the Loan Recipient in writing that the Buy American Requirement is not applicable to the Project. .

(b) The Loan Recipient also agrees to comply with all recordkeeping and reporting requirements under the Clean Water Act (codified generally under 33 U.S.C. §1251 et seq.) (the "Clean Water Act"), including any reports required by a federal agency or the Authority such as performance indicators of program deliverables, information on costs and Project progress. The Loan Recipient understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities, and (ii) failure to comply with the Clean Water Act and this Agreement may be an Event of Default hereunder that results in a repayment of the Authority Loan in advance of the maturity of the Evidence of Indebtedness and/or other remedial actions.

The Loan Recipient agrees to cause all contractors and subcontractors to comply with (through the inclusion of appropriate terms and conditions in all contracts, subcontracts and lower tiered transactions, such terms and conditions to be in substantially the form set forth in connection with the development and construction of the project

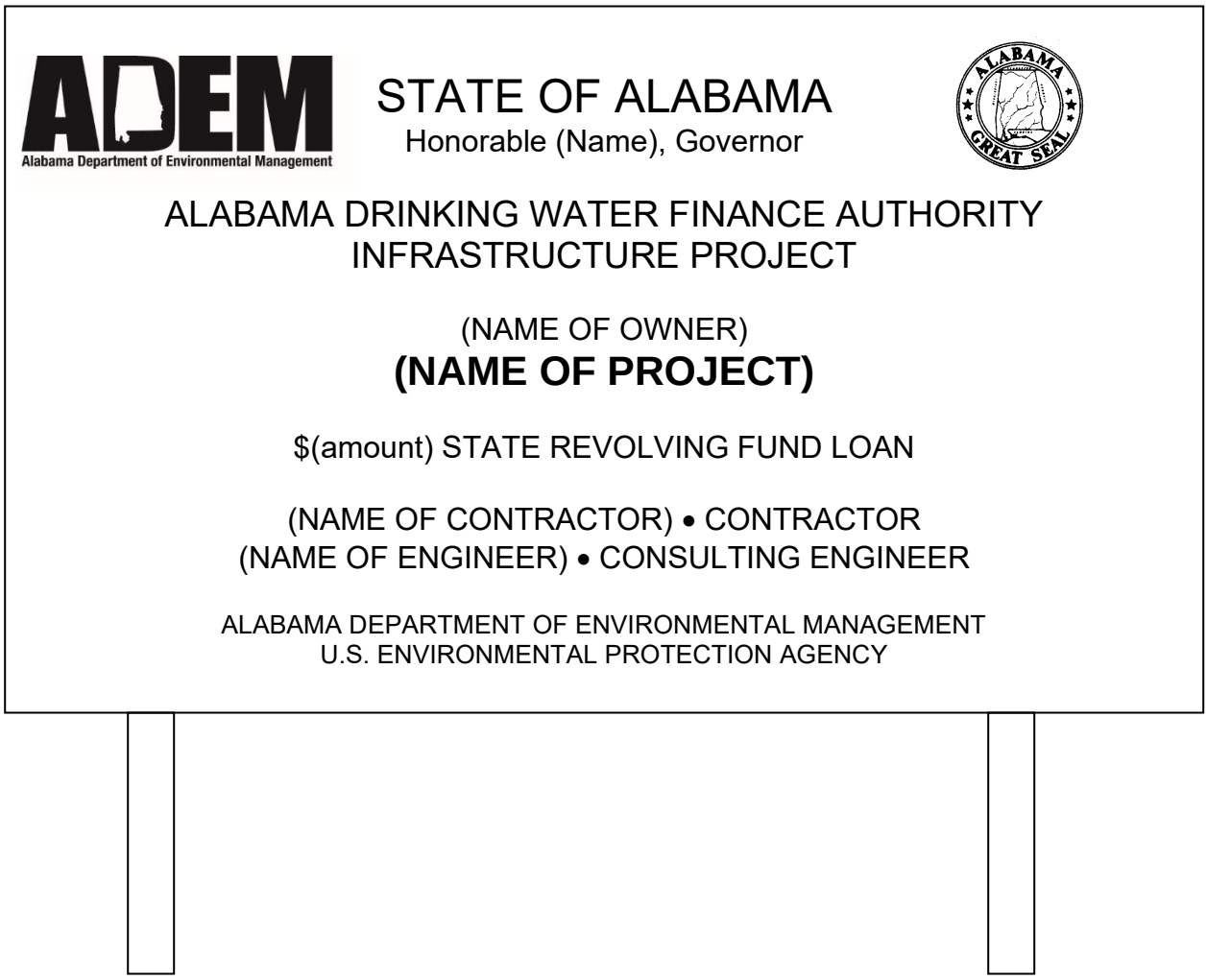
The Contractor acknowledges to and for the benefit of the _____, Alabama ("Purchaser"), and the Alabama Water Pollution Control Authority or the Drinking Water Finance Authority (the "State Authority") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel") including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State Authority that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State Authority or any damages owed to the State Authority by the Purchaser). While the Contractor has no direct contractual privity with the State Authority, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State Authority.

XVII – Project Sign Detail - CWSRF



1. Sign is to be constructed of ½" MDO plywood, 4' x 8'. Alternate materials may be used if approved by ADEM prior to use.
2. Paint with two (2) coats oil-base enamel before lettering.
3. Background color white; lettering black.
4. Lettering may be painted or vinyl. All lettering sizes to be proportionate to sign layout.
5. Sign shall be attached to 4" x 4" x 8' treated posts. Alternatives may be used if approved by ADEM prior to use.
6. Sign shall be placed in prominent location, easily readable from existing street or roadway.
7. Sign shall be maintained in good condition until completion of project.

XVIII – Project Sign Detail - DWSRF



1. Sign is to be constructed of ½" MDO plywood, 4' x 8'. Alternate materials may be used if approved by ADEM prior to use.
2. Paint with two (2) coats oil-base enamel before lettering.
3. Background color white; lettering black.
4. Lettering may be painted or vinyl. All lettering sizes to be proportionate to sign layout.
5. Sign shall be attached to 4" x 4" x 8' treated posts. Alternatives may be used if approved by ADEM prior to use.
6. Sign shall be placed in prominent location, easily readable from existing street or roadway.
7. Sign shall be maintained in good condition until completion of project.

XIX – Construction Contract Requirements

This checklist is to be completed by the Loan Recipient (Owner)/Engineer when submitting plans and specifications to the SRF Section for review. It affirms to the SRF reviewer that the Loan Recipient (Owner)/Engineer has addressed these items (in boilerplate form) within the specifications manual.

Contract Page No.	Satisfied Yes/No	
_____	_____	Bid Advertisement (including date, time, and location of bid opening).
_____	_____	Bid Bond.
_____	_____	Performance Bond (100%).
_____	_____	Payment Bond (Not less than 50%).
_____	_____	Contract Length.
_____	_____	Liquidated Damages.
_____	_____	Liability Insurance (including workman's comp, public liability, and builder's risk, if applicable).
_____	_____	Method of Award (i.e. lowest, responsive, responsible bidder).
_____	_____	Air testing of gravity sewers (if applicable).

Within 14 days after the bid opening, the Loan Recipient (Owner)/Engineer is to prepare the Project Review and Cost Summary (per the **PR&CS Checklist, page SGC-39**) and submit it to the SRF Section of ADEM. Upon completion of review, a ***written*** ATA (Approval-to-Award) will be issued.

NOTE:

The Loan Recipient (Owner) assumes all financial risk, if the construction contract is awarded prior to the issuance of an ATA letter by the SRF Section.

XX – Project Review and Cost Summary

ADEM Alabama Department of Environmental Management	SRF Project Review and Cost Summary	Form Revised **07-2021**

This form is to be completed and submitted (with supporting documentation) to the SRF Section within 14 days after bid opening. Following satisfactory review, an ATA (Approval-to-Award) letter will be issued. After the ATA is issued/ award of the contract, a pre-construction conference should be scheduled (**with the SRF Project Manager in attendance**). *A complete, bound set of the executed contract documents manual should be forwarded to the SRF Section for review and written approval following the pre-construction conference.*

Loan Recipient: _____ Project Number: _____

Project Name: _____

Contract Number: _____ Contract Name: _____

1. Date of plans and specifications concurrence letter from ADEM-SRF Section: _____

   Date of construction permit issuance from ADEM-DW Branch: _____

2. Attach copies of the following documents:

___ a. Bid advertisement with certification by publisher and date(s) of publication.

___ b. Certified bid tabulation.

___ c. Proposal of the selected bidder.

___ d. Bid bond.

___ e. Engineer's letter to the loan recipient recommending award of the contract. If the award is made to other than the low bidder, provide justification.

___ f. Site certificates for the project, if not previously submitted with the SRF loan application.

___ g. DBE Documentation from **the loan recipient (owner) and the prime contractor**. Utilization, solicitation and documentation requirements (with a list of required documents) are discussed in detail in Parts III - V (pages SGC-3 - SGC-23) of the ADEM *SRF Supplemental General Conditions* for SRF Assisted Public Drinking Water and Wastewater Facilities Construction Contracts.

___ h. Copy of the wage determination used in bidding.

___ i. Any addenda that have been issued after ADEM review of the plans and specifications.

Comments:

_____

_____

PART 2

MAWSS GENERAL CONDITIONS

SECTION 1 - DEFINITION OF TERMS

1.01 DEFINITIONS:

Whenever in these Specifications, or in any documents or instruments in construction operations where these Specifications govern, the following terms, or pronouns in the place of them, are used, the intent and meaning shall be interpreted as follows:

1.02 AASHTO:

The American Association of State Highway and Transportation Officials. Any reference to AASHTO standards shall be taken to mean the most recently published revision unless otherwise specified.

1.03 ANSI:

The American National Standards Institute. Any reference to ANSI standards shall be taken to mean the most recently published revision unless otherwise specified.

1.04 ADDENDUM:

An Addendum is a document which is added to the original Contract Documents during the bidding period to clarify, revise, add to, or delete from the original Contract Documents or previous Addenda.

1.05 ADEM:

The Alabama Department of Environmental Management.

1.06 ADVERTISEMENT FOR BIDS:

A document which briefly describes to prospective Bidders the title and location of Project, location of bid opening, brief description of nature and scope of Project, identities of Owner and Engineer, how to obtain Bid Documents, deposit requirements, statement of bid security, and method of submitting bids.

1.07 AGREEMENT:

The written agreement between Owner and Contractor covering the Work to be performed; other Contract Documents are attached to the Agreement.

1.08 ASTM:

The American Society for Testing Materials. Any reference to ASTM standards shall be taken to mean the most recently published revision unless otherwise specified.

1.09 AWWA:

The American Water Works Association. Any reference to AWWA standards shall be taken to mean the most recently published revision unless otherwise specified.

1.10 BID:

The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.11 BID BOND:

The approved form of security furnished by the Bidder and their surety, with the Bid Proposal, as a guarantee that the Bidder will enter into an agreement with the Owner for construction of the Work should the Contract be awarded to the bidder.

1.12 BID PROPOSAL:

The written and signed statement of the Bidder submitted on the prescribed form setting forth the prices to perform the contemplated Work and furnish the necessary materials in accordance with the provisions of the Drawings and Specifications.

1.13 BID PROPOSAL FORM:

The prescribed form on which the offer of a Bidder is to be submitted.

1.14 BIDDER:

Any individual, firm or corporation submitting a Proposal for the Work contemplated, acting directly or through a duly authorized representative.

1.15 BOARD:

The Board of Water and Sewer Commissioners of the City of Mobile, Alabama.

1.16 CALENDAR DAYS:

Every day shown on the calendar, beginning and ending at midnight, including Sundays and holidays.

1.17 CONTRACT:

The written agreement between the Owner and the Contractor, covering the performance of the Work and the furnishing of the labor and materials in the construction thereof. The Contract shall include, but shall not be limited to the “Invitation for Bids,” “Proposal,” “Plans,” “General Conditions,” “Standard Specifications,” “Supplemental Specifications,” “Special Provisions” (if any), “Contract Agreement” and “Contract Bonds,” together with all the “Supplemental Agreements,” “Addenda,” and “Extra Work Orders” that are required to complete the Work in a substantial and acceptable manner.

1.18 CONTRACT DOCUMENTS:

The Contract, including Advertisement for Bids, Bid Proposal, Contractor Performance Requirements, Special Conditions, Technical Specifications, Agreement, Bonds, Drawings, Notice of Award, Notice to Proceed, Addenda, if any, and all approved Change Orders.

1.19 CONTRACT BID PRICE:

The sum of the products of the quantities of the items of the Work listed in the Proposal, and the respective lump sum or unit prices bid in the Proposal.

1.20 CONTRACT BONDS:

The approved bonds furnished by the Contractor and his surety to guarantee completion of the Contract in accordance with its terms and prompt payment to all persons supplying him or them with labor, materials, or supplies.

1.21 CONTRACT TIME:

The number of calendar days or working days, stated in the Bid Proposal, allowed for completion of the Contract, including authorized time extensions. If a calendar date of completion is stated in the Bid Proposal in lieu of a number of calendar or working days, the Contract shall be completed by that date.

1.22 CONTRACTOR:

The individual, firm, or corporation that has entered into a Contract awarded him by the Owner for any work covered by these Specifications, acting directly or through his agents or employees.

1.23 COUNTY:

The county in which the Project is being constructed.

1.24 DEFECTIVE WORK:

a. Any product, material, system, process, equipment, or service, or its installation or performance, which does not strictly conform to the requirements of the Contract Documents.

b. In-progress or completed work where the workmanship of which does not conform to the quality specified and to the quality produced by skilled workers performing work of a similar nature on similar projects in the state where the Work is located.

c. Substitutions and deviations not properly submitted and approved or otherwise authorized by the Owner.

d. Materials or equipment rendered unsuitable for incorporation into the Work due to improper storage or protection or other causes.

e. Any work that does not fulfill its intended function and purpose.

1.25 DEVELOPER:

The person, firm or corporation engaged in developing or improving real estate for use or occupancy.

1.26 DEVELOPER'S ENGINEER:

An Engineer registered with the Alabama State Board of Registration for Professional Engineers, retained by the developer to provide professional engineering services for a project.

1.27 DIPRA:

The Ductile Iron Pipe Research Association.

1.28 DRAWINGS:

The official Drawings or exact reproduction thereof which show and describe the Work to be done, and which are to be considered as a part of the Contract, supplementary to the Specifications.

1.29 ENGINEER:

An Engineer registered with Alabama State Board of Registration for Professional Engineers or his authorized representative, acting as the Owner's agent within the scope of the authority and/or

the particular duties entrusted to it.

1.30 EPA:

Environmental Protection Agency

1.31 EQUIPMENT:

All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the Work.

1.32 EXTRA WORK:

Performance or furnishing of work or materials which is found necessary for proper completion of the improvement and which in principle is an obligation of the Contractor, but which is not covered by any item in the bid schedule in the Proposal and for which no means of payment, direct or indirect, has been provided in the Contract, and which is an obligation for which special remuneration, by an "Extra" price or by other consideration, in any case to be duly negotiated, or by "Force Account," shall be paid to the Contractor.

1.33 EXTRA WORK ORDERS:

Written orders approved by the Owner to the Contractor concerning the performance of work or furnishing of materials involving Extra Work as defined in these Specifications.

1.34 FURNISH:

When used in connection with services, materials, or equipment, "furnish" means to supply and deliver said services, materials, or equipment to the Project site (or some other specified location) ready for use or installation and in usable or operable condition.

1.35 INSPECTOR:

An authorized representative of the Engineer assigned to make all necessary inspections and/or tests of the Work performed or of the materials furnished or being furnished by the Contractor.

1.36 INSTALL:

When used in connection with services, materials, or equipment, "install" means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

1.37 LABORATORY:

Any laboratory authorized by the Owner to test materials and work involved in the Contract.

1.38 MATERIAL:

Any substance proposed to be used in connection with the construction of any part of the Work and its appurtenances.

1.39 NEMA:

The National Electrical Manufacturers Association. Any reference to NEMA standards shall be taken to mean the most recently published revision unless otherwise specified.

1.40 NOTICE OF AWARD:

The written notice of the acceptance, by the Owner, of the successful Bidder's Bid Proposal.

1.41 NOTICE TO PROCEED:

Written notice from the Engineer or the equivalent thereto giving the Contractor notice of the date on which he is to begin the prosecution of the Work for which he has contracted.

1.42 OR EQUAL:

Wherever a particular process, material, device, detail, or part is specified herein, followed by these words or by similar or equivalent expressions, such words or expressions shall be understood to mean and permit the use of another process, material, device, detail, or part that the Engineer shall determine is fully equal in suitability, quality, durability, performance, and in all other respects, to the process, material, device, detail, or part herein specified for such use, and shall approve for such use in the Work. When these words or similar or equivalent expressions are not present, the specified process, material, device, detail, or part shall be provided by one of the named manufacturers, suppliers, providers, etc. and no “or equal” processes, materials, devices, details, or parts will be considered.

1.43 OSHA:

The Federal Occupational Safety and Health Administration.

1.44 OWNER:

The Board of Water and Sewer Commissioners of the City of Mobile, Alabama.

1.45 OWNER CONTINGENCY ALLOWANCE:

A cash allowance amount established in the bid proposal for the owner’s use in the event there are additions and/or changes to the work in the contract.

1.46 PAY ITEM:

A specifically described unit of Work for which a price is provided in the Contract.

1.47 PAYMENT BOND:

The approved form of security furnished by the Contractor and his Surety as a guarantee that he will pay in full all bills and accounts for materials and labor used in the construction of the Work.

1.48 PERFORMANCE BOND:

The approved form of security furnished by the Contractor and his Surety as a guarantee that the Contractor will complete the Work in accordance with all Contract Documents.

1.49 PLANS (DRAWINGS):

All official, approved Plans (Drawings), which are on file with the Owner, or exact reproductions thereof, showing details of the Work covered by the Contract.

1.50 PRODUCT:

The term “product” as used in these Contract Documents includes materials, systems and equipment.

1.51 PROJECT:

The entire Work to be performed pursuant to the Contract Documents.

1.52 PROPOSAL:

The written offer for the Work contemplated, when submitted by the Bidder in the required manner on the prescribed Proposal Form, properly signed and guaranteed.

1.53 PROPOSAL FORM:

The approved prepared form on which the Owner requires the formal bids to be submitted for the Work contemplated.

1.54 PROPOSAL GUARANTY:

The certified check or bid bond designated in the Invitation for Bids, or in the Proposal Form, to be furnished by the Bidder to ensure execution of the Contract and furnishing of the bonds for the Work contemplated, if it be awarded to him.

1.55 PROVIDE:

When used in connection with services, materials, or equipment, “provide” means to furnish and install said services, materials, or equipment complete and ready for use.

1.56 RECORD DRAWINGS:

Drawings which show details of the Work as on the Plans but which revise the Plans to include any modifications or deviations which have been approved by the Board or the Engineer and incorporated into the Work.

1.57 RESIDENT PROJECT REPRESENTATIVE:

The authorized representative of the Engineer who is assigned to the Project site or any part thereof.

1.58 SAHD:

The State of Alabama Highway Department.

1.59 SHOP DRAWINGS:

All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by Contractor, a subcontractor, manufacturer, supplier, distributor or other person on behalf of the Contractor, and which illustrate the equipment, material or some portion of the Work.

1.60 SPECIAL CONDITIONS:

Additions and revisions to the Standard Specifications applicable to an individual project. The Special Conditions are intended to supplement, modify, or delete items covered in the Standard Specifications. Special Conditions shall prevail over General Conditions.

1.61 SPECIFICATIONS:

The general term comprising all the directions, provisions and requirements contained herein, together with such as may be added or adopted as General Conditions, Supplemental General Conditions, Supplemental Specifications or Special Provisions.

1.62 STATE:

The state in which the Project is being constructed.

1.63 STRUCTURES:

Facilities such as bridges, culverts, catch basins, inlets, retaining walls, cribbing, storm and sanitary sewer lines, water lines, under drains, electrical ducts, manholes, handholes, lighting fixtures and poles, transformers, flexible and rigid pavements, buildings, vaults, and other manmade features that may be encountered in the Work and not otherwise classified herein.

1.64 SUBCONTRACTOR:

Any properly qualified individual, firm, or corporation undertaking the performance of any part of the Work under the terms of the Contract by virtue of an agreement between himself and the Contractor previously approved by the Owner.

1.65 SUPERINTENDENT:

The representative for the Contractor present on the Work site at all times during progress, authorized to receive and fulfill instructions from the Engineer or Owner.

1.66 SUPPLEMENTAL AGREEMENT:

A written agreement executed by the Owner and the Contractor with the consent of the Surety covering major changes and/or revised or new prices and items and supplementing the original Contract.

1.67 SUPPLIER:

Any individual, firm, partnership, or corporation who sells, rents, or supplies materials or equipment for the proper execution of the Work, including that fabricated to a special design, but who does not perform labor at the site. Establishment of a temporary plant or facility of any kind on or near a project for the purpose of furnishing material for that project only will not be considered a “Supplier” but will be considered a “Subcontractor” as defined in these Specifications, unless such plant is established and operated by the prime Contractor.

1.68 SURETY:

The corporate body, licensed under the laws of the state, bound with and for the Contractor for the acceptable performance of the Contract and for the payment of claims recoverable under the Contract Bonds.

1.69 WORK:

The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

1.70 WRITTEN NOTICE:

Any notice to any party of the Contract relative to any part of the Contract in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address or delivered in person to said party or his

authorized representative on the Work.

END OF SECTION

SECTION 2 - PROPOSAL REQUIREMENTS AND CONDITIONS

2.0 GENERAL

2.1 GENERAL QUALIFICATIONS OF BIDDERS

A. All bidders acknowledge that a bidder's financial stability, its ability to furnish the necessary equipment and materials throughout the project, and the knowledge, training, and experience of its employees are important to prevent interruption of service and inconvenience to Owner, to protect the environment and public health, and to ensure completion of a quality product in the allotted time.

B. Bidders shall be licensed as Contractors when required by law and shall have appropriate specialty designation(s) if required for the project.

C. Each bidder must be able to submit proof that bidder as an entity [whether the bidder is a person, corporation, partnership, firm, company, or other entity] as well as bidder's supervisory employees [including project superintendent, project manager, and forepersons] have had a minimum of two (2) years' experience immediately preceding the submission of the bid, performing work of a similar scope and complexity. Bidder must be able to present proof that Bidder and its supervisory employees completed this similar work in a satisfactory and safe manner.

D. Each bidder acknowledges that failure to present proof that Bidder as an entity and Bidder's supervisory employees have satisfactorily performed similar work for at least two (2) years immediately preceding the submission of this bid shall result in rejection of bid.

E. Each bidder must be able to furnish proof that it owns, or has in its possession and control, appropriate and sufficient equipment to properly and efficiently perform all work required under this contract.

2.2 CONTENTS OF PROPOSAL FORMS

A. The Owner will furnish to Bidders, Specifications containing a blank Proposal Form showing description of the Work contemplated, the approximate estimate of the various quantities of the pay items of the Work to be performed and materials to be furnished, the amount of the Proposal Guaranty, and the date, time, and place of opening of Proposals, and the time in which the Work must be completed. All papers bound with or attached to the Proposal Form are a necessary part thereof and must not be detached or altered.

B. Failure to submit a subcontracting plan will result in your bid being considered non-responsive.

C. All bidders shall submit a plan for the use of small and small disadvantaged businesses as subcontractors. The form provided with the Proposal shall be used for this purpose.

2.3 INTERPRETATION OF APPROXIMATE ESTIMATES

A. Although the estimate of quantities of work listed in the Proposal Form are the results of calculations made from field surveys or other available information, they are to be considered as

only approximate estimates of the quantities of the different pay items and are to be used only as a basis for comparing bids for awarding the Contract.

B. Such quantities, including the classification thereof, may or may not be representative of the actual conditions encountered during construction and the Owner does not guarantee that the approximate quantities given will hold strictly in the construction of the Work.

C. Final payment to the Contractor will be made for only the actual quantities of the respective pay items of the Work performed, at the Contract unit prices bid in the Proposal, in accordance with the Plans and Specifications, as finally determined from actual measurements made during the progress or after completion of the Work, and if, upon completion of the Work, the actual quantities of the respective pay items performed shall be more or less than the quantities estimated in the Proposal, the Contract unit prices bid in the Proposal will still prevail, except as otherwise hereinafter provided.

2.4 EXAMINATION OF PLANS AND SPECIFICATIONS, SPECIAL PROVISIONS AND SITE OF WORK

A. All Bidders are required to examine carefully the site of the proposed Work, the Proposal Form, Plans, General Conditions, Standard Specifications, Supplemental Specifications, Special Provisions, and the Contract and Bond Forms, and it is mutually agreed that the submission of a Proposal shall be prima-facie evidence that the Bidder has made such examination and has judged for and satisfied himself as to the conditions to be encountered as to the character, quality, and quantities of work to be performed and materials to be furnished, and as to the requirements of Plans, General Conditions, Standard Specifications, Supplemental Specifications, Special Provisions, Contract and Bonds, and as to the contingencies. Bidders shall satisfy themselves that the Work can be completed within the time set forth in the Contract. Bidders shall also familiarize themselves with and shall comply with the requirements of all federal, state, and local laws and ordinances which may directly or indirectly affect the Work or its prosecution, persons engaged in or employed on the Work, and the materials or equipment used in the Work. No adjustments or compensations will be allowed for losses caused by failure to comply with the above requirements.

2.5 PREPARATION OF PROPOSAL

A. The Bidder’s Proposal must be submitted on the Proposal Form furnished him by the Owner.

B. The Bidder must specify, with figures, a unit price for each of the separate items for which a quantity is given in the Proposal Form (except when alternate bids are called for on items) and shall show the products of the respective unit prices and the estimated quantities in the columns provided for that purpose, as well as the gross sum for which he will perform all of the estimated work required by these Standard Specifications, Supplemental Specifications, Special Provisions, and the Plans. The Engineer will check the gross sum given in the Proposal, and in case of error or discrepancy, the gross sum obtained by adding the products of the unit prices and the various estimated quantities listed in the Proposal shall prevail and this shall be the Contract Bid Price. The Proposal shall be properly signed by the Bidder.

2.6 IRREGULAR PROPOSALS

A. Proposals may be rejected if they contain any omissions, alterations of form, additions not called for, conditional bids, alternate bids unless called for, incomplete bids, erasures or irregularities of any kind. Proposals in which the unit or lump sum prices bid are obviously unbalanced may be rejected.

B. No alteration of the terms and conditions of the sealed bid which are written upon or appended to the outside of the bid will be accepted or considered.

2.7 PROPOSAL GUARANTY

A. No Proposal will be considered unless accompanied by a properly certified check or bid bond made payable to the Owner in the amount indicated in the Invitation for Bids. Cashier's checks will not be accepted in lieu thereof. The full amount of the Proposal Guaranty of a Bidder whose Proposal is accepted shall be forfeited to the Owner, in liquidation of damages, in the event of failure of the Bidder to execute Contract and Contract Bonds as stipulated herein.

2.8 DELIVERY OF PROPOSALS

A. Each Proposal shall be placed, together with the Proposal Guaranty, in a sealed envelope, on the outside of which is written in large letters "Proposal for (Name of Project)" and so marked as to indicate the Project and the name of the Bidder, and the Bidder General Contractor's license number (where applicable). Proposals may be delivered in person or by mail. When sent by mail, preferably registered, the sealed Proposal, marked as indicated above, shall be enclosed in another envelope for mailing. Proposals will be received by the Owner until the hour of the date set in the Invitation for Bids for the opening thereof. No Proposal will be accepted or considered which has not been received prior to the hour of the opening date.

2.9 WITHDRAWAL OR REVISION OF PROPOSAL

A. A Proposal may be withdrawn at any time prior to the hour fixed in the Invitation for Bids for opening of Proposals, provided a request in writing executed by the Bidder or his duly authorized representative is filed with the Owner prior to that time. When such Proposal is reached, it will be returned to the Bidder unopened. No Proposal can be withdrawn, modified or corrected after the hour set for opening such Proposals. Proposals received after the hour set for opening will be returned unopened.

2.10 OPENING OF PROPOSALS

A. Proposals will be opened and read publicly, except when directed otherwise by the Owner, at the time and place indicated in the Invitation for Bids. Bidders or their authorized representative are invited to be present at public opening of bids.

2.11 DISQUALIFICATION OF BIDDERS

A. If there is reason to believe that collusion exists among the Bidders, any or all Proposals may be rejected, and participants in such collusion may not be considered in future Proposals for the same work.

2.12 LIQUIDATED DAMAGES

A. Time is an essential element in the Contract. As the prosecution of the Work will inconvenience the public, obstruct traffic, and interfere with business, it is important that the Work be pressed vigorously to completion. Also, the cost to the Owner for the administration of the Contract, observation, and engineering for the Work under construction will be increased if the time occupied in the Work is lengthened. Therefore, for each day that the Work remains uncompleted after the time specified in the Contract, or additional time may be allowed by the Owner for the completion of the Work when extra or additional work is ordered by the Owner, the amount specified in the Contract shall be paid by the Contractor to the Owner as liquidated damages for the loss sustained by the Owner because of failure of the Contractor to complete the Work within the specified time. Liquidated damages will be deducted from partial payments otherwise due the Contractor. The amount of liquidated damages shall be the amount set forth in the Contract.

END OF SECTION

SECTION 3 – AWARD AND EXECUTION OF CONTRACT

3.0 GENERAL

3.1 CONSIDERATION OF BIDS:

A. After the Proposals are opened and read, the approximate estimated quantity of each item multiplied by the unit price bid for that item, the products calculated, and the gross sums bid obtained in each of the acceptable Proposals, the Contract Bid Prices will be compared and the results of such comparison will be made available to each Bidder on request. Until the final award of the Contract, however, the Owner reserves the right to reject any and all Proposals, and to waive all technicalities.

3.2 AWARD OF CONTRACT:

A. The award of the Contract, if it is to be awarded, will be by the Owner to the lowest responsible Bidder whose Proposal shall comply with all the requirements necessary to render it formal. The successful Bidder will be notified by letter, mailed to the address shown on his Proposal, that his bid has been accepted and that he has been awarded the Contract. Award will be made within 60 days after bids are received unless otherwise stated in the Special Provisions. This period may be extended if mutually agreeable to Owner and Contractor.

B. The Owner, before awarding the Contract, may require a reviewed financial statement. If, in the opinion of the Owner, this statement does not justify the award, the Owner reserves the right to reject the low bid. The reviewed financial statement shall contain, as a minimum, a review of financial statements including performing inquiry and analytical procedures that provide the Owner with a reasonable basis for expressing limited assurance that there are not material modifications that should be made to the statements in order for them to be in conformity with generally accepted accounting principles or, if applicable, with any other comprehensive basis of accounting. The financial statement shall be submitted within 10 days of the Owner’s request.

C. Should it be necessary to eliminate part of the Work in order to award the Contract within the funds available for construction, the Owner reserves the right to designate the portion of the Work to be omitted. The amount of deduction will be determined by multiplying the quantity of items omitted by the unit price or lump sum bid for such items, or by negotiation.

3.3 RETURN OF PROPOSAL GUARANTEE:

A. All Proposal Guarantees will be returned, if requested, within 30 days following the opening of Proposals; except those of the three lowest Bidders, which will be returned, if requested, after satisfactory bonds have been furnished and the Contract has been executed. The Owner reserves the right to return all Proposal Guarantees by mail and its responsibility shall end upon the mailing thereof.

3.4 EXECUTION OF CONTRACT:

A. The Contract shall be signed by the successful Bidder and returned to the Engineer with satisfactory Contract Bonds within 10 days after the date of Notice of Award.

3.5 FAILURE TO EXECUTE CONTRACT:

A. Failure to execute a Contract and file acceptable Contract Bonds within 10 days after the date of Notice of Award shall be just cause for the annulment of the award and the forfeiture of the Proposal Guaranty as liquidation of damages sustained. Award may then be made to the next lowest responsible Bidder, or the Work may be readvertised or constructed by day labor, or otherwise contracted as the Owner may decide.

3.6 REQUIREMENTS OF CONTRACT BONDS:

A. Prior to award of the Contract, the Contractor shall submit to the Owner the name and address of the bonding company for the approval of the Owner.

B. A Contract Bond, and a Labor and Material Payment Bond, in the forms which are included in the Contract Documents, and each in the sum as herein specified, to be duly executed at the proper time sequence by the successful Bidder as Principal and by a surety company licensed to do business under the laws of the State in which the Work is located, and satisfactory to the Owner, will be required for the faithful performance of the Contract, and the payment for labor and materials. Sureties to be acceptable must be named in the current list of “Companies Holding Certificates of Authority as Acceptable Sureties” as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U. S. Treasury Department. In addition, the surety company must have a rating of A- or better, as rated by A. M. Best Company.

C. To insure the faithful performance of each and every condition, stipulation, and requirement of the Contract, and to indemnify and save harmless the Owner from any and all damages, either directly or indirectly, arising out of any failure to perform the same, the successful Bidder, to whom the Contract is awarded shall, within 10 days from the date of the award, furnish and file with the Owner an acceptable Contract Bond in the amount equal to 100 percent of the Contract Bid Price of the Contract awarded. In case of default on the part of the Contractor, all expenses incident to ascertaining and collecting losses suffered by the Owner under the bond, including both engineering and legal services, shall lie against the Contract Bond for performance of the Work.

D. In addition thereto, the successful Bidder to whom the Contract is awarded shall, within 10 days, furnish and file with the Owner an acceptable surety bond for payment of labor, materials, feed-stuffs or supplies payable to the Owner in an amount not less than 100 percent of the Contract Price, with the obligation that the Contractor shall promptly make payment to all persons furnishing him or them with labor, materials, feed-stuffs, or supplies for or in the prosecution of the Work, and for the payment of reasonable attorney’s fees incurred by successful claimants or plaintiffs in suits on said Bond.

E. If at any time, the Owner, for justifiable cause, shall be or become dissatisfied with any surety or sureties upon the Performance or Payment Bonds, the Contractor shall, within 5 days after notice from the Owner, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments to the Contractor shall be deemed due nor shall be made until the new surety or sureties shall have furnished acceptable bond to the Owner.

F. In lieu of a Contract Bond and a Labor and Material Bond, the Contractor may submit an irrevocable letter of Credit (Appendix K). The letter must be completed and certified by a lending institution satisfactory to the Board. The letter shall be in the amount of 100% of the Contract amount.

3.7 INSURANCE:

A. General: The Contractor shall provide insurance in accordance with the required specifications.

B. Contractor Coverage: The Contractor shall not commence work under this Contract until he has obtained all insurance required under the following paragraphs and until such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been obtained and approved. If the subcontractor does not take out insurance in his own name, the principal contractor shall provide such insurance protection for the subcontractor and such subcontractor's employees.

C. Casualty Insurance: The following insurance coverages (with limits not less than specified herein) shall be maintained by the Contractor for the duration of the Contract, affording coverage for any claim arising out of Contractor's operations herein, whether by the Contractor or by any subcontractor or by any Employee or Agent of either:

1. Claims of Employees under Worker's Compensation and other similar employee benefit acts, including claims because of bodily injury, occupational sickness or disease, or death.

2. Claims arising out of bodily injury, sickness, disease, or death of any person other than employee.

3. Claims for damages arising out of libel, slander, false arrest, detention or imprisonment, malicious prosecution, defamation or violation of right of privacy, wrongful entry or eviction or other right of private occupancy, including claims as a result of an offense related to the employment of a claimant by Contractor (so-called "Personal Injury").

4. Claims arising out of damage to or destruction of tangible property, including loss of use.

5. The Contractor shall furnish certification of insurance and policies verifying that the above coverages are in effect before commencing any work, and that each policy is endorsed to give the Owner 30 days' notice in writing in the event of cancellation or material change therein. Policies of Insurance shall state that the Owner and the Owner's employees be named as additional insureds on the Contractor's Automobile Liability and Commercial General Liability policies. In respect to Worker's Compensation, a Waiver of Subrogation shall be issued in favor of the Owner. Where applicable, the U.S. Longshore and Harborworkers Compensation Act Endorsement shall be attached to the policy. Where applicable, the Maritime Coverage Endorsement (to include coverage under Jones Act) shall be attached to the policy. Both the U. S. Longshore and Harborworkers and the Maritime Coverage shall have limits equal to or greater than the employer's liability coverage.

6. Rated by AM Best – A- or better. For non-admitted companies, a rating of A or better by AM Best.

a. At the discretion of the Board, worker's compensation insurance may be placed through a qualified worker's compensation self-insurance fund.

b. Limits of Liability:

Type of Insurance	**Bodily Index**
Worker's Compensation	Statutory
Employers' Liability	$500,000 Each Accident, $500,000 By Disease, Policy Lmt $500,000 Disease, Each Employee
Commercial Automobile	$1,000,000 Each Accident Bodily Injury and Property Damage Combined Business auto includes all owned, leased, hired and non-owned automobiles.
Commercial General Liability:	
	$1,000,000 per Occurrence $1,000,000 Personal & Advertising Injury $2,000,000 General Aggregate per project $2,000,000 Products & Completed Operations Aggregate $100,000 fire damage liability

c. **Umbrella Liability**

1) In addition to the basic limits previously set out for Commercial General Liability, Products and Completed Operations, Automobile Liability and Worker's Compensation and Employer's Liability, Contractors shall provide Umbrella Liability limits of $5,000,000 per occurrence and aggregate

2) Coverage shall be issued with a "pay on behalf of" wording, including Personal Injury and other extensions, and provide coverage at least as broad as that afforded by the primary insurance policies.

d. **Extensions**

1) Blanket Contractual Liability

2) Personal Injury

3) Blanket Collapse and Underground Coverage

4) Broad Form Property (including Completed Operations)

5) Employees as Additional Insureds

6) Host Liquor Liability

7) Non-owned Watercraft Liability

8) Worldwide Products

9) Fire Legal Liability

10) Incidental Medical Malpractice

11) Extended Bodily Injury (Assault and Battery)

12) Newly Acquired Organizations

13) When and if the use of explosives for blasting purposes appears necessary or desirable, such methods shall not be undertaken without written authorization of the Owner, and then only provided that acceptable extensions of liability coverage have been obtained specifically to include the explosion (“X”) hazard and the collapse (“C”) hazard.

14) The policy of general liability shall include the special underground property damage coverage (providing the so-called “U” hazard) on a blanket basis.

D. Owner’s Protective Liability

1. The Contractor shall furnish from a carrier acceptable to the Owner, a policy of liability insurance, commonly called “Owner’s Protective Liability” in the name of the Board of Water and Sewer Commissioners of the City of Mobile, d/b/a MAWSS, providing “Independent Contractor’s Coverage” for the operations embraced by this Contract with limits of $1,000,000 bodily injury and $1,000,000 property damage. Policy shall be endorsed that the premium is to be paid by the named Contractor.

E. Property Insurance – Contractor

1. The Contractor shall assume complete responsibility for safe guarding all portions of the Work in progress, whether completed or not, until such work has been accepted by the Owner, and shall maintain such insurance to protect himself against perils which may cause such property to be damaged or destroyed. This coverage shall be similar to the former All Risks of Physical Loss Form, including, if available, Collapse. Title to such work in progress, whether completed or not, shall remain vested in the Contractor until finally accepted by the Owner.

2. **Coverage Form** - Coverage shall be provided on an actual completed value Builder’s Risk Form or, if more appropriate, an installation floater in the joint name of the Contractor and Owner for the duration of the Contract.

3. The Owner has the option of providing Builder's Risk coverage for any projects undertaken by a Contractor. If the Owner exercises this option, the Contract Proposal will appropriately indicate this and provide for separately showing the cost of the Builder's Risk coverage in the bid.

F. INDEMNITY PROVISIONS

1. The Contractor shall indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses, demands, payments, suits, actions, recoveries and judgments of every nature and description and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense: (1) 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; and (2) is caused in whole or in part by a negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

2. The Contractor shall assume all risk and bear any loss or injury to property or persons occasioned by neglect or accident during the progress of Work until the same shall have been completed and accepted. He shall also assume all blame or loss by reason of neglect or violation of any state or federal law or municipal rule, regulation or order. The Contractor shall give to the proper authorities all required notices relating to the Work, obtain all official permits and licenses and pay all proper fees. He shall make good any injury that may have occurred to any adjoining building, structure or utility in consequence of the Work.

3. In any and all claims against the Owner or the Engineer or any of their agents or employees by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under the "INDEMNITY PROVISIONS" shall not be limited in any way by any limitation on the amount or types of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

4. The obligations of the Contractor under Paragraph 3.08 shall not extend to the liability of the Engineer's negligent acts, errors or omissions, or those of his employees or agents.

END OF SECTION

SECTION 4 – SCOPE OF WORK

4.0 GENERAL

4.1 INTENT OF PLANS AND SPECIFICATIONS

A. The true intent of the Plans, Specifications, and Special Provisions is to prescribe a complete Work or improvement which the Contractor undertakes to do, complete in every detail, in full compliance with the Plans, General Conditions, these Specifications, the Supplemental Specifications, the Special Provisions, Proposal, Contract and Invitation for Bids, together with all authorized alterations, Supplemental Agreements and Extra Work Orders. The Contractor shall perform all items of the Work covered and stipulated in the Contract, Specifications, and Plans, shall remove all obstructions from the right of way, and shall do such special, additional, extra, and incidental work as may be considered necessary to complete the Work and its appurtenances, or structures, to the finished lines, grades, cross sections and dimensions shown on the Plans or as modified by written orders of the Engineer, in a satisfactory and acceptable manner. The Contractor shall furnish, unless definitely and expressly provided to the contrary in the Proposal, Special Provisions or Plans, all material, implements, machinery, equipment, tools, supplies, transportation and labor necessary to the prosecution and completion of the Work.

4.2 UNDERGROUND AND EXISTING UTILITIES

A. The Plans show structures, certain features of the topography, and certain underground utilities, but they do not purport to show all features, lines, or obstructions. Such topography and notes in the Plans were inserted from records available and are for the Contractor’s convenience only. The Contractor shall verify the existence and location of surface topography, underground structures, and utilities to assure conflicts will be avoided in the construction of this Work. The Contractor shall conduct prudent underground explorations in advance of his work in order to make adjustments to the Work if necessary. The Contractor shall protect, maintain and keep in service all existing utilities and service connections during construction operations. Any existing utility lines cut or damaged shall be repaired immediately and the service restored at the Contractor’s expense.

4.3 ALTERATION OF PLANS OR CHARACTER OF WORK

A. The Owner or his authorized representative may without notice to the Surety make, without change in the unit prices, alterations in the Plans or in the nature of the Work which they may consider necessary or desirable during the progress of the Work to complete fully and acceptably the proposed construction, provided that such alterations do not materially change the general features of the original Plans and Specifications. Material changes shall be understood to mean those changes in the original Plans and Specifications made necessary by the exigencies of the Work resulting in the alteration of cost to the Contractor by an amount which could not have been foreseen at the time of his bidding upon the Work. The Owner reserves the right for the Engineer to revise any part of the alignment, grades, structures, width, and other dimensions on the Work, if the Engineer deems it advisable and such changes shall not be considered material changes. The Owner also reserves the right for the Engineer to increase or decrease the quantity of any or all of the items listed in the estimate of approximate

quantities in the Proposal Form and such increase or decrease shall not be considered as a waiver of any of the conditions of the Contract or Contract Bonds.

4.4 EXTRA WORK

A. In connection with the Work covered by the Contract, the Owner or his authorized representative may at any time during its progress order other work or materials incidental thereto. If any such work and material is not listed as a pay item with a Contract Unit Bid Price or if compensation therefore is not included in the Contract unit prices bid for other pay items under the terms of the Contract, it will be designated as Extra Work, and shall be performed by the Contractor as directed, provided, however, that before any Extra Work is started the Engineer shall furnish the Contractor a Proposal Form, stating the location, kind and estimated quantity of Extra Work to be done. The Contractor shall indicate on this Proposal Form the compensation (unit price, or lump sum) for which he will perform the Extra Work and this Proposal shall be submitted to the Owner for approval. The Owner may approve the Proposal, in which case it shall be an authorization for doing the Work and shall become a part of the Contract, but if the Owner considers the price submitted for any item of the Extra Work excessive and a satisfactory adjustment price cannot be reached for such item, it shall be optional with the Owner to terminate the Contract insofar as it applies to such item or Extra Work in question and perform such Extra Work by other agents or other means or to direct that the Contractor performs the Work on a “Force Account” basis. Claims for payment for Extra Work not so authorized may be rejected by the Owner.

4.5 CONSTRUCTION AND MAINTENANCE OF DETOURS

A. No road or section of road shall be closed to traffic except with the written permission of the Engineer and the governing authority, and no construction operations that will in any way inconvenience the traveling public shall be started until adequate provisions have been made to detour or bypass traffic in safety and comfort. All detours shall be approved by the Highway Department, City Engineer or the official having jurisdiction over the roads or streets.

B. The Contractor shall maintain all detours for traffic over the Work. Unless otherwise provided in the Special Provisions, the road, while undergoing improvement, shall be kept continuously open to public traffic and in passable and safe condition.

C. When the Contractor hauls materials over any detour or public road, he shall so regulate his loads that the capacity of the road and its structures is not exceeded, and he shall be responsible for any specific damage that may result to the road or its structures from failure to observe regulations governing traffic thereon.

4.6 REMOVAL AND DISPOSAL OF STRUCTURES AND OBSTRUCTIONS

A. Unless otherwise provided, the Contractor shall remove at his expense any existing above or below-ground structure or part of structure, fence, building, or other encumbrance or obstruction upon or within the limits of the Work, which interferes in any way with the new construction. Compensation for the removal of any structure not listed as a pay item in the Proposal with a Contract Bid Price shall be included in the Contract unit prices bid for the pay items of the Work.

4.7 FINAL CLEAN-UP

A. Upon completion and before Work will be finally accepted and final payment made, the Contractor shall clean and remove from the Work and adjacent property, stream channels, sites of structures, and all areas occupied by him in connection with the Work, all weeds, shrubs, stumps, portions of trees, and all other forms of objectionable organic matter; all useless, surplus, excavated or discarded materials; and all loose rock, boulders, falsework, temporary structures, machinery and equipment. He shall restore in an acceptable manner all property, both public and private, which has been damaged during the prosecution of the Work and shall leave the Work and sites of structures in a neat presentable condition throughout the Project. Depositing any material on abutting property with or without the consent of the property owner will not be considered a satisfactory method of disposal.

4.8 MAINTENANCE OF THE WORK DURING CONSTRUCTION

A. The Contractor shall be required to maintain the Work from the date of the approval of his Contract until the Work is completed and shall maintain it in first-class condition for 30 days after it is completed and until the Work is finally accepted.

B. The maintenance shall consist of continuous and effective work prosecuted day by day, with adequate equipment and forces to the end of the Project, keeping the entire work site in satisfactory and acceptable condition at all times. The Contractor shall take adequate precautions to protect trees, shrubs, plants, and existing site improvements from injury during construction operations and shall maintain adequate drainage and utility service during his work.

C. Compensation for maintenance work during construction and before the Work is finally accepted shall be included in the Contract unit prices bid on the pay items of the Work and the Owner will not pay additional for such work.

4.9 FAILURE TO MAINTAIN WORK

A. The failure of the Contractor, at any time, to comply with the above provisions for maintenance of the Work will result in the following:

1. First: The Owner, or his authorized representative, will immediately notify the Contractor, his superintendent or employees to comply with the required maintenance provisions.

2. Second: In the event the Contractor fails to remedy his lack of or unsatisfactory maintenance within 24 hours after the date of issuance of this notice, the Owner may proceed immediately with adequate forces and equipment to maintain in a satisfactory and acceptable manner the Work site, and the entire cost of this maintenance will be deducted from monies due or that become due the Contractor on this Contract.

3. Third: As an alternate to the Owner’s taking over the maintenance, all the quantities of the Work performed which are not properly maintained may be deducted from the Contractor’s current payment request even if such quantities have been allowed on a previous estimate.

END OF SECTION

SECTION 5 – CONTROL OF WORK

5.0 GENERAL

5.1 \AUTHORITY OF THE ENGINEER

A. To prevent misunderstandings, disputes, and litigation, the Engineer shall decide all questions which arise concerning the quality and acceptability of materials furnished and work performed, the rate of progress of the Work, interpretation of the Plans and Specifications, and the acceptable fulfillment of the Contract on the part of the Contractor. The Engineer will determine the amount, quantity, classification, and quality of the several kinds of work performed and materials furnished which are to be paid for under the Contract and his decision and estimate shall be conclusive and binding on both parties thereto and such decision and estimate of the Engineer, in case any questions arise, shall be a condition precedent to the right of the Contractor to receive any money due him under the Contract. Explanations concerning the meaning of the Plans and Specifications and Contract, all directions necessary to complete or make definite the Plans, Special Provisions, Specifications or Contract and to give them due effect, will be given by the Engineer and his findings shall be final and binding on both parties hereto. The Engineer shall have authority to enforce and make effective decisions and orders as apply to conformance with the Contract. He shall decide disputes and mutual rights between Contractors.

B. Notwithstanding any general clauses, wording, paragraphs, or other references contained in the Plans, Specifications, General Conditions, or elsewhere in the Special Provisions, the Engineer and his Resident Project Representative are not charged with the responsibility of directing the actual procedures and detail methods of construction to be used by the Contractor in accomplishing the Work contained in the Contract between the Owner and the Contractor; nor is the Engineer responsible to act as superintendent, foreman, or safety engineer for the Contractor, nor for the safety of the Contractor's personnel.

5.2 PLANS AND SHOP DRAWINGS

A. General drawings, showing such details as are necessary to give a comprehensive idea of the construction contemplated will be included in the approved Plans. The approved Plans will be supplemented by such working drawings as are necessary to adequately define the Work. It is mutually agreed that all authorized alterations affecting the requirements and information given on the approved Plans shall be in writing.

B. After checking and verifying all field measurements, Contractor shall submit to Engineer for review, five copies of all Shop Drawings, plus the number of copies Contractor wishes to have returned to him after Engineer's review, collated according to the organization of the accepted schedule of Shop Drawings, which will bear a stamp or specific written indication that Contractor has satisfied Contractor's responsibilities under the Contract with respect to Contractor's review of the submission. All submissions will be identified as "Shop Drawings" on the outermost enclosure and show Project name and Engineer's Project number. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, descriptive data, diagrams specified performance, design criteria, materials, and similar data to enable Engineer to review the information as required.

C. Contractor shall also submit to Engineer for review and approval, with such promptness as to cause no delay in Work, all samples required by the Contract. All samples will have been checked by and accompanied by a specific written indication that Contractor has satisfied Contractor's responsibilities under the Contract with respect to the review of the submission and will be identified clearly as to material, supplier, pertinent data such as catalog numbers, and the use for which intended.

D. Before submission of each Shop Drawing or sample, Contractor shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Contract. At the time of each submission, Contractor shall give Engineer specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract, in addition, shall cause a specific notation to be made on each Shop Drawing submittal to Engineer for review and approval of each such variation. When the Contractor does call such deviation to the attention of the Engineer, the Contractor shall state in his letter whether such deviations involve deductions or extra cost adjustments.

E. Engineer will review with reasonable promptness Shop Drawings and samples, but Engineer's review will be only for conformance with the design concept of the Project and for compliance with the methods, techniques, sequences, or procedures of construction (except where a specific means, method, technique, sequence, or procedure of construction is indicated in or required by the Contract Documents). The review of a separate item will not indicate approval of the assembly in which the item functions. 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. Contractor shall direct specific attention in writing to revisions other than the corrections called for by the Engineer on previous submittals.

F. Engineer's review of Shop Drawings or samples shall not relieve Contractor from responsibility for any variation from the requirements of the Contract unless Contractor has, in writing, called Engineer's attention to each such variation at the time of submission, and Engineer has given written approval of such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawings or sample; nor will any review by Engineer relieve Contractor from responsibility for errors or omissions in the Shop Drawings.

G. The Contractor shall furnish five complete sets of the corrected copies of Shop Drawings including parts list, operation and maintenance manuals, lubrication charts and descriptive literature for all equipment. No payment shall be made to the Contractor for any specialties or equipment unless Shop Drawings have been approved by the Engineer. Final payment under the Contract will not be made until all specified documents have been submitted for equipment.

H. Compensation for furnishing all Shop Drawings and samples shall be included in the Contract Unit Prices for the pay items of the Work and such Drawings and samples shall be furnished by the Contractor without additional compensation.

5.3 MANUFACTURER'S DRAWINGS

A. The manufacturer's drawings of any special materials required for the job shall be submitted to the Engineer for review prior to installation.

5.4 MANUFACTURER'S CERTIFICATION

A. To assure that manufacturers and suppliers are aware of the use to which their equipment and products will be subjected, the Contractor shall require the manufacturer or manufacturer's representative to place the following certification on submittal data transmittals.

MANUFACTURER'S CERTIFICATION

"This is to certify that we have examined the Plans and Specifications for this Project and have ascertained that this equipment or material is suitable for the Purpose and use intended."

_____

Authorized Signature – Title/Date

5.5 CONFORMITY WITH PLANS AND ALLOWABLE DEVIATIONS

A. Finished work in all cases shall conform with lines, grades, sections, details and dimensions of the Work contemplated as shown on the approved Plans except as modified in writing by the Engineer. Any deviation from the approved Plans and working drawings that may be required by the exigencies of the construction will be determined by the Engineer and authorized in writing.

B. In cases where minor deviations within the limits shown on the Plans or contained in the Specifications will be in the best interest of the Owner or present a more finished or aesthetic appearance, then the Contractor shall notify the Engineer or his representative before the Work progresses to a point where the change cannot be affected without incurring additional expense to the Owner.

5.6 COORDINATION OF PLANS, SPECIFICATIONS, AND SPECIAL PROVISIONS

A. The Specifications, Supplemental Specifications, General Conditions, Plans, Special Provisions, and all supplementary documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete Work. In case of discrepancy, figured dimensions, unless obviously incorrect, shall govern over the scaled dimensions. Supplemental Specifications shall govern over the Standard Specifications. Plans shall govern over Specifications; Special Provisions shall govern over both Specifications, Supplemental Specifications and Plans.

B. The Contractor shall take no advantage of and shall promptly notify the Engineer if he or she discovers, any error or omission of dimensions in the Plans, or of any discrepancy between the Plans and Specifications. The Engineer will make such corrections and supply omitted dimensions as may be necessary and his or her interpretation shall be final.

C. When supplementary specifications such as Federal, ASTM, ANSI, AASHTO, AWWA, etc., are referenced in these Specifications, such references shall be the latest edition of such supplementary specifications.

5.7 COOPERATION OF THE CONTRACTOR

A. The Contractor will be supplied with no more than four copies of the Plans, Specifications, Supplemental Specifications, and Special Provisions. If additional copies of documents are required, the Contractor shall reimburse the Engineer for the actual cost of reproduction of documents as requested. The Contractor shall have available on the Work at all times one copy of each of said Plans, Specifications, Supplemental Specifications, and Special Provisions. He or she shall give the Work the constant attention necessary to facilitate the progress thereof and

shall cooperate with the Engineer, Engineer's Resident Project Representative, and with other Contractors in every way possible.

B. The Contractor shall always have a competent Superintendent on the Work, capable of reading and thoroughly understanding the Plans and Specifications, as his agent on the Work, with full authority to execute the Work without delay and to supply promptly such materials, tools, plant equipment, and labor as may be required. Such Superintendent shall be furnished irrespective of the amount of work subcontracted and shall have authority over all subcontract work.

C. The Contractor shall schedule and conduct their work and dispose of their material as to avoid causing unnecessary inconvenience and delay to other Contractors engaged on adjacent work and so as to join his work to that of other Contractors in a proper manner, and in accordance with the spirit of the Plans and Specifications, and so as to perform their work in the proper sequence in relation to that of other adjacent work. Each Contractor shall so conduct their operation and maintain the Work in such condition that adequate drainage shall be always affected.

D. It is mutually agreed that in case of a dispute arising between two or more Contractors engaged on the same work as to the respective rights of each under these Specifications, the Engineer shall determine the matters at issue and shall define the respective rights of the various interests involved in order to secure completion of all parts of the Work in general harmony and with satisfactory results, and his decision shall be final and binding on all parties concerned and shall not in any way be a cause for claims for extra compensation by any of the parties.

5.8 CONSTRUCTION SURVEYS

A. The Engineer will establish benchmarks and horizontal control points. From these points, Contractor shall lay out the Work by establishing all lines and grades at the site necessary to control the Work and shall be responsible for all measurements that may be required for the execution of the Work. Second order leveling shall be used by the Contractor in establishing elevations, and all levels shall be looped in or closed. All survey data shall be recorded in accordance with standard and approved methods. All field notes, sketches, and computations made by the Contractor in establishing control points for his work shall always be available to the Engineer.

B. The Contractor shall furnish, at their expense, all stakes, pins, platforms, equipment and labor as may be required in laying out any part of the Work from the control points established by the Engineer. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other markers established by them until authorized to remove them. If any of the control points established by the Engineer are destroyed by or through negligence of the Contractor, they may be replaced by the Engineer, and the expense of replacement will be deducted from any amount due, or which may become due the Contractor.

5.9 RESIDENT PROJECT REPRESENTATIVES

A. The Engineer may appoint such Representatives as he desires, and they shall be granted full access to the Work and to mills and factories in which material is being prepared for use under the Contract. They shall have authority to request compliance with terms of the Contract, to approve or reject materials, to make measurements of quantities, to keep records of costs, and otherwise represent the Engineer. The Contractor may appeal from their decisions to the Engineer, pending settlement but no work shall be done in any manner contrary to the Contract on items affected by such appeal. If the Contractor refuses to comply with instruction of the Representative to fulfill the requirements of the Contract, the Representative shall, if possible, immediately notify his immediate superior and obtain instructions. Failing in this, if the Contractor refuses to suspend operations on verbal order, they shall issue a written order suspending the Work on items affected, giving in detail the reasons for suspension.

Immediately after placing the order in the hands of the person in charge for the Contractor, they shall report to his immediate superior, or in their absence to the Engineer, for further instructions.

B. Representatives shall not be authorized to revoke, alter, enlarge, relax or release any requirements of the Special Provisions, Specifications, or Contract; to approve or accept any portion of the Work; nor to issue instruction contrary to the Plans and Specifications; nor shall they act as superintendent, foreman, or safety engineer for the Contractor nor for the safety of the Contractor's personnel; or interfere with the management of the Work. Any advice which they may give the Contractor shall not be construed as binding the Owner in any way, nor releasing the Contractor from fulfilling all the terms of the Contract.

5.10 INSPECTION

A. All materials and workmanship shall be subject to inspection, examination, and test by the Representatives of the Owner, or the Engineer, at all times. The Owner, or the Engineer, shall have the right to reject defective materials and workmanship or require correction thereof. Rejected materials shall be promptly and satisfactorily replaced with proper materials and rejected workmanship shall be promptly and satisfactorily corrected. If the Contractor fails to proceed at once with the replacement of rejected materials or the correction of rejected workmanship, the Owner may, by Contract or otherwise, replace such materials or correct such workmanship and charge the cost thereof to the Contractor. Failure of representatives to find defects or to request removals shall in no way relieve the Contractor of responsibility.

B. The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether the Work performed and materials used are in accordance with the requirements and intent of the Specifications and Contract. At any time before final acceptance of the Work, the Contractor shall, if the Engineer requests, remove and uncover such portions of the finished work as the Engineer may direct. After the examination, the Contractor shall restore said portions of the Work to the standard required by the Contract. If the work thus exposed or examined proves acceptable, the uncovering or removing and replacing of the covering or making good of the parts removed, shall be paid for as Extra Work, but, if the work so exposed or examined proves unacceptable, no compensation will be allowed the Contractor for the uncovering or removing and the replacing of the covering or making good of the parts removed. No work shall be done nor material used without suitable inspection by the Engineer, or his representative.

C. Failure to find or reject any defective work or material shall not prevent later rejection when such defect be discovered or obligate the Owner to Final Acceptance.

5.11 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

A. All work which has been rejected shall be remedied, or else removed and replaced in an acceptable manner by the Contractor at their own expense, and no compensation shall be allowed them for such removal or replacement. Any work done without the lines and grades shown on the Plans or as given, as herein provided, or any Extra Work done without written authority will be considered as unauthorized and at the expense of the Contractor and will not be measured or paid for. Unauthorized work shall be removed and replaced at the Contractor's expense. Upon failure on the part of the Contractor to immediately comply with any order of the Engineer made under the provisions of the Section, the Owner shall have authority to cause defective work to be remedied, or removed and replaced, and unauthorized work to be removed and to deduct the cost from any monies due or to become due the Contractor. In case no such monies are available, the amount shall be charged against the Contractor's Surety.

5.12 DISPUTED CLAIMS

A. In any case where the Contractor wishes to make claim to the Owner for extra compensation for work or materials they deem not clearly covered in the Contract or not ordered by the Engineer as Extra Work, the Contractor shall notify the Engineer or the Owner in writing, of their intention to make claim for such extra compensation, before they begin the work on which they base their claim. If such notice is not given, or if the notice is given and the Engineer is not afforded proper facilities for keeping strict account of the actual cost to the Contractor, then the Contractor hereby agrees to waive claim for such extra compensation. Such notice by the Contractor, and the fact that the Engineer has kept account of the cost shall in no way be construed as establishing the validity of the claim. When the work has been completed, the Contractor shall immediately file their claim with the Engineer.

5.13 CONTRACTOR INITIATED CHANGES

A. The Contractor and their subcontractor must submit in writing any requests for modifications to the Plans and Specifications. Shop Drawings that are submitted to the Engineer for his review do not constitute “in writing” unless it is brought to the attention of the Engineer that specific changes are being suggested.

5.14 PROJECT COMPLETION

A. The Work shall be complete when all pay items and any Extra Work to be performed under this Contract is performed in its entirety and in accordance with contractual requirements.

5.15 FINAL CONSTRUCTION INSPECTION

A. Whenever the Engineer considers the Work provided and contemplated by the Contract is nearing completion, or within 10 days after being notified by the Contractor that the Work is completed, the Engineer will inspect all the Work included in the Contract. If the Engineer finds that the Work has not been satisfactorily completed at the time of such inspection, they shall advise the Contractor in writing as to the Work to be done or the defects to be remedied. When these defects have been remedied, and the Work has been satisfactorily completed the Engineer shall make the Final Inspection and shall notify the Contractor in writing that the Final Inspection has been made and that time charges end on the day of Final Inspection. Maintenance Period shall start on the day after this Final Inspection.

5.16 FINAL ACCEPTANCE

A. After the Final Inspection is made as outlined above, the Contractor shall maintain the Work for 30 days in the same manner as set forth under “Maintenance of the Work During Construction.” The Work will be finally accepted at the end of the 30-day maintenance period provided all work has been satisfactorily maintained.

B. The Contractor, immediately after receiving the letter of Final Inspection, shall give notice of said completion of Work by an advertisement in some newspaper of general circulation published within the city or county wherein the Work has been done for a period of four successive weeks. Proof of publication of said notice shall be made by the Contractor to the Owner, by affidavit of the publisher and a printed copy of the notice published. If no newspaper is published in the county where the Work is done, the notice may be given by posting at the Court House for 30 days and proof of same shall be made by the probate judge or sheriff and the Contractor.

C. In no instance shall a final settlement be made upon the Contractor until the expiration of the Maintenance Period and until the Contract is completed and Project accepted by the Owner.

5.17 MAINTENANCE GUARANTEE AFTER ACCEPTANCE

A. Neither the final certificate of payment nor any provisions in the Contract, nor partial or entire use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the Work and pay for any damage to other work resulting therefrom which shall appear within a period of two years from the date of final acceptance of the Work unless specified otherwise by the Owner. The Owner will give notice of observed defects with reasonable promptness and the Contractor shall repair the defects immediately. The Contractor's Performance or Contract Bond shall remain in effect and cover this guarantee. After completion of the Project and prior to final acceptance, the Contractor shall provide a statement addressed to the Owner from his/her Surety acknowledging that the Contract Bonds will remain in effect during the two-year warranty period or as otherwise required by the Owner. Final payment under the contract will not be made until this statement is received.

B. For projects involving the lining of sewer mains and laterals, a ten-year warranty shall be provided in lieu of a two-year warranty. The requirements stated above for a two-year warranty shall also hold true for the ten-year warranty.

5.18 CONTRACT CLOSEOUT DOCUMENTS

The Contractor shall complete and submit to the Engineer the following contract closeout requirements:

A. The Contractor's advertisement of Notice of Completion.

B. The Contractor's Affidavit of Payment of Claims and Debts.

C. The Contractor's Consent of Surety Company to Final Payment.

D. The Contractor's letter acknowledging that acceptance of final payment constitutes a waiver of all claims, present or future, in connection with the referenced project.

E. The Contractor's Letter of Warranty for all defects in materials and workmanship shall be in effect for a period of two years and shall contain the stipulated start date and stipulated end date established by Contractor and shall also contain an acknowledgement that the Contractor's Material and Performance Bond shall remain in effect to cover this warranty period.

F. One set of Record Drawings and video, where required, neatly marked with all changes for quantity computation for all changes.

END OF SECTION

SECTION 6 – CONTROL OF MATERIAL

6.0 GENERAL

6.1 SOURCE OF SUPPLY AND QUALITY OF MATERIALS

A. All materials proposed to be used may be inspected or tested at any time during their preparation and use. Only materials conforming to the requirements of the Specifications shall be incorporated in the Work. Material which has become in any way unfit for use shall not be used in the Work. Any material which has become mixed with or coated by dirt or other foreign substance shall not be used in the Work.

B. The source of supply of each of the materials shall be approved by the Owner's representative before the delivery is made to any section of the Work. When so indicated or directed, representative preliminary samples of character and quality shall be submitted for examination or test, and written approval of the quality of such samples must be received by the Contractor prior to obtaining materials from the respective sources of supply.

6.2 SAMPLES AND TESTS

A. Inspection and tests will be conducted promptly but the Contractor shall notify the Owner's Representative, in writing, immediately on the placing of orders for materials, giving the source and the dates when shipments are to be made. Materials to be tested will be sampled by the authorized representative, upon delivery, or at any time before use and acceptance or rejection will be based on the test of such samples.

B. In any event, material incorporated in the construction must meet the requirements of the Contract. The Contractor shall afford such facilities for collecting and forwarding samples; but shall not make use of nor incorporate in the Work any material represented by the samples until the tests have been made and the materials found acceptable in accordance with the requirements of the Contract. The Contractor in all cases shall furnish the required samples without charge.

C. When tests are made at the source of production, the producer shall furnish every reasonable facility for the protection of testing equipment and supplies and shall permit the Owner's representative to have free access to all parts of the plant to enable adequate inspection and selection of samples. Sources of supply of bituminous material shall have adequate testing facilities and satisfactory laboratory equipment, which equipment shall meet the requirements of the standard methods mentioned in the Specifications

6.3 STORAGE OF MATERIALS

A. Materials shall be stored to ensure the preservation of their quality and fitness for the Work in a manner as recommended by the manufacturer and approved by the Engineer. Materials in storage shall be so arranged as to facilitate prompt inspection. Stored materials even though approved before storage may be inspected prior to their use in the Work and shall meet the requirements of the Specifications at the time they are incorporated in the Work.

B. Materials shall be stored only where specifically permitted. Stockpiling of construction materials shall be confined to such cleared areas as may be approved. Private property shall not be used without written permission of the property owner or lessee.

6.4 DEFECTIVE MATERIALS

A. All materials not conforming to the requirements of the Contract shall be considered as defective and all such materials, whether in place or not, shall be rejected and shall be removed immediately from the site of the Work. Defective materials discovered in the process of the Work will be rejected. All defective material shall be replaced by the Contractor at his expense. No rejected materials, the defects of which have been subsequently corrected, shall be used until written approval has been given by the Owner's representative. Upon the failure of the Contractor to comply at once with any order under the provisions of this Section, the Owner shall have authority to remove and replace defective material and to deduct cost of removal and replacement from any monies due or which may become due the Contractor or his Surety.

6.5 CONTRACTOR'S TITLE TO MATERIALS

A. No materials or supplies for the Work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or order and conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the Work, free from all liens, claims or encumbrances.

END OF SECTION

SECTION 7 – LEGAL RELATIONS & RESPONSIBILITY TO PUBLIC

7.0 GENERAL

7.1 LAWS TO BE OBSERVED

A. The Contractor shall at all times observe and comply with all federal, state, and local laws, ordinances, orders, decrees, and regulations existing or enacted subsequently to the execution of the Contract which in any manner affect the prosecution of the Work. The Contractor and his Surety shall indemnify and save harmless the Owner and all their representatives, agents, and employees against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself, his employees, or his subcontractors.

7.2 PERMITS, TAXES, LICENSES, LAWS, AND ORDINANCES

A. The Contractor shall procure all permits, certificates, and licenses, pay all charges, royalties and fees, and give all notices necessary and incident to the due and lawful prosecution of the Work. The Contractor shall pay all applicable federal, state, and local sales, use or other category of tax that may be imposed. He shall comply with all federal, state and local laws, ordinances or rules and regulations relating to the performance of the Work. A permit must be obtained from the MAWSS engineering department prior to any construction activity taking place within easements or rights-of-way which contain water and/or sanitary sewer mains. Application for the permit must be in the form specified. A detailed set of plans and specifications must be submitted with the application. Following a review of the plans, MAWSS will issue a permit for the construction activity. The permit may be issued subject to the modification of the plans to include provisions to safeguard the sanitary sewer system from damage during construction and to minimize the possibility of future maintenance activities.

7.3 PATENTED DEVICES, MATERIALS, AND PROCESSES

A. If the Contractor is required or desires to use any design, device, material, or process covered by letters, patents or copyrights, he shall arrange and provide for such use by suitable agreement with the patentee or owner, and a copy of the agreement shall be filed with the Owner. Whether or not such agreement is made or filed, the Contractor and the Surety shall indemnify and save harmless the Owner, the Engineer, and all their authorized representatives from any and all suits, costs, penalties, or claims for infringement by reason of the use of any such patented design, device, material, or process, or any trademark or copyright in connection with the Work agreed to be performed under the Contract, and shall indemnify the Owner, the Engineer and all their authorized representatives for any costs, expenses, and damages which he or they may be obligated to pay by reason of such infringement or alleged infringement at any time during the prosecution or after the completion of the Work.

7.4 SANITARY PROVISIONS

A. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his employees as may be necessary to comply with the rules and regulations of the State Board of Health or of other authorities having jurisdiction and shall permit no public nuisance.

7.5 PUBLIC CONVENIENCE AND SAFETY

A. No road or street shall be closed by the Contractor to the public except by written permission of the authority having jurisdiction, and except while so closed, the Contractor shall maintain traffic over, through or around the Work included in this Contract, with the maximum practical

convenience, for the full 24-hours of each day of the Contract, whether or not work has ceased temporarily. The Contractor shall notify the Engineer at the earliest possible date after the Contract has been executed, and in any case before the starting of any construction that might in any way inconvenience or endanger traffic, so that the necessary arrangements may be determined.

B. The convenience of the general public and of residents along the road shall be provided for in a reasonably adequate and satisfactory manner. Where existing roads are not available for use as detours, unless otherwise provided in the Special Provisions, all traffic shall be permitted to pass through the Work. The Contractor shall provide and maintain at his own expense such temporary roads as may be necessary to provide convenient access to driveways, houses, buildings, or other property abutting the Work under construction, as well as temporary approaches to, and crossings of, intersecting roads.

C. The Contractor shall arrange his work so that no undue and prolonged blocking of business establishments will occur.

D. Whenever possible all materials unloaded on the job sites will be placed in an area well away from the traveling public to avoid hazardous conditions.

E. Materials and equipment stored on the roads shall be so placed and the Work at all times shall be so connected as to insure minimum danger and obstruction to the traveling public.

F. In order that all unnecessary delay to the traveling public may be avoided, the Contractor shall provide and station competent flagmen whose sole duties shall consist of directing and controlling the movement of public traffic either through or around the Work.

G. Fire hydrants shall be accessible at all times to the Fire Department. No materials or other obstruction shall be placed closer to a fire hydrant than permitted by ordinances, rules or regulations, or within 5 feet of a fire hydrant, in the absence of such ordinances, rules, or regulations. In case of city or town work, the Contractor shall give the Chief of the Fire Department, City Engineer, and other appropriate local officials at least 24 hours' notice in writing before it becomes necessary to obstruct a cross street.

7.6 CROSSING RAILROADS

A. No work of any character shall be commenced on the railroad right of way until the Railroad Company has been duly notified by the Contractor of the date he proposes to begin work and until an authorized representative of the Railroad Company is present, unless the Railroad Company waives such requirement.

7.7 INGRESS AND EGRESS

A. In areas where there is access to residences, businesses, public and private buildings, and other facilities, the Contractor shall plan his work to afford access to property abutting the Work at all times except when absolutely necessary, including providing immediate backfill of pipe, shells for temporary surfacing, and adequate signing and flagmen to control and direct traffic. The Contractor shall submit his method of operation for approval before starting work on the Project. There will be no direct payment for this Work, with payment included in the bid for other items of work in the Contract.

7.8 BARRICADES, DANGER, WARNING, AND DETOUR SIGNS

A. The Contractor shall at his own expense, provide, erect, paint and maintain all necessary barricades of the material and design to meet the requirements of the State Highway

Department, Public Works Department, City Engineering Department, or other officials having jurisdiction. Also, at his own expense, the Contractor shall provide suitable and sufficient red lights, torches, reflectors or other danger signals and signs, provide a sufficient number of watchmen and take all the necessary precautions for the protection of the Work and safety of the public.

B. The Contractor shall erect warning signs beyond the limits of the Project as required, but at least 300-feet beyond each end of the Project and at least 300-feet in advance of any place on the Project where operations interfere with the use of the road by traffic. Barricades shall be kept well painted, and suitable warning signs shall be placed thereon. All barricades and obstructions shall be illuminated at night and all lights or devices for this purpose shall be kept burning from sunset to sunrise.

7.9 PRESERVATION AND RESTORATION OF PROPERTY, TREES, MONUMENTS, ETC.

A. The Contractor shall not enter upon private property for any purpose without first obtaining permission from the Owners and the lessees. The Contractor shall be responsible for the preservation of all public and private property, monuments, signs, telephone lines, roads, highways, streets, other utilities, etc., along and adjacent to the Project; shall use every precaution necessary to prevent damage to pipes, conduits and other underground structures; and shall protect carefully from disturbance or damage all land monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed. The Contractor must obtain all necessary information in regard to existing utilities and shall give notice in writing to the Owners or proper authorities in charge of streets, gas and water pipes, electric and other conduits, railways, poles and pole lines, manholes, catch basins, fixtures, appurtenances, and all other property that may be affected by the Contractor's operations at least 48 hours before his operations will affect such property. The Contractor shall not hinder or interfere with any person in the protection of such work, or with the operation of utilities at any time.

B. The Contractor shall not remove, injure, cut or destroy trees, shrubs, or plants that are to remain on the streets or those which are privately owned without proper authority.

C. When or where any direct or indirect damage or injury is done to public or private property by or as a result of any act, omission, neglect, or otherwise of the Contractor, he shall make good such damage or injury in an acceptable manner.

D. The Contractor shall examine all bridges and culverts, on or near the Work, over which he will move his materials, implements or equipment and shall take such precautions as are necessary to properly strengthen such structures to prevent damage before he uses them. The Contractor shall be responsible for any and all damages, caused by his operation to such bridges and culverts.

7.10 RESPONSIBILITY OR DAMAGE CLAIMS, ETC.

A. The Contractor and Surety shall save harmless the Owner and all his representatives from all suits, actions, or claims of any character brought on account of any injuries or damages sustained by any person or property in consequence of performing any work in connection with this Project, or of any neglect in safeguarding the Work, or of any delay in completing the Work or of the use of any unacceptable or defective materials, or of any other act or omission either similar or dissimilar to the above enumerated acts, by said Contractor or his agent by which any person or property is injured through the fault of the said Contractor or his agents.

B. The Contractor shall report to the Owner all accidents occurring on the Work within 48 hours after their occurrence. The report shall contain complete information on the accident including names, addresses of persons involved and names and addresses of witnesses.

7.11 RIGHT-OF-WAY

A. All right-of-way easements for the Work will be provided without cost to the Contractor unless otherwise specified with ingress and egress at public roads and streets. If the Contractor desires other points of entry, he shall secure the written permission of the property owners and pay any cost relative thereto.

7.12 INTERFERENCE OF CONTRACTORS

A. The right is reserved by the Owner to award any work not included in the Contract to another for performance during the progress of this Contract, or to perform such work with their own forces, and the Contractor for this Contract shall so cooperate and conduct his operation as to minimize the interference therewith. Where two or more Contractors are employed on related or adjacent work, each shall conduct his operations in such a manner as not to cause any unnecessary delay or hindrance to the other. Each Contractor shall be responsible to the other for any damage, injury, loss or expense which may be suffered on account of interference of operations, neglect or failure to finish the Work at the specified time, or for any other cause.

B. If, through acts of neglect on the part of the Contractor, any other Contractor, subcontractor or vendor shall suffer loss or damage or assert any claim on the Work, the Contractor agrees to settle with such other Contractor, subcontractor or vendor by agreement or arbitration if such other Contractor, subcontractor or vendor will so settle. If such other Contractor, subcontractor or vendor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

7.13 CONTRACTOR'S RESPONSIBILITY FOR WORK

A. Until the final acceptance of the Work by the Owner as evidenced in writing, it shall be in the custody and under the charge and care of the Contractor and he shall take every necessary precaution against injury or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution or from the nonexecution of the Work. The Contractor shall rebuild, repair, restore and make good at his own expense all injuries or damages to any portion of the Work occasioned by any cause before its completion and acceptance and shall bear the expenses thereof.

7.14 CONTRACTOR'S RESPONSIBILITY FOR COMPLETION

A. The Contractor shall accept ultimate responsibility for completion and final acceptance of the overall Project including work done by subcontractors and material and equipment provided by vendors and suppliers. The Contractor shall be responsible for coordination of Project execution in order to prevent duplication of Work, omissions, and other inter-contract conflicts. References to duties and responsibilities of subcontractors, vendors, suppliers, etc., within the Specifications are intended to be addressed through the general Contractor's overall responsibility.

7.15 PERSONAL LIABILITY OF PUBLIC OFFICIALS

A. In carrying out any of the provisions of the Contract or in exercising any power or authority granted thereby, there shall be no liability upon the Engineer or his representatives, either

personally or as officials of the Owner, it being understood that in such matters they act as agents and representatives of the Owner.

7.16 NO WAIVER OF LEGAL RIGHTS

A. The Owner or the Engineer shall not be precluded or stopped by any measurement, estimate or certificate made or given by either of them before or after the completion and acceptance of the Work and payment therefore, pursuant to any measurement, estimate or certificate, from showing the true and correct amount and character of the Work performed and materials furnished by the Contractor; or from showing at any time that any such measurement, estimate or certificate is untrue or incorrectly made in any particular; or from showing at any time that the Work or materials or any part thereof, do not conform in fact to the Contract. The Engineer shall have the right to reject the whole or any part of the aforesaid work or materials should the said measurements, estimate or payment be found, or be known, to be inconsistent with the terms of the Contract, or otherwise improperly given; and the Owner shall not be precluded from demanding and recovering from the Contractor and his Surety such damages as it may sustain by reason of the Contractor's failure to comply with the terms of the Contract. Neither the acceptance by the Engineer, or any representative, or employee; nor any certificate by the Engineer for payment of money; nor any payment for nor acceptance of the whole or any part of the Work by the Owner, or Engineer; nor any extension of time; nor any possession taken by the Owner or its employees, shall operate as a waiver of any portion of the Contract or of any power herein reserved by the Owner or of any right to damages herein provided, nor such any breach of the Contract be held to be a waiver of any other or subsequent breach.

7.17 USE OF CHEMICALS

A. All chemicals used during Project construction or furnished for Project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must be clearly identified and show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with manufacturer's instructions or government regulations as applicable.

7.18 DUST CONTROL

A. The Contractor shall at all times provide for the control of dust within residential areas and such other areas where dust is a nuisance to the public by sprinkling with water or by other approved dust control measures. Water shall be provided by the Contractor. No direct compensation will be made for water or other dust control measures, payment for which shall be included in the price bid for other items of work except where a specific pay item is included in the Proposal.

7.19 SAFETY AND HEALTH REQUIREMENTS FOR CONSTRUCTION

A. The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (P.L. 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (P.L. 91-54) and any amendments or additions thereto, where excavation and trenching are required the contractor shall comply with the requirements of OSHA Excavation and Trenching Safety Regulations (29 CFR Part 1926 – Excavation, Final Rule), and any amendments or additions thereto.

B. The Contractor shall be familiar and comply with the Board's Safety Rules Handbook in so far as it augments the specific regulation referred to in this Section.

C. The Contractor alone shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary

precautions for the safety of, and shall provide necessary protection to prevent damage, injury or loss to:

1. All employees on the Work and other persons and organizations who may be affected thereby.
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 over the course of construction.

D. The Contractor shall comply with all applicable Laws and Regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and of Underground Facilities and 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. All damage, injury, or loss to any property referred to above in Paragraphs 2 and 3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the Contractor.

E. The Contractor's duties and responsibilities for the safety and 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 that the Work is acceptable.

F. The Contractor shall designate a responsible representative at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Owner. The Contractor shall procure the referenced safety and health regulations, shall keep them on file at the job site, and shall require all supervisory personnel to become familiar with them.

7.20 BRACING

A. In the event that the Contractor or his Surety deems it necessary, desirable, or for other reasons to open sheet or close sheet the trenches, the sheeting shall be accomplished in such a manner that the pipe will be protected at all times. Such sheeting shall remain in place until the backfill is carried to a point at least 2 feet above the top of the pipe. The Contractor shall exercise every precaution in removing the sheeting in order to avoid damaging the pipe. Should there be evidence that the removal of sheeting would damage the pipe, the sheeting shall be left in place. The top of sheeting left in place shall be at least 12-inches below the finished ground. There will be no payment for this item.

7.21 WETLANDS

A. The Contractor shall have a thorough knowledge of all wetland regulations and shall be able to determine if wetland areas are encountered during construction. If construction is determined to be in a wetland area or adjacent to a wetland area, the Contractor shall comply with all wetland regulations

END OF SECTION

SECTION 8 – PROSECUTION AND PROGRESS

8.0 GENERAL

8.1 SUBLETTING OF ASSIGNING OF CONTRACT; SUBCONTRACTORS

A. Subletting or Assignment: The Contractor shall not sublet, assign, transfer, convey, sell or otherwise dispose of any portion of the Contract, his right, title, or interest thereon or his power to execute such Contract, to any person, firm, or corporation without written consent of the Owner, and such written consent shall not be construed to relieve the Contractor of any responsibility for the fulfillment of the Contract. In case the Contractor assigns all or any part of any monies due or to become due under the Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior liens of all persons, firms, and corporations for services rendered or materials supplied for the performance or the Work called for in the Contract.

B. Subcontractors. The Contractor may utilize the service of Specialty Subcontractors on those parts of the work which, under normal contracting practices, are performed by the Specialty Subcontractors. The Contractor shall not award any Work to any subcontractor without prior written approval of the Owner. As part of the submittals with the Contractor's bid for award of the Contract, the Contractor must include a Subcontracting Plan form with a brief description of the proposed award to each subcontractor, including such information as the Owner may require. Award of the Contract by the Board is acceptance of the submitted Subcontracting Plan unless Contractor is notified otherwise by the Board's authorized designated representative.

The Owner reserves the right to decline to approve a subcontractor proposed on a bidder's Subcontracting Plan if the Owner, in its sole discretion, has concerns as to the quality of past work performed by the subcontractor on any job; the subcontractor's willingness or ability to adhere to ordinances, other laws, and/or court orders affecting the environment or other matters relative to the Work; or any other matter which may adversely affect the Owner's customers, the general public, or the Owner's systems, facilities, or property.

C. If the Owner, acting through its authorized designated representative, declines to approve a subcontractor proposed in a Subcontracting Plan submitted by an otherwise responsible and responsive bidder, the bidder will be given an opportunity as set forth herein to propose a different subcontractor or to withdraw the bid without penalty. The Owner's representative will provide the bidder with written notice [via e-mail, certified mail, or hand delivery] that the proposed subcontractor is not approved, and the bidder will then have five (5) business days from receipt of the notice in which to deliver to the Owner's representative an amended Subcontracting Plan proposing a different subcontractor. The contractor shall not change the amount of his bid when submitting a revised Subcontracting Plan. If the bidder delivers an amended Subcontracting Plan, the Owner's representative will have authority to accept the amended Subcontracting Plan and recommend award of the Contract, or to decline to accept the substitute subcontractor and recommend award to the next lowest responsible and responsive bidder. Or, the bidder may withdraw its bid without penalty prior to the end of this 5-day period. This opportunity to propose a new subcontractor within the 5-day period as set forth herein is ONLY for situations in which the Owner has rejected a proposed subcontractor for reasons stated in the preceding paragraph. In no other circumstances will a bidder be permitted to change a proposed contractor after bid opening but before contract award. This provision shall not be interpreted to allow a bidder to add a DBE subcontractor to its Subcontracting Plan after bids have been opened but before contract award.

The Contractor acknowledges the Owner's responsibilities for providing water and sewer services to its customers, complying with environmental and other laws, and protecting its systems, facilities and properties. The Contractor will ensure that its contracts with all

subcontractors incorporate by reference the Standard Specifications, General Conditions, and other Contract Documents of the contract between the Owner and the Contractor, including but not limited to this Section 8.01.

Nothing herein is intended to limit the responsibilities of the Contractor for directing the work and performance of its subcontractors or for the quality of work, compliance with laws and court decrees, safety, or any other responsibilities of the Contractor as reflected in the Contract and or as required by construction industry standards.

The Contractor shall be as fully responsible to the Owner for the acts and omissions of the subcontractors, and of personnel either directly or indirectly employed by them, as the Contractor is for the acts and omissions of persons directly employed by Contractor.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind subcontractors to the Contractor by the terms of the General Conditions and other Contract Documents insofar as applicable to the Work of subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise of the Contractor under any provision of the Contract Documents.

Nothing contained in this Contract shall create any contractual relation between any subcontractor and the Owner, nor shall it create any obligation on the part of the Owner to pay or to see to the payment of any moneys due any subcontractor, except as may be otherwise required by law.

8.2 NOTICE TO PROCEED

A. The Owner will, after executing the Contract, issue to the Contractor in writing or by wire a Notice to Proceed. The beginning of the time allotted for the Contract completion will be 10 days after the date of the Notice to Proceed, or the day on which Work is actually started, whichever occurs first.

8.3 NOTICE AND SERVICE THEREOF

A. Any notice to any Contractor from the Owner relative to any part of this Contract shall be in writing to the said Contractor at his last given address or delivered in person to said Contractor or his authorized representative on the Work.

8.4 PROSECUTION OF WORK

A. The Contractor shall begin the Work to be performed under the Contract within 10 days after issuance of the Notice to Proceed, and they shall give the Engineer definite notice of his intention to start work at least 72-hours in advance of beginning work. During the progress of the Work, the Contractor shall notify the Engineer at least 24-hours before they expect to be ready to undertake any features of the Work in order that proper inspection may be provided.

B. The Contractor must continuously and diligently prosecute the Work in such order and manner to complete the Work in the specified time. The Contractor shall employ an ample force of staff and provide construction plant properly adapted to the Work and of sufficient capacity and efficiency to accomplish the Work in a safe and workmanlike manner at the rate of progress deemed necessary to ensure its completion within the time set forth in the Contract. Each operation shall be begun as soon after the Contract is awarded as conditions will permit. Each class of work will be expected to progress from the date it is begun until completed. All plant and equipment shall be maintained in good working order and provision shall be made for immediate emergency repairs.

C. Should the Contractor fail to maintain a satisfactory rate of progress, the Owner will require that additional men and/or plant be placed on the Work, or a reorganization of plant layout be affected in order that the Work be brought up to the required progress schedule and maintained there. Should the Contractor fail to furnish suitable or sufficient tools, machinery, equipment or force for the proper prosecution of the Work, the Owner may withhold all estimates which are or may become due until their orders are complied with or the Contract may be annulled as hereinafter provided.

D. Should the prosecution of the Work be discontinued by the Contractor, with the consent of the Owner, the Contractor shall notify the Engineer in writing at least 24-hours before resuming operations.

8.5 CONSTRUCTION SCHEDULE AND PERIODIC ESTIMATES

A. Immediately after execution and delivery of the Contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in the form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule. The Contractor shall also furnish the Owner: (a) a detailed estimate giving a complete breakdown of lump sum prices; (b) periodic itemized estimates of work done for the purpose of making partial payments thereon; and (c) a schedule of Shop Drawings submissions. The cost incurred in making up any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the Contract Price.

8.6 LIMITATIONS OF OPERATIONS

A. The Contractor shall always conduct the Work in such manner and in such sequence as will insure the least practicable interference with traffic. They shall not open work to the prejudice of work already started. The Contractor shall finish the section on which work is in progress before work is started on any additional section.

B. Whenever work being done by other Contractors is contiguous or related to the Work included in the Contract, the respective rights of the various interests involved shall be established by the Engineer in order to secure the completion of the various portions of the Work in general harmony.

8.7 CHARACTER OF WORKMEN AND EQUIPMENT

A. All subcontractors, superintendents, foremen, and workmen employed by the Contractor shall be competent and reliable. All workmen must have sufficient skill and experience to properly perform the Work assigned them. All workmen engaged on special work or skilled work, or in any trade shall have had sufficient experience and ability in such work to properly and satisfactorily perform it and operate the equipment involved and shall make due and proper effort to execute the Work in the manner prescribed in the Contract. The Owner may demand the dismissal of any person employed by the Contractor in, about, or upon the Work who misconducts himself or is incompetent or negligent in the due and proper performance of his duty, or who neglects or refuses to comply with the Contract; and such person shall not again be employed thereon without the written consent of the Owner. Should the Contractor continue to employ or re-employ any such person, the Owner may withhold all estimates, which are or may become due or he may suspend the Work until the Contractor complies with such orders.

B. The methods and appliances used, the labor employed, and the machinery and equipment used shall be of sufficient size and in such mechanical condition as to meet the requirements and

produce a satisfactory quality and quantity of work, shall be adequate to complete the Contract within the time specified in the Contract. No change in the machinery and equipment employed on the Work, which shall have the effect of decreasing its capacity, shall be made. The measure of the capacity of machinery and equipment shall be its actual performance on the Work.

C. In case the actual progress shall fall behind the estimated progress at any time, or should it become apparent that the Contractor will be unable to complete the Contract at the time and in the manner specified in the Contract, the Owner may require that additional equipment be placed on the Work. Should the Contractor fail to furnish suitable or sufficient tools, machinery, equipment or force for the proper prosecution of the Work, the Owner may withhold all estimates which are or may become due until their orders are complied with or the Contract may be annulled as hereinafter provided.

D. Equipment used on any portion of the Work shall also be such that no injury to the roadway, adjacent property, utilities, structures or other highways will result from its use.

8.8 TEMPORARY SUSPENSION OF WORK

A. The Owner shall have the authority to suspend the Work wholly or in part for such period as may be deemed necessary, due to unsuitable weather, or other essential conditions which are unfavorable for the suitable prosecution of the Work, or for failure on the part of the Contractor to carry out instructions, or to perform any provision of the Contract or on account of any other conditions, which make it impracticable to secure satisfactory work. No additional compensation shall be paid the Contractor because of such suspension. The Contractor shall immediately respect the written order of the Owner or his authorized representative to suspend the Work, wholly or in part. Upon suspension, the Work shall be put in proper and satisfactory condition, carefully covered and properly protected. The Contractor shall not suspend the Work without such authority and the Work shall be resumed when conditions are favorable and methods are corrected when instructed in writing, and the Contractor shall notify the Engineer when he proposes to resume work, sufficiently in advance of such time, to afford the Engineer opportunity to re-establish field representation.

B. Should the progress of the Work be stopped by a temporary injunction, court or restraining order, process or judgment of any kind directed to either of the parties hereto, then such period of delay shall not be charged against the Contract Time, nor shall the Owner be liable to the Contractor because of such delay or termination of Work.

C. If for any reason it should become necessary to stop work for an indefinite period, the Contractor shall store all materials in such a manner that they will not obstruct or impede the traveling public or become damaged in any way, and he shall provide suitable drainage and take every precaution to prevent damage to or deterioration of the Work performed.

8.9 DETERMINATION AND EXTENSION OF CONTRACT TIME FOR COMPLETION OF WORK

A. A. When the time for completion of the Work in the contract is based upon working days, the number of working days will be specified in the Proposal Form.

A working day is defined as any day when, in the opinion of the Engineer, soil and weather conditions are such as would permit effective work on any of the current major or controlling operations of the Project with at least 80% of the labor and equipment normally engaged on such major or controlling operations for at least 5 hours or more. If conditions are such as to stop work in less than this time, the day will not be counted as a working day. If adverse weather conditions are the basis for a claim for additional time, such claim shall be documented by data substantiating that the weather conditions were abnormal for the period of time it occurred, could not have been reasonably anticipated, and had an adverse effect on the

scheduled construction. The 10-year historic average of rainfall per month, as reported at the Mobile Municipal Airport, will be used as a basis to assess the number of rain days allowed. No rain days will be considered when the average rainfall amount is less than 0.1 inches in a day. Sundays, national holidays, and holidays legal in the State shall be excluded from the count of working days. Contract working days shall start on the date stipulated in the Notice to Proceed and the Engineer shall be the sole judge of working days that elapse between the date stipulated in the Notice to Proceed and the actual commencing of operations by the Contractor. In computing the time required by the Contractor in the execution of the Work, allowance will be made for days not considered working days. However, no allowance shall be made for delays or suspension of the Work due to fault of the Contractor. Each week the Engineer shall give written notice to the Contractor, or to his representative in charge of the Work, of the number of working days the Engineer has determined there were in the weekly period covered by such notices. Any objection by the Contractor to such weekly decision shall be deemed waived, shall not thereafter be made the basis for any claim, unless the Contractor shall within 3 (three) days of receipt of such notice file with the Engineer written protest setting forth his objections and specifying the reason, therefore.

In case the final estimate exceeds the Contract Bid Price an extension in the workdays will be granted the Contractor. This extension shall be in direct proportion to the amount of total overrun in dollars, that is, the percentage of overrun shall first be computed, and the Working Days shall be increased by the same percentage.

B. When time set for completion of the Work is based upon calendar days, working days are not applicable and no extension of time beyond the calendar date will be made, except that where the final estimate exceeds the Contract Bid Price, and extension in calendar days will be granted the Contractor. This extension shall be in direct proportion to amount of total overrun in dollars as above provided.

Time shall not be charged for maintenance after the Final Construction Inspection in case of either A or B.

8.10 FAILURE OF DELAY IN COMPLETING WORK ON TIME

A. Time is an essential element in the Contract, as delay in the prosecution of the Work will inconvenience the public, obstruct traffic, and interfere with business. It is important that the Work be pressed vigorously to completion. Should the Contractor, or, in case of default, the Surety fail to complete the Work within the time stipulated in the Contract, or within such extra time as may be allowed as herein above provided, a deduction of the amount stipulated in the Contract for Liquidated Damages will be made for each and every calendar day that such Contract remains uncompleted after the calendar date specified for completion or after the expiration of the number of working days allowed for completion. The said amount stipulated in the Contract is hereby mutually agreed upon as liquidated damages.

B. Permitting the Contractor to continue and finish the Work or any part of it after the calendar date specified for completion or after the expiration of the number of Working Days allowed for completion, after any extension of time, shall not operate as a waiver on the part of the Owner of the rights of the Owner under this Contract.

C. In any suit for collection of, or involving the assessment of, liquidated damages, the reasonableness of the amount per day stipulated in the Contract shall be presumed. The liquidated damages referred to herein are intended to be and are cumulative and shall be in addition to every other remedy now or hereafter enforceable at law, in equity, by statute, or under the Contract.

8.11 DEFAULT OF CONTRACT

A. If the Contractor fails to begin the Work under Contract within the time specified, or fails to perform the Work with sufficient workmen, equipment, or materials, to insure its prompt completion, or performs the Work unsuitably, or neglects or refuses to remove materials or perform anew such work as shall be rejected as defective and unsuitable, or discontinues the prosecution of the Work, or from any other cause whatsoever does not carry the Work in an acceptable manner, or becomes insolvent or is adjudicated as bankrupt, or commits any act of bankruptcy or insolvency, or allows any final judgment to stand against him unsatisfied for a period of 10 days, the Owner or his representative may give notice in writing by registered mail to the Contractor and the Surety of such delay, neglect, or default. If within 10 days after such notice the Contractor does not proceed to remedy to the satisfaction of the Owner the fault specified in said notice, or the Surety does not proceed to take over the Work for completion, the Owner shall have full power and authority, without impairing the obligation of the Contract or the Contract Bonds, to take over the completion of the Work; to appropriate or use any or all material and equipment on the ground that may be suitable and acceptable; to enter into agreements with others for the completion of the Contract according to the terms and provisions thereof; or to use such other methods as in its opinion may be required for the completion of the Contract. The Contractor and his Surety shall be liable for all costs and expenses incurred by the Owner in completing the Work, and for the liquidated damages in conformity with the terms of the Contract. In case the sum of such liquidated damages and the expense so incurred by the Owner is less than the sum which would have been payable under the Contract if it had been completed by the Contractor or his Surety, the Contractor or his Surety shall be entitled to receive the difference; and in case the sum of such expense and such liquidated damages exceeds the sum which would have been payable under the Contract, the Contractor and his Surety shall be liable and shall pay to the Owner the amount of such excess. Notice to the Contractor shall be deemed to be served when delivered to the person in charge of any office used by the Contractor, his representative at or near the Work or by registered mail addressed to the Contractor at his last known place of business.

8.12 TERMINATION FOR FAILURE OF PERFORMANCE

A. In the event of failure by the Contractor to perform any and all of the Contractor’s obligations in a prompt and efficient manner satisfactory to the Owner, the Owner will have the right to summarily terminate this agreement, including all work covered hereby, by giving the Contractor written notice of such termination, after which the Owner may employ contracting services of his choice to complete the Work under this Contract and the Contractor and its Sureties will reimburse the Owner any additional costs which may result from such termination and employment of other contracting services. Failure by the Owner to exercise this right to so terminate this Contract for any such default by the Contractor shall not constitute a waiver by the Owner of its right to so terminate this Contract for any subsequent default.

8.13 PAYMENTS TO CONTRACTOR

A. The Contractor shall submit a payment estimate on or before the 1st day of each calendar month for work performed the preceding calendar month. Within ten (10) days of receipt of the estimate, the Engineer will review, approve, and forward the estimate to the Owner, or return the estimate to the Contractor for needed corrections. Upon receipt of an estimate which has been reviewed and approved by the Engineer, the Board will consider the estimate at its next scheduled meeting, and within ten (10) calendar days after Board approval, will make a partial payment to the Contractor based on an approved and certified estimate. To ensure the proper performance of this Contract, the Owner will retain five (5%) percent of the amount of each estimate until fifty percent (50%) of the Contract amount is reached, and no further retainage will be withheld (unless a different amount is stipulated in the Special Provisions) until final completion and acceptance of all Work covered by the Contract. All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this

provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract.

B. The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen, mechanics, materialmen, and furnishes of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. The Contractor shall furnish satisfactory evidence that all obligations of nature herein above designated have been paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills of which the Owner has written notice, direct, or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payment to the Contractor shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his Surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as a payment made under the Contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payment made in good faith.

C. All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and Work upon which payments have been made or the restoration of any damaged Work, or as a waiver of the right of Owner to require the fulfillment of all the terms of the Contract.

8.14 PAYMENT FOR MATERIAL STORED

A. Material delivered to the Project site, but not incorporated in the completed work will be paid for (less retainage) in the month following delivery when substantiated by invoices from the manufacturer. This includes materials delivered to storage prior to issuance of Notice to Proceed. Invoices for materials delivered during the month shall be included with the estimate on which the materials are shown. On monthly estimates subsequent to the first estimate submitted that includes invoices for stored materials for which payment to the Contractor has been made, there shall be a signed statement that the invoices have been paid by the Contractor. The statement shall read as follows:

"This is to certify that payment has been made for invoiced materials included in Previous monthly estimates No. _____ through _____ .

Signed _____ "

B. In the event that such statement is not furnished or the manufacturer's or material suppliers notify the Owner in writing that they have not been paid for materials included on previous estimates, the Owner will make payment to the manufacturers or material suppliers in accordance with the provisions of these Specifications and the amount of such payments shall be deducted from the amount then due the Contractor. It is the intent that payment for materials delivered to the Project are to be paid for as promptly as possible and that the Contractor is to make remittance for such materials to the manufacturers or materials suppliers promptly upon receipt of funds from the Owner. The Owner reserves the right to take such steps as deemed appropriate pursuant to the provisions of these Specifications to assure that materials are paid for promptly.

8.15 PAYMENT BY CONTRACTOR

The Contractor shall pay:

A. for all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered;

B. for all materials, tools, and other expendable equipment to the extent of 90 percent of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the project;

C. for major items of equipment to be installed in the Work, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the equipment furnished; and

D. to each of his subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors to the extent of each subcontractor's interest therein.

8.16 FURNISHING OF UTILITIES

A. The Contractor, at their own expense, shall provide water, sewer, gas, electricity and telephone lines for construction. The Contractor shall provide all necessary temporary piping and wiring as required to perform their work. After completion of the permanent utility connections, the Contractor shall be required as a part of this Work to secure all utility services from the respective utility companies and shall pay all monthly bills until final acceptance. The Contractor shall then have the respective utility companies transfer their billing to the Owner's name. If the Owner obtains beneficial use prior to final acceptance, the billing may be transferred at that time. Utility services required for testing of equipment or other use of the Contractor will be paid for by the Contractor regardless of whether equipment has been placed in service. Unless specified elsewhere within these Specifications and/or noted on the Plans, costs associated with the providing of permanent utilities including water and electricity requiring work beyond the point of connection of the utility company will be considered outside the scope of work defined for this Contract. Costs, charges, fees, etc., assessed by utility companies for work or services beyond the point of connection shall not be the responsibility of the Contractor unless specifically included by other portions of these Specifications and Plans. Utility services required for testing of equipment will be paid for by the Contractor regardless of whether equipment has been placed in service.

8.17 MONTHLY ESTIMATES

For the purpose of making partial monthly estimates only work that has been completed will be measured for payment. On each monthly estimate, the Contractor shall place the following certification:

"I hereby certify that the Work covered by this estimate was performed in accordance with the Contract, that prevailing scales of wages were paid and that this estimate is true, and that payment therefore has not been received.

Number of Days in Contract _____ Days

Number of Days Elapsed _____ Days

Percent of Time Elapsed _____ %

Percent of Contract Completed _____ %

By _____ “

8.18 EXTRA AND FORCE ACCOUNT WORK

Extra Work as hereinbefore defined, when authorized and accepted will be paid for in accordance with the following:

1. The Contractor shall submit to the Owner or its authorized representative a written agreement for the Work to be done and basis of payment (lump sum, force account or unit price), and submit the same to the Owner for authorization to perform such Extra Work.

2. When Extra Work is authorized to be paid for on a lump sum basis, the Contractor shall compute the percentage done each month and submit with the monthly estimate, a detail sheet showing this percentage and the amount due.

3. When Extra Work is authorized to be paid for on a unit price basis, the Contractor shall include on each monthly estimate the amount of Work done that month. When Extra Work is authorized to be paid for on a Force Account basis, the Contractor shall furnish itemized statements to the Engineer of the cost of all Force Account work, which shall include a certified copy of the weekly payroll and original receipted bills for all materials used and freight charges paid on same, provided that where materials used are not specifically purchased for use on Extra Work but are taken from the Contractor’s stock, the Contractor shall submit an affidavit of the quantity, price, and freight on such materials in lieu of original bills and invoices, which affidavit must be approved by Engineer.

   With each monthly estimate on Work paid for on a Force Account basis, the Contractor shall submit in duplicate a detailed statement showing the following:
   a. Name, class, date, number of hours worked each day, total hours, rate and extension for each laborer and foreman engaged.
   b. Designation, number of hours worked each day, total hours, rental rate and extension for each truck, and unit of machinery engaged.
   c. Quantity of materials, price and extension.
   d. Freight on materials.
   e. When the Extra Work is complete, the cost of Property Damages, Liability, Worker’s Compensation and Unemployment Insurance.

B. All Extra Work done by Force Account will be paid for in the following manner:

1. For all labor, and foreman in direct charge of the specific work, the Contractor shall receive the current local rate of wage, to be agreed upon in writing before beginning work, for each hour that said labor, teams and foreman are engaged in such work; to which shall be added an amount equal to 10 percent thereof. No allowance shall be made for general superintendent and use of small tools and ordinary equipment.

2. For the cost of Property Damage, Liability, Worker’s Compensation and Unemployment Insurance required for Force Account Work, the Contractor shall receive the actual cost to which no percentage shall be added. The Contractor shall furnish satisfactory evidence of the rate or rates paid for such insurance.

3. For materials, the Contractor shall receive the actual cost of such material delivered to the Work, including the freight charges, as shown by original receipted bills; to which shall be added an amount equal to 10 percent of the sum thereof.

4. For any machinery or special equipment other than small tools, including pertinent fuel and lubricants, which it may be deemed necessary or desirable to use, the Contractor

shall be allowed a reasonable rental price to be agreed upon in writing before such work is begun, for the time that such equipment is in use on the Work and to which sum no percentage shall be added.

No Extra Work will be paid for unless unit prices or wages have been agreed upon in writing before such work is started.

The compensation as above provided in 1, 2, 3, and 4 shall be accepted by the Contractor as payment in full for Extra Work done on a Force Account basis including superintendence, general expense, overhead, use of tools and equipment for which no rental is allowed, Contract Bonds and profit.

8.19 OWNER CONTINGENCY ALLOWANCE

A. The Owner Contingency Allowance shall be a cash allowance for the Owner's use. In the event there are additions and/or changes to the work in the contract, the Owner will have the ability to use funds out of the Contingency Allowance to pay the Contractor for these items of work. Items included under the Contingency Allowance shall be first approved by the Owner and the Engineer prior to commencing the work. Any work completed without approval from the Owner/Engineer is at risk of non-payment.

8.20 ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE

A. The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor for all things done or furnished in connection with this Work and for every act and neglect of the Owner and other relating to or arising out of this Work. No payment, however, final or otherwise, shall operate to release the Contractor or his Sureties from any obligations under this Contract or the Contract Bonds.

8.21 DISTURBED AREAS

A. All areas that are disturbed due to direct or indirect construction operations shall be restored by the Contractor to a condition equal or better than the condition of the area prior to the operations.

END OF SECTION

SECTION 9 – TESTING MATERIALS

9.0 GENERAL

9.1 INSPECTION AND TESTING OF MATERIALS

A. The following will be the minimum test requirements. All tests are to be performed by a recognized testing laboratory subject to the approval of the Owner.

B. Materials of construction, particularly those upon which strength and durability of the structure may depend, shall be inspected and tested to establish conformity with the Contract and suitability for uses intended. The following are differentiations of minimum service desired to protect the interest of the. Owner. Other materials, not listed, shall also receive attention consistent with the importance of the use to which they are to be put.

C. The judgment of the Engineer shall prevail where it appears advisable to deviate from the limitations set forth hereinafter because of nonavailability of the material required other than concrete materials and concrete.

D. When so specified in the Special Provisions, the Owner will pay for testing; but when not specified, the testing shall be performed, at no cost to the Owner, by an approved independent testing laboratory.

9.2 PORTLAND CEMENT

A. Where the total Project requirement is less than 200 barrels (one car): Cement shall have been shipped from the mill not more than three months previous to receipt on the Work. Manufacturer's certificate required.

B. Where the total Project is between 200 barrels and 800 barrels: Manufacturer's test and certificate of inspection conformance for each shipment shall be furnished except where, for special reasons, independent laboratory testing as for Condition C is required.

C. Where the total Project requirement exceeds 800 barrels; also, where cement other than a standard ASTM, or a Federal Specification Portland Cement, is used: Tests shall be made on the entire cement requirement by an approved independent laboratory on car samples, or bin (sealed) samples, as may be required. (ASTM Specification C150). Cement Testing shall be conducted under ASTM Specification C150 where not in conflict with Project Specifications.

9.3 AGGREGATES FOR USE IN CEMENT CONCRETES

A. Concrete aggregates shall conform to "Standard Specifications for Concrete Aggregates", ASTM Serial Designation C33.

B. In the absence of test records indicating suitability, or of a satisfactory service record for a period of 5 or more years, the test requirements for fine and coarse aggregates shall be made.

C. The maximum size of the aggregate shall not be larger than one-fifth of the narrowest dimension between forms of the member for which the concrete is to be used, nor larger than three-fourths of the minimum clear spacing between reinforcing bars.

9.4 FINE AGGREGATE

A. Conformity with ASTM C33. Tests shall be made periodically as the Work progresses to assure uniformity.

9.5 COARSE AGGREGATE

A. Conformity with ASTM C33.

9.6 SLUMP TESTS OF CONCRETE

A. Where 25 or more cubic yards of concrete are placed, also as necessary to maintain desired consistency of the concrete, a slump test shall be made per ASTM C143. Not less than one such test shall be made for each 50 cubic yards of concrete placed at one operation. Such test shall also be made on each sample of concrete used in making test specimens.

9.7 ADVANCE CONCRETE TESTS

A. Where more than 50 and less than 500 cubic yards are required: Before the start of concreting, make a single batch of a set of four standard 6-inch cylinders per ASTM C31 and cure. Test two at 7 days and two at 28 days per ASTM C39. Report as for “Concrete Control Test (Laboratory Curing)” below.

B. Where a total of more than 500 cubic yards of concrete is required: Advance tests of concrete shall be made in an independent laboratory in accordance with ASTM C39. Six standard 6-inch compression cylinders, three to be tested at 7 days and three at 28 days, shall be made with the proportioning and materials, including cement, of the type, brand and mill source proposed to be used in the major part of the Project. The slump should not be less than the greatest slump expected to be used in the structure. The tests made on aggregates, as required above, may be made a part of these tests if suitably referenced on the reports which shall be issued at 7 and 28 days to interested parties. These tests shall be repeated, if necessary, because of changes in materials or unsatisfactory results. Strength requirements will be stated in the Contract.

9.8 CONCRETE DESIGN MIX AND TESTS

A. The Contractor shall submit to the Owner for approval a design concrete mix by an approved commercial testing laboratory before placing any concrete.

B. All on-site concrete testing shall be at the Owner’s expense.

9.9 CONRETE CONTROL TESTS (LABORATORY CURING)

A. Where a total of more than 500 cubic yards of concrete is required: During the progress of the Work, and for each different mix of concrete, a set of two standard 6-inch concrete cylinders shall be made and tested, where from 25 to 100 cubic yards of concrete are placed, during each day’s operations. Also, an additional set of tests shall be made for each 100 cubic yards or major fractions thereof over and above the first 100 cubic yards. The cylinders of each set shall be molded from the same sample of concrete and tested 7 days or at 28 days, as may be specifically desired. ASTM C31 shall govern. Testing shall be done per ASTM C39.

9.10 REINFORCING STEEL

A. Where less than 50 tons are required: Field inspection for section, rust, shape and dimensions. Manufacturer’s certificate required.

B. Where 50 or more tons are required: Inspection and tests by an approved laboratory for conformance with governing specification.

9.11 STRUCTURAL STEEL

A. Where less than 100 tons are required: Field inspection for rust, dimensions, riveting, welding, painting, etc. Manufacturer's certificate required.

B. Where 100 or more tons are required: Mill and shop inspection by an independent laboratory.

9.12 STEEL BAR JOISTS

A. Where more than 100 joists are required: There shall be furnished the manufacturer's test data proving the efficiency of the design of his joists for the purpose intended, and in addition there shall be furnished certificates that the joists as furnished are in accordance with Project requirements and with the Standard Specifications for Steel Joists as given in the handbook "Steel Joists Construction" published by the Steel Joists Institute.

9.13 BRICK

A. Where less than 50,000 are required: Visual inspection as set forth in ASTM or other designated specification.

B. Where 50,000 or more are required: Visual inspection and tests, as set forth in ASTM or other designated specification, by an independent laboratory.

9.14 BUILDING BLOCK AND STONE

A. Where less than 1,000 pieces are required: Visual inspection as set forth in ASTM or other designated specification.

B. Where 1,000 or more pieces are required: Visual inspection and tests, as set forth in ASTM or other designated specification, by an independent laboratory.

9.15 CONCRETE SEWER PIPE

A. Inspection and testing, as set forth in ASTM or other designated specification, by an independent laboratory. Inspection shall be made at the factory, and each joint of approved pipe and fitting shall be stamped by the laboratory. Except when so specified in the Special Provisions, the supplier may use his own quality control program and provide an affidavit as to conformance with Contract requirements.

9.16 CAST IRON, DUCTILE IRON PIPE AND SPECIAL CASTINGS

A. Each piece of pipe shall bear the manufacturer's serial number and shall be certified by the manufacturer to have met the requirements of the governing Standard Specifications. Also, each piece shall be visually inspected in the field for Specification conformance.

9.17 OTHER MATERIALS AND EQUIPMENT

A. Materials other than the foregoing, including equipment, shall of course, also be suitably specified, and shall be inspected and tested to assure conformance with the Specifications and with manufacturer's certificates.

END OF SECTION

PART 3

MAWSS CONSTRUCTION SPECIFICATIONS

SECTION 10 – SPECIAL PROVISIONS

10.0 GENERAL

10.1 ALABAMA ACT NO. 84-228

A. Contractors shall comply with the requirement of Act No. 84-228 of the Legislature of the State of Alabama. Particular attention is directed to Section 2 of Act. No. 84-228 which requires submission of certain documents with the bid documentation and failure to submit such documents may be cause for rejection of the Contractor's bid.

B. As a convenience to bidders, the law is presented below; however, it shall be the Contractor's responsibility to satisfy himself as to the responsibilities under the law.
   1. ALABAMA LAW (Regular Session, 1984) - Act No. 84-228 - S. 135-Senators Foshee, and Teague - AN ACT

C. Relating to contracts and contractors; to give preference to resident contractors who bid on public work projects except where federal funds are involved.

D. Be it Enacted by the Legislature of Alabama:
   1. Section 1. In the letting of public contracts in which any state, county or municipal funds are utilized, except those contracts funded in whole or in part with funds received from a federal agency, preference shall be given to resident contractors and a nonresident bidder domiciled in a state having laws granting preference to local contractors shall be awarded Alabama public contracts only on the same basis as the nonresident bidder's state awards contracts to Alabama contractors bidding under similar circumstances; and resident contractors in Alabama as defined in Section 39-2-12, Code of Alabama 1975, be they corporate, individuals or partnerships, are to be granted preference over nonresidents in awarding of contracts in the same manner and to the same extent as provided by the laws of the state of domicile of the nonresident.
   2. Section 2 Nonresident bidders must accompany any written bid documents with a written opinion of an attorney at law licensed to practice law in such nonresident bidder's state of domicile, as to the preferences, if any or none, granted by the law of that state to its own business entities whose principal places of business are in that state in the letting of any or all public contracts.
   3. Section 3. A summary of this law shall be made a part of the advertised Specifications of all projects affected by this law.
   4. Section 4. The provisions of this Act are severable. If any part of this Act is declared invalid or unconstitutional, such declaration shall not affect the part which remains.
   5. Section 5. All laws or parts of laws which conflict with this Act are hereby repealed.
   6. Section 6. This Act shall become effective immediately upon its passage and approval by the Governor, or upon its otherwise becoming law.
      a. Approved April 30, 1984 Time: 4:30 P.M.

10.2 REVISIONS

A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to insure the latest and most current revision is applied to the project.

10.3 REFERENCED SECTIONS

A. Section 5 – Control of Work

B. Section 8 – Prosecution and Progress

C. Section 12 – Sanitary Sewer Standard Specifications

D. Appendix F – Project Sign Detail

E. Appendix I – Trench Widths and Paving Cut-Backs

10.4 REFERENCED CODES AND STANDARDS

A. State of Alabama Highway Department - Standards for Accommodating Utilities on Highway Rights-of-Way

B. Federal Specification QQ-B-71a – Steel for Concrete Reinforcement

C. AWWA C105 – Polyethylene Encasement for Ductile Iron Pipe Systems

10.5 SMALL AND SMALL UNDERUTILIZED BUSINESSES

A. The Board's Small and Underutilized Business office will assist Bidders upon request in meeting the requirements of the Contract.

10.6 STATE HIGHWAY OR RAILROAD PERMITS

A. Where a pipe is to be laid along or under a State Highway or railroad, the Contractor shall furnish the Highway Department or railroad company with bonds and insurance as required to secure a permit. The cost of bonds and insurance will be borne by the Contractor.

10.7 PERMITS, CERTIFICATES, LAWS AND ORDINANCES

A. The Contractor shall, at his own expense, procure all permits, certificates and licenses required of him by law for the execution of his work. He shall comply with all federal, state, and local laws, ordinances and rules and regulations relating to the performance of the Work.

B. The Contractor shall also comply with Ordinance 55-012 "An Ordinance Regulating All Excavation Work of Existing Streets and Improvements Within Public Rights-of-Ways," adopted by the Board of Water and Sewer Commissioners of the City of Mobile, Alabama, April 3, 1970.

10.8 WAGE RATES

A. The construction of said Project shall in all respects conform to all applicable requirements of federal, state and local laws and ordinances.

10.9 SEQUENCE OF OPERATIONS

A. The Contractor shall start at the point or points designated by the Owner and shall proceed with the sequence of construction as the Owner directs. The Contractor shall provide sufficient crews to lay pipe and complete the job within the time specified. In general, each line shall be laid, tested and placed in service before another line is started.

10.10 PROJECT DOCUMENTATION

A. General: Prior to start of construction, the project right-of-way or easement shall be documented by the use of photographs or videotapes. Pictures (photo or video), in color, shall be taken at 100 feet on centers and shall be taken along the centerline of the Project looking up station. At

least one station marker shall be visible for identification purposes and station markers shall be set up by the Contractor. During the course of documentation, any features or items of interest or importance which may be encountered shall be photographed or videotaped. Prints or tapes shall be delivered to the Engineer within one week after they are made.

B. Photographs: Clear, legible photographs shall be taken by a skilled technician using a wide angle lens. Each photograph shall be identified on the back with Project number, location, date and time of day that photograph was taken. One color print approximately 4” x 6” and the negative shall be delivered to the Engineer.

C. Videotapes: The purpose of the videotape recordings shall be a supply of continuous visual and audio record of problem areas, items, and features found within any particular area. This videotape record may be supplemented with photographs to exactly identify and locate specific bad features or items.
   1. The videotape recordings shall be capable of recording and reproducing a picture having not less than 500 lines of resolution. The videotape recorder shall be one on which both sound and video information can be recorded utilizing a VHS video cassette system. The videotape recording shall be made on magnetic tape which shall produce a visual image equal to or better than the quality of the picture on a television monitor. The replay of the recorder video information, when reviewed on a monitor/receiver, shall be free of electrical interference and shall produce clear, stable images. To ascertain that the equipment to be used in this Work meets the stated minimum requirements, a videotape of a suitable test pattern will be required prior to initiation of Work.
   2. The audio portion of the composite signal shall be sufficiently free of electrical interference and background noise to provide an oral report that is clear and completely and easily discernible. The audio portion of the tape report shall be recorded by the operating technician on the audio-video tapes as they are being produced and shall include the location or identification of the section being viewed, the station-to-station direction of travel, the distance traveled on the specific run, and any problems encountered.
   3. Videotape recordings shall be enclosed in a vinyl plastic container which shall clearly indicate the date the tape was taken, and the designated section(s) of the Project contained on the tape.
   4. There shall be no separate payment for photographic and/or videotape work.

10.11 REPORTS, RECORDS AND DATA

A. The Contractor and each of his subcontractors shall submit to the Owner such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records, and other data as the Owner may request concerning work performed or to be performed under this Contract.

10.12 SIGNS

A. Before starting and during construction on any Project, the Contractor shall place at both ends of the section signs approximately 8 feet long by 4 feet high. The signs shall be worded approximately as shown in Appendix F.

10.13 CONSTRUCTION WITHIN STATE HIGHWAY RIGHT-OF-WAY

A. The requirements of the State of Alabama Highway Department “Standards for Accommodating Utilities on Highway Rights-of-Way” are hereby made a part of these Specifications for all utility construction within rights-of-way for roads or highways under the jurisdiction of the State of Alabama Highway Department.

10.14 CUTTING OF TREES WITHIN PUBLIC RIGHTS-OF-WAY

A. The Contractor shall obtain a permit from the Mobile Tree Commission prior to trimming or removing any trees located within public rights-of-way. When large tree limbs and roots are encountered, the Contractor shall take precautions to protect by tunneling, or pushing the pipe under the roots so as not to damage them. No additional payment shall be made for this Work, but it shall be included in the unit price bid for related items.

10.15 DEWATERING

A. The Contractor shall remove any water which may be found or may accumulate in the trenches and shall perform all work necessary to keep them clear of water while the foundations are being laid, the masonry being constructed, or pipe laying is in progress. Such removal shall be accomplished by means of a well point system or other approved means. Comprehensive plans for dewatering operations, if used, shall be submitted prior to installation. No extra payment will be made for dewatering.

10.16 WEATHER CONDITIONS

A. In the event of temporary suspension of work or during inclement weather, or whenever the Owner shall direct, the Contractor will, and will cause his subcontractor to protect carefully his and their Work and materials against damage or injury from weather. If any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors to protect his work, such materials shall be removed and replaced at the expense of the Contractor.

10.17 LOCKS AND KEYS

A. All locks to be furnished under this Contract shall be keyed alike and 5 keys shall be delivered to the Engineer for distribution to the Owner. Padlocks shall be furnished by the Owner except where noted otherwise on the Plans and in these Specifications.

10.18 TIGHTNESS OF WATER CONTAINING WALLS

A. All basins and tanks are hydraulic structures and shall be watertight. Each tank shall be filled with water to full depth and kept full 24 hours for observation. The Contractor shall exercise every precaution to secure watertightness by careful mixing and placing of the concrete so as to obtain a homogeneous mixture at maximum density, without air pockets or voids, using the minimum practical amount of water in the mix. Extreme care shall be used to secure continuity of water stops at expansion and construction joints, sealing off holes from wall ties, etc., and thoroughly placing concrete about wall sleeves, wall pipes and other obstructions. The Contractor shall fix all leaks. The Contractor shall furnish test water at his own expense.

10.19 EXTENSION OF CONTRACT TIME

A. Unless specifically waived by the Owner, when an extension of contract time is granted by the Owner to the Contractor to complete the Work under this Contract, the Contractor shall pay any additional engineering Cost or other Cost accrued to the Owner as a result of the extension of time granted.

B. The requirements of Specification Paragraph 5.14, Paragraph 5.15 and Paragraph 8.10 will be strictly adhered to upon completion of the Work.

10.20 CLEAN-UP

A. The job shall be kept clean at all times. Loose dirt shall not be allowed to clog ditches or cover sidewalks. Soft clay or other undesirable material removed from the trenches shall be removed from the streets, sidewalks or ditches. The Owner reserves the right to demand that the Contractor's forces be diverted to this clean-up at any time that condition of streets, driveways, sidewalks, or private property warrants such diversion. Such diversion of Contractor's forces will not entitle the Contractor to any extension of time or additional compensation.

10.21 BRANDS OF EQUIPMENT AND MATERIALS

A. When referenced the name of a certain brand, make or manufacturer is to denote the quality standard of the equipment or material, and is to convey the general style, type, character and quality. Whenever a material or article required is specified or shown on the Plans by using the proprietary product or of a particular manufacturer or vendor, any material or article which will meet the design criteria and is equal in function and durability as determined by the Engineer will be considered.

10.22 AFFIDAVIT OF COMPLIANCE

A. Suppliers of pipe and fittings shall furnish in triplicate to the Owner, an affidavit stating that all pipe and fittings furnished under this Contract conform to the requirements as set forth in these Specifications. Unless specified otherwise, all materials shall be new, unused and without defect.

10.23 SUPERVISION OF INSTALLATION AND THE GUARANTEE

A. The Contractor shall employ a factory trained engineer to supervise the installation and alignment of all items of mechanical and electrical equipment. He shall see that all items of equipment are installed, piped, and wired, meeting the requirements of the Plans and Specifications and in accordance with the manufacturer's recommendations. The Contractor shall place all equipment in satisfactory operation and demonstrate such. The Contractor shall guarantee the satisfactory operation of all apparatus and machinery against defects in workmanship, material, and installation for a period of one year from the date of final acceptance. The Owner will give notice of observed defects with reasonable promptness and the Contractor shall remedy any defects in the Work and pay for any damage to other work resulting therefrom. Neither the final certificate of payment nor any provision in the Contract Documents nor partial or entire use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract Documents, or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

B. The manufacturer's representatives shall submit to the Engineer in writing a document stating the Contractor has installed the equipment properly and in accordance with the manufacturer's recommendations.

10.24 MANUFACTURER'S CERTIFICATION

A. To assure that manufacturers and suppliers are aware of the use to which their equipment and products will be subjected, the Contractor shall require the manufacturer or manufacturer's representative to place the following certification on submittal data transmittals:
   1. "This is to certify that we have examined the Plans and Specifications for this Project and have ascertained that this equipment or material is suitable for the Purpose and use intended. _____ Authorized Signature"

10.25 MAXIMUM TRENCH WIDTH

A. The maximum trench widths set the limit of payment for various items listed in Paragraph 10.1.26, “Basis of Payment and Method of Measure.” The maximum trench widths and typical paving cut-backs which are applicable to these Specifications are shown in Appendix I.

10.26 BASIS OF PAYMENT AND METHOD OF MEASURE

A. General: The unit price bid for the various items shall be compensation in full for furnishing all materials, labor, equipment, and incidentals for the item in place complete in every detail. There will be no direct payment for clearing, excavating, bracing, caulking, backfilling, clean-up, restoration of property, testing or other items of work necessary for the installation of the item, with the exception of the removal and replacement of pavement as paid for under a separate item.

10.27 SPECIAL HANDLING OF PURCHASE ORDERS

A. The Board of Water and Sewer Commissioners is exempt from City, County, State and Federal sales tax for any hardware, equipment, and materials purchased for the installation of Capital projects. Contractors shall take this into consideration when preparing bids for capital projects. To ensure there are no taxes charged, Contractors are directed to do the following:

B. Contractor shall contact the Alabama Revenue Department and apply for a tax exempt certificate for the specific project. The phone number for the Mobile office is 334-344-4737. The web site that explains the rules and regulations for tax exemption is www.ador.state.al.us, rule number 810-6-5.02.
   1. Contractor shall mail copies of the tax exempt certificate to all suppliers of all hardware, equipment, and material.

C. Contractor shall state on each purchase order to the supplier that material, equipment, and hardware for installation owned and operated by the Board of Water and Sewer Commissioners of the City of Mobile are exempt from County and State sales tax as per the number on the certificate of exemption.

10.28 BYPASS PUMPING

A. The Contractor shall submit three (3) copies of a Bypass Pumping Plan as required in Section 12.1.26 to the Engineer for review prior to proceeding with bypassing operations. Bypassing operations shall not commence until a Bypass Pumping Plan is reviewed by the Engineer.

B. The Contractor shall be responsible for and shall indemnify and hold the Owner harmless for any sanitary sewer overflow occurring as the result of the work performed. The Contractor is responsible for any sewer discharge to the surface due to failure in bypass hose, piping or other equipment. Any discharge from air release valves shall be contained. The Contractor shall ensure that raw sewage will not spill on the ground or into any bodies of water, channel, or conduits of conveyance of storm water during the performance of this work. Prior to removal of the bypass pumping pipe, the Contractor shall empty all sewage into the sewer system. The Contractor is responsible for and shall indemnify and hold the Owner harmless for any sanitary sewer discharge to the environment due to a failure in the equipment and/or bypassing operation.

C. In the event of a sanitary sewer overflow, the Contractor shall contact the Owner’s representative immediately and complete the Contractor Unpermitted Discharge Reporting Form provided by the Owner. If there is a sanitary sewer discharge to the environment due to a failure in the equipment and/or bypassing operation, the Contractor shall reimburse the Owner

all costs related in any way to compliance with laws, regulatory requirements, and/or court orders and decrees associated with the overflow or discharge event. The costs include, but not limited to, water quality monitoring, signage, cleanup, fines, legal fees, claims, and reporting. In the event that the peak flows during the bypass pumping operation exceed the projected peak flow figures previously provided by the Owner and a sanitary sewer overflow event occurs when the Contractor's equipment is operating correctly, the Contractor will not be held liable for the sanitary sewer overflow or discharge.

D. The Contractor shall be liable for and shall indemnify and hold the Owner harmless for any other claims made as a result of the sanitary sewer discharge or sanitary sewer overflow due to a failure in the equipment and/or bypassing operation and shall be responsible for all requirements imposed by the regulatory agencies. In addition, the Contractor shall provide notification consisting of one (1) quarter page advertisement published in the Mobile Register within 3 days of the sanitary sewer overflow. The advertisement shall be written in a manner reasonably designed to inform fully the customers of the Owner. The notice shall be conspicuous and shall not use unduly technical language, unduly small print or other methods which would frustrate the purpose of the notice. The notice shall disclose all material facts regarding the subject including the amount of the overflow, when the overflow occurred, any potential adverse health effects, the population at risk, reasonably known methods of mitigation known, and steps being taken to mitigate problems with the by-pass pumping operation. Each notice shall contain the name, business address, and telephone number of the Contractor.

END OF SECTION

SECTION 14 – REMOVING AND REPLACING PAVEMENT

14.0 GENERAL

14.1 SCOPE

A. These specifications form a part of the Contract Documents and shall govern for removing and replacing pavement for sanitary sewers, water mains and sewage pumping stations. All Work shall be in accordance with the State of Alabama Highway Department (SAHD) Standard Specifications for Highway Construction, latest edition. Centerline stripes or other pavement markings which existed prior to start of construction shall be replaced. No separate payment will be made for striping or marking.

B. The term “pavement” shall be construed to mean either concrete, bituminous, cobblestones, or brick placed as a wearing surface in streets, driveways, or sidewalks; or placed as slope protection for ditches or drains. Shell surfacing, sand-clay surfacing, gravel surfacing and other such types of surfacing will not be considered paving and will not be paid for as such.

C. The various types of pavement replacement and method of payment shall be as hereinafter specified. The specific type or types of pavement replacement for each project will be as indicated on the Drawings or as noted in the Proposal.

14.2 REVISIONS

A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to insure the latest and most current revision is applied to the project.

14.3 REFERENCED SECTIONS

A. Section 15 – Backfilling

14.4 REFERENCED CODES AND STANDARDS

A. State of Alabama Highway Department Standard Specifications
   1. Plant Mix Bituminous Base
   2. Bituminous Concrete Wearing Surface
   3. Bituminous Concrete Plant Mix, Patching
   4. Portland Cement Concrete Pavement

14.5 MATERIALS

A. Materials of this Section shall be as specified herein.

14.6 REMOVING AND REPLACING PAVEMENT:

A. Base Course for Flexible Pavement: Base course shall conform to Section 15 entitled “Backfilling”.

B. Replacement of Flexible Pavement: As soon as possible, and no later than 30 days, after the trench has been backfilled in accordance with Section 15 entitled “Backfilling”, the following procedures shall be followed:
   1. Preparation – Jagged edges of the pavement shall be squared and cut to a neat line with an appropriate saw. The edges of the pavement shall be cut along straight lines parallel

to the center of the pavement cut. The trench shall be shaped to receive the permanent base and bituminous wearing surface. As specified herein.

2. Base – After the pipe trench has been backfilled and compacted in accordance with Section 15 entitled “Backfilling”, bituminous base, 5 inches compacted thickness (8 inch compacted thickness at 2 to 4 inch lifts shall be required in Mobile County right-of-way), complying with “Plant Mix Bituminous Base, of the SAHD Specifications, latest edition, shall then be installed. Bituminous base shall be installed the width of trench plus paving cutback of 9 inches on each side of the trench, (within State right-of-way the bituminous base shall extend 12 inches beyond the sides of the trench), and shall be compacted to 100 percent maximum density. Bituminous base for patch surfacing shall be finished off 1-1/4 inches (or 1-1/2 inches in State and Mobile County right-of-way) below the surface of the existing pavement and to the shape of the original pavement. Bituminous base for full width street surfacing shall be installed flush with the existing bituminous surface treatment. Care shall be taken to seal the edges of the trench. In State and Mobile County right-of-way, the trench shall then immediately be prepared for bituminous wearing surface, and the bituminous base shall be maintained until surfacing is applied. In other than State and Mobile County right-of-way, the patched area shall then be maintained for a period of one to six months. If after a one month period no settlement problems occur, the Contractor may upon approval of the appropriate agency install the bituminous wearing surface. Note: Where the Bituminous base for patch surfacing is finished off 1-1/4 inches below the surface of the existing pavement, the top 1-1/4 inches, to existing surface, shall be filled with processed reef shell base in accordance with SAHD Specifications, latest edition, and maintained during the weathering period.
3. Bituminous Wearing Surface for Patch Surfacing – If required, the trench shall be leveled and prepared for resurfacing. In the State right-of-way, the width of the surface course shall extend 6 inches beyond the bituminous base on each side. A tack coat using SS1 or SS1h emulsified asphalt shall be applied to the full trench width. After proper curing, the trench shall be surfaced full width using 1-1/4 inches (or 1-1/2 inches in State and Mobile County right-of-way) of “Bituminous Concrete Wearing Surface”, in accordance with SAHD Specifications, latest edition.
4. Bituminous Wearing Surface for Full Width Street Surfacing – If required, the roadway surface shall be leveled and prepared for surfacing. A tack coat using SS1 or SS1h emulsified asphalt shall be applied to the full roadway width. After proper curing, the entire roadway within the Project limits shall be resurfaced with 1-1/4 inches of “Bituminous Concrete Wearing Surface”, in accordance with SAHD Specifications, latest edition.
5. Certification – Any pavement failure that occurs during the warranty period shall be replaced at the Contractor’s expense, including removing and replacing subgrade material if necessary. A letter of certification shall be required from the testing lab, verifying that the materials used meet the above Specifications.
6. Testing - Testing laboratory services shall be paid for by the Owner.
7. Time Charges – Upon completion of the bituminous base course, where applicable, time charges will be stopped on pavement work only and will not resume until the placement of the wearing surface is resumed or at the end of six months, whichever occurs first.

C. Replacement of Concrete Pavement: As soon as possible, and no later than 30 days, after the trench has been compacted in accordance with Section 15 entitled “Backfilling”, the following procedures shall be followed:

1. Preparation – Existing pavement shall be cut back a minimum of 9 inches from the edge of the trench with an appropriate saw. The edges of the pavement shall be sawed along straight lines parallel to the center of the pavement cut. In the event that a crack exists in the pavement within 2 feet of the saw cut, the width of pavement to be removed shall be widened to include the crack in the removal and replacement, and the saw cut shall be made parallel to the centerline of the street behind the crack between existing transverse pavement joints.

2. Temporary Asphalt Patch – The top 2 inches of backfill material shall then be removed and a temporary asphalt patch, (complying with “Bituminous Concrete Wearing Surface” or “Bituminous Concrete Plant Mix, Patching” of the SAHD Specifications, latest edition), shall be installed and maintained for a period of one to six months. If after one month period no settlement problems occur, the Contractor may upon arrival of the appropriate agency, install the final concrete patch.
3. Concrete Patch – If required the trench shall be leveled and prepared for resurfacing. The top 6 inches of material shall be removed from the trench, the subgrade material prepared, and the final concrete patch installed. Concrete used in the patch shall comply with “Portland Cement Concrete Pavement” of the SAHD Specifications, latest edition. All steel reinforcement shall be spliced according to acceptable standards. Concrete finish shall match the finish of the existing concrete pavement. Note: Concrete patch work within Mobile County right-of-way, subject to vehicular traffic, shall have an 8 inch compacted thickness, at 2 to 4 inch lifts, sand-clay base. Cost for this base course shall be included in the cost for the concrete patch.
4. Certification – Any pavement failure that occurs during the warranty period will be replaced by the Contractor at his expense, including removing and replacing subgrade material if necessary. A letter of certification shall be required from the testing lab (if located within the City of Mobile right-of-way, a copy shall be submitted to the City Engineer), verifying that the installation and materials used in the patch meet the above Specifications.
5. Testing – Testing laboratory services shall be paid for by the Owner.
6. Time Charges – Upon completion of all of the temporary asphalt patching, time charges under this Contract shall be stopped and will not resume until the Work resumes for placing of the final concrete pavement, or after the six months waiting period, whichever occurs first.

D. Replacing Concrete Sidewalk or Ditch Paving:
1. Replacement of Concrete Sidewalks or Ditch Paving – After the trench has been compacted in accordance with the Section 15 entitled “Backfilling” the following procedure shall be followed:
    a. Replacing Concrete Sidewalk or Ditch Paving: Where concrete sidewalks or paved ditches are removed, they shall be replaced with the same type and thickness as that removed including finish. Sidewalks shall be provided with expansion joints, and shall be constructed of 3,000 psi, minimum, concrete.

END OF SECTION

SECTION 15 – BACKFILLING

15.0 GENERAL

15.1 SCOPE

A. These Specifications form a part of the Contract Documents and shall govern the backfilling requirements for water mains, sanitary sewers and sewage pumping stations.

15.2 REVISIONS

A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to insure the latest and most current revision is applied to the project.

15.3 REFERENCED SECTIONS

A. Section 16 – Erosion Control

15.4 REFERENCED CODES AND STANDARDS

A. AASHTO T99 – Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-pound) Rammer and a 305-mm (12-inch) Drop

B. State of Alabama Highway Department Specifications – Soil, Soil Aggregate, and Aggregate, Base and Sub-Bases

C. ASTM C150 – Standard Specification for Portland Cement

D. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcinated Natural Pozzolan for Use in Concrete

E. ASTM C33 – Standard Specification for Concrete Aggregates

F. ASTM D4832-88 – Standard Specification for Preparation and Testing of Controlled Low Strength Material (CLSM) test Cylinders

G. ASTM C403 – Standard Specification for Time of Setting of Concrete Mixtures by Penetration resistance [List other product-specific handling requirements]

15.5 MATERIALS

A. Materials of this Section shall be as specified herein.

15.6 BACKFILLING

A. Examination Prior to Backfilling: Before backfilling any trench, the Contractor's foreman shall examine the completed line and all joints and shall correct any deficiencies that exist.

B. Curing of Concrete: No trenches or excavations shall be backfilled until concrete in the structures placed therein has acquired a suitable degree of hardness, and the Work shall be prosecuted expeditiously after it has commenced.

C. Overcutting: Overcutting of trench bottom shall be backfilled at the Contractor's expense with select material from the excavations and compacted to not less than 95 percent maximum density as determined by AASHTO T99 prior to placing of pipe. Select material shall be granular soil free from rock, grass, wood or other deleterious material. If in the opinion of the Owner or the Owner's representative, the material from the excavation is not considered to be satisfactory for backfill, the overcut shall be backfilled with crushed slag, crushed stone, or reef shell and separate payment will be made therefore, except where overcut is caused by the Contractor's operations or for his convenience. Crushed slag, crushed stone or reef shell shall be as specified in Section 16 entitled "Erosion Control."

D. Overcutting of Sanitary Sewer Manholes: Overcut in depths of manholes shall be backfilled with concrete. The minimum compressive strength of the concrete required at 28 days is 3,000 pounds per square inch.

E. Initial Backfill: After the pipe has been installed, select material from the excavation shall be placed alongside the pipe in layers not exceeding 4 inches in depth to a depth of at least 2 feet above the top of the pipe. Select material shall be specified above for filling overcut. Care shall be taken to insure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted by hand tamping with iron tampers, the tamping face area of which shall not exceed 50 square inches, to not less than 90 percent maximum density as determined by AASHTO T99. All material shall be deposited carefully in the trench to avoid damaging the pipeline. The operation of heavy equipment shall be conducted so that no damage to water or sewer lines will result.

F. Final Backfill: The remainder of the trench above an elevation of 2 feet higher than the top of pipe shall be backfilled with material from the excavation. Mechanical backfilling will be permitted providing material being placed with dragline or crane has a free fall of not greater than one foot from the bucket. The manner of placing and the degree of compaction shall be as specified hereinafter:

1. Fields and Open Country: The backfill above a point 2 feet above the top of the pipe shall be placed in the trench until full. The remaining earth shall be placed on top of the trench and dressed by the Contractor until it settles. At the completion of the job, all excess dirt shall be leveled and disposed of by the Contractor.

2. Backfill Under Pavement Other Than State Highways, Mobile County Road Right-of-Way or City of Mobile Right-Of-Way: Backfill under all existing or proposed pavement for streets, sidewalks, or roadways, except pavement under the jurisdiction of the State Highway Department, State Department of Transportation, the County of Mobile or the City of Mobile shall be backfilled as hereinafter specified. After the pipe has been backfilled to a point 2-feet above the top of the pipe, the remainder of the trench shall be backfilled to the ground surface with material from the excavation. Backfill shall be placed in uniform layers not exceeding 6-inches in thickness except that material may be placed in thicker layers where the Contractor can demonstrate that the procedures used can produce the required compaction results.

    a. The trench from 2-feet above the top of the pipe to within 2-feet of the top of the trench shall be compacted to not less than 90 percent maximum density as determined by AASHTO T99. The remainder of the trench to within 8-inches of the finish grade shall be compacted to not less than 95 percent maximum density as determined by AASHTO T99. The top 8-inches of the trench shall be compacted to not less than 100 percent maximum density as determined by AASHTO T99. Where pavement is not replaced, the top 6-inches of backfill shall be of a select granular material from the excavation.

3. Backfill Under Pavement of State Highways – Backfill under all existing or proposed pavement under the jurisdiction of the State Highway Department or State Department of Transportation shall be backfilled with material from excavation. The backfill procedures

and degree of compaction shall be in accordance with applicable portions of the latest edition of the SAHD Specifications or State Department of Transportation having jurisdiction, except for compensation which shall be as specified herein. Where pavement is not to be replaced, the top 6-inches of backfill shall be of a select granular material from the excavation.

4. Backfill Within Mobile County Road Right-Of-Way – Backfill for all work within Mobile County Road right-of-way shall be placed in accordance with all applicable provisions of the SAHD Specifications, latest edition. Backfill for all excavation performed within 8 feet or less than the edge of pavement or edge of traveled way, in the case of unpaved roads, shall be placed at not less than 95 percent maximum density as determined by AASHTO T99. Fill shall be placed in lifts not exceeding 12-inches in depth, compacted to the required density. The Contractor shall obtain density tests for all work done within the 8-foot dimension. Density tests shall be performed by a testing laboratory approved by the Owner and the County Engineer. The Owner will pay for initial testing. In the event of inadequate compaction, the Contractor will pay for subsequent density testing. Density requirements for backfill outside the 8-foot dimension shall not be less than 90 percent maximum density as determined by AASHTO T99. Testing in these areas may be waived if the County Engineer's representative determines that the backfill is being placed properly and approves waiving the testing requirements.

5. Backfill Within City of Mobile Right-Of-Way – All trenches shall be backfilled with select, stable material which can be compacted to the specified density. The backfill material shall be compacted at near optimum moisture content, in layers not exceeding 24-inches compacted thickness, to a density of not less than 95 percent maximum density as determined by AASHTO T99. Mechanical tampers shall be used unless another method is approved. Flooding or jetting will not be permitted. The backfill shall be brought up evenly on both sides of the pipe to the top of the subgrade elevation. A crusher run stone or sand-shell base course, 6-inches minimum compacted thickness, in accordance with "Soil, Soil Aggregate, and Aggregate, Base and Sub-bases" of the SAHD Specifications, latest edition, shall then be constructed. The top 1-1/2 inches of the trench shall then be filled with bituminous wearing surface mixed flush with the road surface, and maintained continuously until the applicable pavement replacement procedure has begun. Compaction tests will be required by a certified testing lab at 2-foot increments vertically and at sufficient intervals along the trench to verify that density requirements have been met. A copy of the laboratory reports and compaction test shall be given to the Owner and the City Engineer. The compaction tests will be performed by a laboratory selected by the Owner and payment for such tests will be made by the Owner.

6. Flowable Backfill – This shall be used as a backfill material in cases where traffic can only be closed for a short period of time. It will only be used when directed by the Engineer. Flowable backfill shall be made from a mixture of cement (ASTM C150, Type II), fly ash (ASTM C618, Class C), sand (ASTM C33) and water having a compressive strength of not more than 500 psi. The strength of the material shall be tested by following the procedures given in ASTM D4832-88. A penetration resistance test (ASTM C403) can assess the setting and early strength development of the backfill. This test will be used to determine if the fill is ready to be covered with a patch or strong enough to support equipment, traffic or construction loads. Tests will be required by a certified testing lab at sufficient intervals along the trench to verify that all requirements are met. A copy of the laboratory reports and tests will be given to the Engineer.

G. Sand: Flooding or jetting will be permitted, unless specified otherwise, where the clay and silt content of the backfill material is low enough to permit this method of consolidation. When allowed, this method will be used from a point 2-feet above the top of the pipe to the original ground line except under state highways, county roads or with City of Mobile streets and right-of-way.

H. Muck: In fields and open country, flooding or jetting will be permitted or required where the clay and silt content or water content is so high as to make tamping ineffective. Flooding or jetting will be confined to that portion of the trench starting 2-feet above the top of pipe and ending 2-feet below the original ground surface. The last 2-feet shall be backfilled with selected earth and shall be mechanically rolled or tamped to the degree of compaction of the surrounding ground.

I. Deficiency of Backfill, by Whom Supplied: Any deficiency in the quantity of material for backfilling the trenches, or for filling depressions caused by settlement, shall be supplied by the Contractor at no cost to the Owner.

15.7 BACKFILLING FOR SEWAGE PUMPING STATIONS

A. General: Backfill over, under and around pipes and structures shall be of selected material placed and tamped and compacted in a manner and by methods that will avoid unbalanced loading, and that will not cause movement or undue strain on any pipe or structure. The fill placed against or immediately adjacent to pipes, or structures shall be built in horizontal layers not exceeding 6-inches loose and must be compacted by approved mechanical tampers. The density of each layer of material composing the backfill shall be not less than 95 percent of the relative maximum density as determined by the AASHTO Compacting Test T99. Each layer of backfill material which does not contain sufficient moisture to compact thoroughly shall be sprinkled and mixed with water as directed. Material containing excess moisture shall be permitted to dry out to proper consistency before compacting is attempted. No muck or unsuitable material shall be used in the backfill.

B. Deficiency of Backfill or Fill: In the event that existing material from the excavation is insufficient to bring the pumping station site to the lines and grades shown on the Plans, additional select material shall be provided by the Contractor from his own source. The select material shall be granular soil containing not more than 15 percent passing the 200 mesh sieve, except that the top 4-inches shall be topsoil as specified in Section 16 entitled “Erosion Control”. No separate payment will be made for the additional backfill or fill required.

C. Excess Material: After backfilling, excess material shall be removed and disposed of by the Contractor off the site.

END OF SECTION

SECTION 16 – EROSION CONTROL

16.0 GENERAL

16.1 SCOPE

A. These Specifications form a part of the Contract Documents and shall govern the erosion control requirements for water mains, sanitary sewers, sewage pumping stations, and appurtenances. These Specifications, in addition to applicable regulatory requirements, shall be accommodated to ensure that the lands in the construction project area are not adversely affected as a result of the constructed improvements.:

16.2 REVISIONS

A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to insure the latest and most current revision is applied to the project.

16.3 REFERENCED SECTIONS

16.4 REFERENCED CODES AND STANDARDS

A. State of Alabama Department of Transportation Standard Specifications for Highway Construction

B. ASTM G94 – Standard Guide for Evaluating Metals for Oxygen Service

16.5 EROSION CONTROL AND PROPERTY PROTECTION

A. The Contractor shall adhere to the following provisions at all times for the related construction and maintenance activities:

B. Flow of Drains and Sewers Maintained:
1. Adequate provisions shall be made for the flow of sewers, drains and watercourses encountered during construction. Lines and structures disturbed during construction shall be immediately restored to their original condition.

C. Property Protection: Trees, grass, fences, signboards, poles and all other property shall be protected unless their removal is authorized. Any property damage shall be satisfactorily restored by the Contractor.

D. Maintenance of Erosion Control Measures: The Contractor shall at all times take necessary precautions to prevent erosion or transportation of soil due to natural or induced water flows. Spoil banks and soil stockpiles shall be contained to prevent transportation of soil by run-off waters. All temporary erosion control measures installed and paid for shall be properly maintained for the entire duration of construction. Failing to maintain these structures will be grounds for the Engineer to recommend to the Owner the halting of construction until the measures are properly restored.

E. Topsoil: The Contractor shall remove a minimum of 4 inches of existing grass and topsoil from within the limits of the new construction. Topsoil obtained from this stripping operation that meets or exceeds topsoil requirements in Section 16.1.06.J shall be stockpiled on the site in areas approved by the Engineer. Stripped material not suitable for use as topsoil or embankment material shall be disposed of away from the construction site by the Contractor at

no cost to the Owner. The stockpiled topsoil from the stripping operation shall be used to cover disturbed areas of construction to a minimum thickness of 2 inches, prior to temporary and permanent grassing.

F. Grading: The Contractor shall perform grading of every description regardless of the character of material encountered, within the limits and to the lines and grades shown on the Plans. Minor changes in grades shown on the Plans may be required to allow for final grassing, soil stabilization, and drainage as the work progresses.

G. Permits: The NPDES permit applications will be completed by the Engineer. It will be the Contractor's responsibility to submit this permit application to ADEM and pay necessary fees, unless otherwise specified. Construction shall not begin until all applicable permits have been obtained. The Contractor shall comply with all provisions of construction permits obtained. Contractor shall indemnify Owner in event there is a failure to comply with all provisions of NPDES permit.

16.6 MATERIALS AND CONSTRUCTION REQUIREMENTS

A. Erosion Control Plan (Item No. EC-1): The purpose of the Erosion Control Plan is to ensure the Contractor's compliance with state and federal non-point source pollution legislation. Prior to commencement of construction, the Contractor shall submit a detailed erosion control plan to the Engineer for approval. The Contractor shall be responsible for providing a general location drawing of the project with the following items clearly indicated:
   1. Locations where construction limits will adjoin or cross drainage paths,
   2. Locations where materials for construction will be stockpiled including soils, aggregate, piping, manholes, etc., and
   3. Proposed erosion control measures to be employed at the locations identified in (1) and (2) above. These erosion control measures shall include those measures expressly required on the Plans as well as additional Best Management Practice (BMP) items that were included as contingency in the Plans.
      a. The Engineer will recommend payment of this item upon receipt of an acceptable Erosion Control Plan. Should the Engineer find the submitted Erosion Control Plan unacceptable, the Contractor shall resubmit the Erosion Control Plan incorporating any comments from the Engineer.
      b. Maintenance and erosion control of the construction site is the sole responsibility of the Contractor at all times during the construction and maintenance periods.

B. Temporary Grassing for Erosion Control (Item No. EC-2): As directed on the Plans, the Contractor shall seed the project according to these seeding requirements. Temporary grassing shall be installed in all areas of the project where clearing and grubbing will be completed at least seven (7) days before the installation of the sewer/water lines. Temporary grassing shall take place immediately after the clearing and grubbing operations in order to reduce the erosion from the construction location.
   1. General: The disturbed areas shall be temporarily grassed for erosion control as hereinafter specified. The disturbed areas shall be prepared for grassing by grading and removing and disposing of roots, stumps, or other materials which might be harmful to grass growth. Topsoil shall be spread over the entire area to be grassed to the extent that topsoil along and adjacent to the trench lines is available.
   2. Seeding: The areas to be grassed shall be seeded with quality seed in the following minimum quantities per acre:
      a. Kentucky 31 Fescue 34 pounds
      b. Common Bermuda 10 pounds
      c. White Dutch Clover 10 pounds
      d. In some areas, it may be necessary to vary the concentrations of various seed to suit local conditions and the Owner reserves the right to change proportions of the

various seed so long as the total amount of seed does not exceed 74 pounds per acre at no change in Contract Price.

e. Seed shall be broadcast with hand-operated equipment. When broadcast, seed shall be sown over the areas and raked or dragged and covered to the desired depth. Hydro seeding may, at the Contractor's option, be used in lieu of the above.

f. Unless specifically noted otherwise, Pensacola Bahia shall not be used.

g. When the grassing operation is accomplished after the month of August and before the month of March, in addition to the seeding as outlined above, the entire grassed areas shall also be overseeded with Italian Rye Grass Seed at the uniform rate of 40 pounds per acre at no additional cost to the Owner.

3. Maintenance: The Contractor shall obtain a stand of grass and maintain all temporarily grassed areas until permanent grassing is performed. A satisfactory stand of grass is defined as a cover of living grass in which gaps larger than 12 inches do not occur. Maintenance shall consist of watering, preserving, protecting, replacing dead grass, filling washes and generally maintaining the area until final grassing occurs.

C. Silt Fence (Item No. EC-3): Silt fences shall be constructed at locations approved by the Engineer and installed in accordance with the State of Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition Type A or Type B, as specified on the Plans, shall be provided by the Contractor.

D. Hay Bales (Item No. EC-4): Hay bales shall be a native hay or any other approved material. The bales shall be securely anchored by the use of stakes and wire or other approved method.

E. Temporary Steel Sheet Pile for Erosion Control (Item No. EC-5): All construction for this item shall be in accordance with the State of Alabama Department of Transportation Standard Specifications for Highway Construction, 1992 Edition, Section 505, Piling. Sheet piling shall be used in locations where the stockpiling of materials or the existing banks of watercourses are unstable and potential erosion could occur due to a storm event. The temporary sheet pile structure shall be installed prior to the Contractor constructing a stockpile of material that is erodible or moving equipment on or near an unstable bank. The temporary sheet pile structure shall be left in place until either (1) the stockpile of material has been removed, or (2) No more construction or equipment will be in the vicinity of the unstable watercourse bank.

F. Turbidity Barriers (Item EC-6): Turbidity barriers shall be utilized in locations where specifically required by the Engineer and installed in accordance with the manufacturer's recommendations.

1. Materials: Turbidity barriers shall be composed of polyester reinforced vinyl laminate and shall be Tough Guy floating or staked turbidity barriers as manufactured by AER-FLO Canvas Products, Inc., or approved equal.

2. Installation: Installation shall be in accordance with the manufacturer's specifications. Terminal end anchor points should be located well out of the range of the watercourse on shore and must be strong enough to hold the barrier in place throughout the construction period.

3. The method of furling shall be used to aid in installation and removal of the turbidity barrier, in all cases where the barrier is to be installed in a watercourse. Furling is accomplished by placing light polyester rope ties around the curtain from top to bottom at approximately five (5) feet intervals. Since furling the barrier will also expedite its removal after the work is finished, the lines should be left in place.

G. Clearing and Grubbing (Item No. EC-7): The Contractor shall clear and grub trench lines. Clearing and grubbing shall be confined to the limits of the easements and to the minimum width required for installation of the pipe. All trees, stumps, roots and debris shall be disposed of in an approved manner by the Contractor in accordance with local, state and federal regulations. Burying of stumps and other debris on the site will not be permitted. Where trees within the easements are indicated on the Plans or designated in the field to be retained, such

trees shall be protected from damage at all times. Should, by accident or otherwise, such trees be damaged, they shall be repaired, at the Contractor's expense, by a Certified Arborist.

H. Final Grassing for Erosion Control (Item No. EC-8): The trench lines and other areas disturbed by construction of water and sanitary sewer lines shall be grassed as hereinafter specified where indicated on the Plans or where directed by the Engineer.

1. General: Upon completion of construction of the project, the disturbed areas shall be prepared for permanent grassing by grading to the final grade and removing and disposing of roots, stumps, or other materials which might be harmful to grass growth. Care shall be taken to spread topsoil over the entire area to be grassed to the extent that topsoil along and adjacent to the trench lines is available.
2. Fertilizer: After the surface has been prepared for grassing and before any grass or seeds are planted, the soil shall be loosened by harrowing or other approved methods, and the areas specified to be grassed shall be fertilized at a uniform rate of 1,500 pounds per acre with a standard commercial 8:8:8 fertilizer and 3,000 pounds of agricultural lime per acre.
3. Seeding: The areas to be grassed shall be seeded with quality seed in the following minimum quantities per acre:
    a. Kentucky 31 Fescue 34 pounds
    b. Common Bermuda 10 pounds
    c. White Dutch Clover 10 pounds
    d. In some areas, it may be necessary to vary the concentrations of various seed to suit local conditions and the Owner reserves the right to change proportions of the various seed so long as the total amount of seed does not exceed 74 pounds per acre at no change in Contract Price.
    e. Seed shall be broadcast with hand-operated equipment. Broadcast, seed shall be sown over the areas and raked or dragged and covered to the desired depth. Hydro seeding may, at the Contractor's option, be used in lieu of the above.
    f. Unless specifically noted otherwise, Pensacola Bahia shall not be used.
    g. When the grassing operation is accomplished after the month of August, and before the month of March, in addition to the seeding as outlined above, the entire grassed area shall also be over seeded with Italian Rye Grass Seed at the uniform rate of 40 pounds per acre.
4. Maintenance: The Contractor shall maintain all grassed areas for a minimum two (2) year period following the date of project acceptance unless specified otherwise. If, during the course of the final inspection, the Engineer determines that all work has been satisfactorily completed except for a substantial stand of grass on all or part of the work, he may recommend acceptance if the Contractor provides a bond covering all erosion control and related items. The amount of the bond shall equal replacement costs of the erosion control items as determined by the Engineer. The time period to be covered by the bond will be no longer than the time period of the warranty for the project. It shall be understood by all that such a bond is to ensure replacement of the erosion control items should it become necessary and will in no way relieve the Contractor from the responsibility of damages caused by the lack of erosion control growth.
    a. The Contractor shall reseed and remulch as hereinafter specified in areas in which an established stand of grass is not obtained at no additional cost to the Owner. A satisfactory stand of grass is defined as a cover of living grass in which gaps larger than 12 inches do not occur. Maintenance shall consist of watering, preserving, protecting, replacing dead grass, filling washes and generally maintaining the area.

I. Mulching (Item No.EC-9): In areas shown in the Plans or as directed by the Engineer, the surface of sprigged and over seeded slopes of the roadway or embankments shall be protected by the application of a mulch. The mulch shall be spread uniformly in a continuous blanket by hand or by suitable approved equipment, at a rate of 2 tons to the acre. Mulching material which, in the opinion of the Engineer, is too coarse or too short for proper securing in the

surface soil will be rejected. Mulching shall be started at the windward side of relatively flat areas or at the upper part of a steep slope and continued uniformly over the entire area.

1. The mulch material shall be anchored to the soil by spraying a light coating of emulsified asphalt over the straw or hay after these materials have been placed. The asphalt shall be applied by hand sprayers attached by hoses to an asphalt spreader or other approved methods. The asphalt adhesive shall be applied to the mulch at a rate of 150 gallons of undiluted (straight emulsion) asphalt per ton of straw or hay (300 gallons per acre). When the straight emulsion is further diluted with water in the ratio of 60 (straight emulsion) to 40 (water), the application rate shall be 250 gallons of asphalt emulsion per ton of straw or hay (500 gallons per acre). This will secure the mulch on the ground to form a soil binding mulch and prevent loss or bunching by wind or water.
2. The asphalt adhesive shall be a bituminous soil cover suitable for mulching of seeded areas and shall contain no petroleum solvents or other diluents which would be toxic to plant growth. Asphaltic adhesive shall be a homogenous emulsification of especially refined petroleum asphalt suitable for spray application with or without dilution with water. Laykoid Soil Cover, manufactured by American Bitumuls and Asphalt Company, or other commercial types of asphalt specifically designed for mulching of seeded areas for erosion protection against rain or wind, will be acceptable. Cost of the item shall be included in unit price bid for mulching.

J. Topsoil (Item No. EC-10): As indicated on the Plans or specifically required in the Specifications, additional good quality topsoil shall be provided by the Contractor within the construction limits. The required topsoil for this item shall be material obtained from an offsite source. Topsoil shall be workable, friable, loamy soil free from hard lumps, stiff clay, gravel, noxious weeds, brush and other deleterious materials. Lime shall be added to reduce the possibility of odor. Topsoil shall be placed in all areas disturbed by construction, prior to grassing. The topsoil shall be placed to the compacted depth specified on the Plans, but shall not, in any case, be placed at a compacted thickness of less than 2 inches.

1. It is intended that the grassing operation shall follow immediately after the placing of topsoil in which case such grassing operation would require satisfactory compaction in order to prevent erosion. In the event that grassing operations are delayed, the layer of topsoil shall be compacted until satisfactory.
2. The Contractor shall maintain the topsoil that has been placed, without extra compensation, in connection with any seeding, sodding, planting, or other work, until final completion of the project. Maintenance shall consist of preserving, protecting, and such other work as may be necessary to keep the work in a satisfactory condition.

K. Erosion Control Netting (Item No. EC-11): Erosion control netting shall be utilized in locations where specifically required by the Engineer and installed in accordance with the Manufacturer's recommendations using ¾ inch x 2-1/2 inch x 12 inch wedge shaped wooden stakes and/or staples.

1. Materials: The netting material shall be Curlex Excelsior Blanket manufactured by American Excelsior Company. Excelsior Blanket manufactured by Erosion Control Systems, Enkamat 7220 manufactured by AKZO, or approved equal.
2. Installation: All surfaces to be protected shall be graded, fertilized, limed, and seeded or sodded, as specified and where shown on the Plans, so as to be stable and firm.
    a. Erosion Control netting used as a ditch liner shall be applied with the length of roll laid parallel to the flow of the water. Where a synthetic mat is used and where more than one width is required, a multi-width welded mat shall be supplied in multiples of 3 feet. All lap joints and upslope edges shall be staked at intervals of 3 feet or less. Where three-wide mat is required, lap joints to be limited to one every nine feet of width.
    b. All wood stakes shall be driven to within 2 inches of the ground surface.
    c. An anchor slot shall be placed at the upslope and downslope ends of the mat placement. At least 12 inches of the end of the mat shall be buried vertically in a slot dug in the soil. The mat shall be secured in the anchor slot by staples or

stakes at intervals of 3 feet or less prior to burying, except when the ditch is located above the erosion control netting, in which case no stakes or staples shall be used in the anchor slot unless 6 inches separation is maintained between the point of the installed stake or staple, and the netting. The soil shall be firmly tamped against the mat in the slot.

d. Successive lengths of netting shall be overlapped at least 3 feet, with the upstream length on top. Stake or staple the overlap in 3 places evenly spaced across the end of each of the overlapping lengths and in 3 places across the width of the center of overlap area. Check slots shall be spaced so that a check slot occurs within 30 feet.

e. Stake or staple the netting in the check slot at each edge overlap and in the center of the mat, except when the ditch is located above the netting, in which case no stakes or staples shall be used in the check slot, unless 6 inches separation is maintained between the point of the installed stake or staple and the synthetic liner. Beginning and terminal ends to be staked in accordance with installation manual.

f. Upslope edges of netting used as ditch lining shall terminate on 4-inch wide horizontal shelves running parallel to the axis of the ditch for the full length of the ditch. Edges of the netting shall be staked at 3-foot intervals, backfilled with soil, and tamped to original slope.

g. Erosion control netting damaged by the Contractor during installation shall be repaired immediately.

h. The Contractor shall maintain the netting until all work on the Contract has been completed and accepted. Maintenance shall consist of the repair of areas where damaged by any cause.

L. Solid Sod (Item No. EC-12)

1. Materials: Solid sod may be obtained from any sod producer specializing in sod production harvesting with a minimum of three years' experience. The sod shall be St. Augustine or Centipede and shall be placed as suitable growing conditions may require. The sod shall be live, fresh growing grass, free of weeds and rocks. Solid sod removed from construction site and preserved during construction may be used with the Engineer's approval.

2. Preparation: The Contractor shall prepare the subsoil to a sufficiently loose or pulverized condition and all uneven areas and low spots shall be eliminated prior to planting. All foreign materials and undesirable plants and their roots must be removed from the area. Topsoil shall be spread to a minimum depth of 2 inches over the area to be sodded. Areas to be sodded must be fertilized initially with agricultural limestone and with the type of fertilizer recommended by the sod provider for either Centipede or St. Augustine grass. The fertilizer shall be distributed into the planting areas by approved methods to a depth of at least 2 inches. If the soil is dry, water shall be applied until it is in a workable condition. Immediately following this, the sod shall be placed.

3. Laying Sod: Moisten prepared surface immediately prior to laying sod. To prevent deterioration the sod shall be planted within three days from the time of harvesting.

   a. However, should inclement weather alter this procedure, the grass may be kept in temporary storage if the sod is spread out in a shaded area with the grass side up and kept moist. Any sod allowed by the Contractor to dry out shall be rejected and no payment for such sod will be made.

   b. The sod shall be placed on the prepared surface tightly with no open joints visible and no overlapping. The sod shall be smooth and align with adjoining grassed areas. After installation is complete, the newly sodded areas shall be tamped in place in a satisfactory manner and watered as necessary to enhance growth.

4. Maintenance: The Contractor shall mow grass at regular intervals to maintain a maximum height of 2-1/2 inches. The edges will be neatly trimmed and clipped where necessary. Immediately after mowing and trimming all clippings shall be removed. Watering of the

sodded areas shall be applied in the form of a spray or sprinkle, without erosive force in sufficient amounts that will keep the sod in a living and growing condition.

a. The application of herbicides in accordance with manufacturer's instructions shall be applied for weed control. All sod showing deterioration or bare spots shall be replaced by the Contractor without additional compensation. Additional fertilizer shall be applied after the sod has shown growth (usually approximately forty days).

b. The Contractor shall be responsible for satisfactory growth of the grass until final acceptance of the sod. Should a grassing bond be required for a particular project, the sod shall be covered under the same terms as the grassing.

5. Acceptance: Acceptance of sodded areas will be based on verification of the establishment of a well knitted, living, growing sod covering the areas designated to be sodded. If an acceptable stand of living and growing sod is not obtained, the area shall be re-sodded at no additional cost to the Owner.

M. Riprap (Item No. EC-13): All stone for riprap shall consist of rough unhewn quarry stone as nearly rectangular in section as practicable. The stone shall be resistant to the action of air, temperature changes, and water. The stone shall be sound and dense, and suitable in all other respects, for the purpose intended. The stone shall be a well-graded mixture with individual classified stones ranging in weight in accordance with Section 814 of the Alabama Department of Transportation Standard Specifications, latest edition.

1. Riprap shall be placed in a manner as to ensure that the larger pieces are distributed uniformly and that the smaller pieces will fill the spaces between the larger pieces. After placing, the riprap shall present a reasonably smooth surface to the thickness shown on the Plans.

N. Filter Blanket for Riprap (Item No. EC-14): Where indicated on the Plans or directed by the Engineer, a filter blanket of crushed stone or a geotextile filter fabric shall be placed as a bed for riprap. Crushed stone and geotextile filter fabric shall be as specified in this Section.

1. Crushed Slag or Crushed Stone: Crushed slag or crushed stone shall be screened, washed and shall be 100 percent retained by a ¼ inch screen. One hundred percent shall pass a 1-1/2 inch opening and shall be uniformly graded from maximum size to minimum size. Foreign matter shall not exceed 3 percent by weight when dry.

2. Geotextile: Geotextile filter blanket shall be Terratex GS or approved equal and shall be installed in accordance with the State of Alabama Department of Transportation Standard Specifications for Highway Construction, latest edition.

O. Riprap Gabions (Item No. EC-15): The work under this section consists of furnishing, assembling, typing and filling with approved stones, open mesh wire baskets, constructed in accordance with these Specifications, manufactured by either Maccaferri Gabions, Inc. or Modular Gabion Systems; and placed in reasonably close conformity to the lines, grades, and dimensions shown on the Plans or directed by the Engineer. Other work specified in this section shall include, placing stone (specified for gabion baskets) in the irregular shaped void areas of the ditch between gabions and grouting them.

1. Material:

a. Stone Fill – Stone used in the gabions shall be sound and durable, from any source approved by the Engineer. No stone shall be less than four inches, minimum dimension, nor greater than eight inches. The stone shall be crushed and shall be reasonably well graded between the limiting sizes.

b. Baskets – PVC coated galvanized steel wire gabion basket units shall be of non-raveling construction, fabricated from a triple-twisted hexagonal mesh of hot dipped galvanized steel wire having a minimum diameter of 0.105 inches after galvanization; and additionally, shall be coated with a minimum of 0.020 inches of PVC. The steel wire used shall be galvanized and PVC coated prior to fabrication into mesh. The core wire of all gabion diaphragm and frame components shall equal or exceed Fed. Spec. QQ-W-461H, possess medium tensile strength and Finish 5 Class 3 zinc coating of not less than 0.80 oz/sq. ft. of uncoated wire

surface. Mesh openings shall be hexagonal in shape and uniform in size, measuring not more than 3-1/4 inches by 4-1/2 inches. Coated wire used for lacing or as internal connecting wire within gabion cells may be of soft tensile strength and an overall diameter (core wire plus PVC coating) of 0.127 inches. The PVC coated wire of all gabion components shall be resistant to the destructive effect of immersion in acidic, salt, or polluted water, exposure to ultraviolet light and abrasion, and retain these characteristics after a period of not less than 3,000 hours under test in accordance with ASTM Test Designation G-23.

1) Gabions shall be fabricated in such a manner that the sides, ends, lid and diaphragms can be assembled at the construction site into rectangular baskets of the sizes specified by the Plans. Gabions shall be of single unit construction. The base, lid, ends, and sides shall be either woven into a single unit or one edge of these members connected to the base section of the gabion in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh.
2) Where the length of the gabion exceeds its horizontal width, the gabion shall be equally divided by diaphragms of the same mesh and gauge as the body of the gabions, into cells whose length does not exceed the horizontal width. The diaphragms shall be secured into proper position on the base in such a manner that no additional tying at this junction will be necessary.
3) The field connections between adjacent wire baskets shall be made as recommended by the manufacturer and shall develop a connection strong enough that the failure under test shall occur in the mesh rather than the lacing.

Table for Minimum Strength of Gabion Baskets

Min. Strength	# Linear Feet
Wire mesh pulled parallel to wire test	3,400
Wire mesh pulled perpendicular to wire test	1,000
Connection of selvedge wire to mesh	2,200
Connection of end panels to gabion mesh	1,500

4) The gabions shall be supplied in the various sizes shown on the Plans and shall be shipped flat. The gabion dimensions are subject to a tolerance limit of ± 3% of the specified sizes. All gabion baskets shall have a width of 3.0 feet; heights of 3.0 feet, 1.5 and 1.0 feet; and lengths of 6.0 feet, 9.0 feet or 12.0 feet
5) Each shipment of gabions to a job site shall be accompanied by a certification, on company letterhead, and signed by an officer of the company, which states that the material conforms to the requirements of the Contract Specifications.

c. Grout - Grout shall consist of Portland cement concrete. Concrete shall conform to the requirements of ASTM G94 and shall have a minimum compressive strength of 3,000 psi, a maximum nominal aggregate size of ¾ inch, and sufficient admixture to provide from 5 to 7 percent entrained air. At the Contractor's option, a water-reducing admixture, proportioned as per the manufacturer's recommendation, may be used to increase the penetration of the grout. The grout shall be designed to produce a mixture having a consistency such as to permit gravity flow into the interstices of the stone-filled gabion baskets with the help of limited brooming and vibrating.

1) The grout shall be used in the work within a period of one (1) hour after mixing. Retempering of grout will not be permitted. Gabion baskets shall not be grouted when the ambient temperature is below 35 degrees F. or above 89 degrees F., unless approved by the Engineer in writing; nor when the grout, without special preparation, is likely to be subjected to freezing

temperatures before final set has occurred. Prior to grouting, all surfaces of gabion baskets shall be wetted.

2) The gabion baskets shall be grouted in successive longitudinal strips, approximately ten (10) feet in length, commencing at the furthest in-channel edge and working back towards the top-of-bank. Each batch of grout shall be dumped onto the ungrouted part of the strip and worked into the voids between the stones. Grout shall be brought to the place of final deposit by approved means, and in no case will grout be permitted to flow on the gabion basket surface a distance in excess of ten (10) feet.

3) Immediately after dumping the batch of grout, it shall be distributed over the surface of the strip by the use of brooms, and the grout worked into place between stones with suitable spades, trowels or vibrating equipment. The grout shall penetrate the gabion basket surface to provide a cap having a thickness of not less than six (6) inches. As a final operation, a stiff stable broom shall be used to give the grout cap a broomed finish; however, the wire of the gabion shall not be uncovered during the finishing operation.

4) After completion of any strip as specified, no workman or any load shall be permitted on the grouted surface for at least twenty-four (24) hours. The surface of all grouted gabion baskets shall be cured by keeping the surface continuously wet for a period of not less than seven (7) days, during which time the ground surface shall also be protected from flowing water and mechanical injury.

2. Construction Requirements:

a. Foundation Material – Foundation material shall be spread in-the-dry, uniformly on nonwoven plastic filter fabric within the limits and to thicknesses shown on the drawings, or as directed in the field by the Engineer, to form a backing for the gabions. A tolerance of ± one (1) inch from the full depth shown on the drawings will be allowed on the finished surface of the bedding layer, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet. Placing of bedding material by methods which will tend to segregate particle sizes will not be permitted. Any damage to the filter fabric or prepared foundation surface during bedding placement shall be repaired before proceeding with the work. Compaction of the bedding material will not be required, but it shall be finished to present a reasonably even surface free from mounds, windrows or depressions.

b. Gabion Assembly and Installation – Gabion baskets shall be assembled in such a manner that the sides, ends, lids and diaphragms can be assembled at the construction site into rectangular baskets of the sizes specified and shown on the drawings. Gabions shall be of single unit construction, i.e., the base, lid, ends and sides shall be either woven into a single unit or one edge of these members connected to the base section in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh.

1) Gabions shall be divided into cells by diaphragms of the same mesh and gauge as the gabion body. Diaphragms shall be placed at three (3) foot nominal spacings in the long direction and shall extend the full width and height of the basket. The gabions shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that no additional tying at this junction will be necessary.

2) All perimeter edges of the mesh forming the gabion shall be securely selvedged so that the joints formed by tying the selvedges have at least the same strength as the body of the mesh. Lacing wire or connecting wire shall be supplied in sufficient quantity for securely fastening all diaphragms and edges of the gabion.

3) Empty gabion baskets shall be installed according to manufacturer's recommendations and to the details of the Plans. They shall be individually placed in-the-dry on the approved surface to the lines and grades as shown

on the drawings or as directed by the Engineer, with the sides, ends and diaphragms erected in a manner that will insure the correct position of all creases and that the tops of all sides are level. All adjoining empty gabion units must be connected by tie wire lacing along the perimeter of their contact surfaces in order to obtain a monolithic structure. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at intervals of not more than five (5) inches. All lacing wire terminals shall be securely fastened. The use of clip connections for this purpose and for final lid closing will not be permitted.

4) The initial line of basket units shall be placed on the prepared bedding layer surface in a direction parallel to stream flow, unless otherwise shown on the drawings, and shall be partially filled with stones by hand to provide anchorage against deformation and displacement during the remainder of the filling operation. After adjoining empty basket units are set to the line and grade, and common sides with adjacent units thoroughly laced, they shall be placed in tension and stretched to remove any kinks from the mesh and to obtain a uniform alignment. The stretching of empty basket units shall be accomplished in such a manner as to prevent any possible unraveling.

5) Stone filling operations shall carefully proceed with placement by hand or machine so as not to damage any galvanized or PVC wire coating, to assure a minimum of voids between the stones, and to assure the maintenance of alignment throughout the filling process. Undue bulging of the mesh shall be avoided. To avoid localized deformation, the gabion units in any row are to be filled in stages consisting of maximum twelve (12) inch courses, and at no time shall any cell be filled to a depth exceeding one (1) foot more than any adjoining cell. The maximum height from which the stone may be dropped into the gabion units shall be thirty-six (36) inches. For gabion units in excess of two (2) feet in thickness, a minimum of two (2) uniformly spaced connecting wires shall be placed between each stone layer in all cells, connecting compartment faces across the short dimension of the cells. Connecting wires shall be looped around one (1) mesh opening at each basket face and the wire terminals shall be securely twisted to prevent their loosening.

6) Along all exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to insure a neat and compact appearance. The last layer of stone shall be leveled with the top of the gabion basket to allow for the proper closing of the lid and to provide an even surface that is uniform in appearance. Units that become damaged due to placing operations shall be replaced by the Contractor at no additional expense to the Owner. Lids shall be stretched tight over the stone filling using crowbars or lid closing tools, until the lid meets the perimeter edges of the front end panels. The lid shall then be tightly laced with tie wire along all edges, ends and internal cell diaphragms by continuous stitching with alternating single and double loops at intervals of not more than five (5) inches. Special attention shall be given to see that all projections or wire ends are turned into the baskets.

7) Where shown on the drawings, or as directed by the Engineer, or where a complete gabion unit cannot be installed because of space limitations, the basket unit shall be cut, folded and wired together to suit existing site conditions. The mesh must be cleanly cut and the surplus mesh cut out completely or folded back and neatly wired to an adjacent basket face. The assembling, installation, filling, lid closing and lacing of the reshaped gabion basket units shall be carried out as specified above.

c. Grouted Gabions – Gabions installed as specified herein shall be grouted in areas indicated on the drawings. All grouting of gabions shall be done in-the-dry. Stone for grouted gabion baskets shall conform to the requirements specified hereinbefore. The stone shall be placed in conformance with the general

requirements for ungrouted gabion basket units as specified hereinbefore. The Contractor shall take special care to maintain the surface of the gabion units free from becoming choked with any material, such as spilled bedding material, until grouted, so as not to hamper the penetration of the grout. When such choking does occur, the Contractor shall remove the contaminating material to a minimum depth of 6 inches prior to grouting.

d. Stone – Filled Voids –Irregular shaped areas in the ditch bottom or sides not conforming to an area that will accommodate a gabion basket as shown in the Plans as “stone filled voids” shall be filled with stones in the manner specified for gabion and grouted.

P. Timber Ditch Checks (Item EC-16): Timber ditch checks shall be 2” x 6” rough cut untreated timber and shall be installed as shown on the Erosion Control Details plan sheet.

Q. Temporary Sedimentation Basin (Item No. EC-17): A temporary sedimentation basin is a settling pond with a controlled stormwater release structure used to collect and store sediment produced by construction activities. The purpose of the sedimentation basin is to eliminate transport of sediments off of the construction site during storm events or any events in which stormwater may carry sediments off site.

1. The sedimentation basin shall be constructed before clearing and grading is undertaken and shall be constructed to the dimensions shown on the Plans. The embankment forming the berm shall be well-compacted and stabilized with vegetation. The sedimentation basin shall remain in operation and be properly maintained until the site area is permanently stabilized by vegetation and/or when permanent structures are in place.
2. The Contractor shall maintain access to the sedimentation basin for periodic maintenance and sediment removal. Basins shall be inspected by the Contractor after each rainfall event and shall be cleaned out when half the stormwater storage capacity volume has been filled with sediment.

16.7 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

A. The unit price bid for the various items shall be compensation in full for furnishing, installing, and maintaining each item, complete in place, including all materials, labor, equipment, and incidentals necessary for the completion of the item.

1. EC-1 Erosion Control Plan: The lump sum price bid for this item shall be compensation in full for furnishing and modifying, as required, a complete Erosion Control Plan. Payment shall be made upon approval of the Erosion Control Plan by the Engineer.
2. EC-2 Temporary Grassing for Erosion Control: The unit price for this item shall be compensation in full for one (1) acre of temporary grassing for erosion control complete in place including maintenance until the permanent grassing is installed. Measurement will be made to the nearest tenth of an acre of the area within the project limits actually grassed.
3. EC-3 Silt Fence: The unit price bid for this item shall be compensation in full for furnishing, installing, maintaining, and removing one (1) linear foot of the type of silt fence specified i.e., Type A or B, properly installed for temporary erosion control.
4. EC-4 Hay Bales: The unit price bid for this item shall be compensation in full for furnishing, installing, maintaining, and removing one (1) each hay bale properly installed for temporary erosion control.
5. EC-5 Temporary Steel Sheet Pile for Erosion Control: The unit price bid for this item shall be compensation in full for furnishing, installing, maintaining, and removing one (1) square foot of Temporary Steel Sheet Piling. The sheet pile installation shall be made to the depth and width indicated on the Plans. Payment shall be made for actual square footage installed by the Contractor. Mobilization, equipment, materials, etc. shall be considered subsidiary obligations of this item and no additional compensation shall be provided.

6. EC-6 Turbidity Barriers: The unit price for this item shall be compensation in full for furnishing, installing, maintaining, and removing one (1) linear foot of turbidity barrier properly installed for erosion control and for reducing the turbidity in adjacent water courses.
7. EC-7 Clearing and Grubbing: Where specified on the construction plans, the unit price bid for this item will be compensation in full for furnishing all materials, equipment, tools, labor and incidentals necessary to perform one (1) acre of clearing and grubbing of project limits as described in Section 16.1.06.G. Measurement will be made to the nearest tenth of an acre of the area within the project limits actually cleared and grubbed. Removal and hauling of debris from site shall be considered a subsidiary obligation of this item, and no additional compensation will be provided.
8. EC-8 Final Grassing for Erosion Control: The unit price bid for this item shall be compensation in full for one (1) acre of grassing for erosion control complete in place including ground preparation, fertilizing, seeding and maintenance. Measurement will be made to the nearest tenth of an acre of the area actually grassed except that grassing areas outside of the construction easements will be considered the responsibility of the Contractor and will not be measured for payment.
9. EC-9 Mulching: The unit price bid for this item shall be compensation in full for one (1) acre of mulching complete in place. Measurement will be made to the nearest tenth of an acre of the area actually mulched except that mulching of areas outside of the construction easements will be considered the responsibility of the Contractor and will not be measured for payment.
10. EC-10 Topsoil: The unit price bid for this item shall be compensation in full for furnishing, hauling, spreading, shaping and compacting in its final position one (1) cubic yard of acceptable topsoil ready for incorporating fertilizer and seed, and for furnishing all equipment, tools, labor and incidentals necessary to complete the work. Measurement of the topsoil shall be made per cubic yard, loose measure, in the delivery vehicle at the point of delivery to the project.
11. EC-11 Erosion Control Netting: The unit price bid for this item will be compensation in full for furnishing and properly installing one (1) square yard of erosion control netting, including all materials, equipment, tools, labor, and incidentals required to complete the item.
12. EC-12 Solid Sod: The unit price bid for this item shall be compensation in full for one (1) square yard of solid sod properly installed and maintained where specified for erosion control.
13. EC-13 Riprap: The unit price bid for this item shall be compensation in full for one (1) square yard, one (1) foot in thickness, of the specified riprap classification complete in place i.e., Class 1, 2, etc. Where depths greater than one (1) foot are shown on the Plans or directed the quantity to be paid for will be increased in the proportions that the thickness bears to one (1) foot i.e., if thickness is 1.5 feet, then the surface area will be multiplied by 1.5 to determine the quantity to be paid.
14. EC-14 Filter Blanket for Riprap: The unit price bid for this item shall be compensation in full for all labor, materials, equipment, and incidentals necessary for the installation of one (1) square yard of filter blanket for riprap complete in place. For crushed stone filter blankets, payment shall be for one (1) square yard of filter blanket complete in place with a thickness of at least 6 inches.
15. EC-15 Riprap Gabions: The unit price bid for this item shall be compensation in full for all labor, materials (including wire mesh and stone), equipment, tools, and incidentals necessary for the installation of one (1) cubic yard of wire-mesh, stone filled gabion or stone-filled voids complete in place.
16. EC-16 Timber Ditch Checks: The unit price bid for this item shall be compensation in full for one (1) each timber ditch check as detailed, complete in place.
17. EC-17 Temporary Sedimentation Basin: The lump sum price bid for this item shall be compensation in full for furnishing all equipment, installing complete in place, maintaining, and removing (if required) one temporary sedimentation basin as shown on the Plans and described in the Specifications. Mobilization, equipment, materials, etc., shall be

considered subsidiary obligations of this item and no additional compensation shall be provided.

B. Partial Payment – A percentage of the unit price bid shall be payable in accordance with the following schedule:
   1. After the temporary sedimentation basin has been constructed and accepted, 50 percent of the lump sum price bid for the temporary sedimentation basin will be paid.
   2. When 50 percent of the original Contract amount is earned, including any payment previously made for the item of temporary sedimentation basin is earned, an additional 25 percent of the lump sum price bid for the temporary sedimentation basin will be paid.
   3. Upon completion of all work of the project, payment of the remaining 25 percent of the lump sum price bid for the temporary sedimentation basin will be paid.

C. The sum of all payments shall not exceed the original contract amount bid for the item of temporary sedimentation basin, regardless of the fact that the Contractor may have, for various reasons, cleaned or otherwise maintained the sedimentation basin on as many occasions as required by the Specifications or by the Engineer to properly maintain the capacity of the basin.

END OF SECTION

SECTION 22 – LIGHTNING PROTECTION SYSTEM

22.0 GENERAL

22.1 SCOPE

A. These Specifications shall form a part of the Contract Documents and shall govern construction work for all buildings to be built or modified for the Board of Water and Sewer Commissioners of the City of Mobile, Alabama. The work covered by this section includes the furnishings of all parts, labor, equipment, appliances and materials and performing all operations in connection with the installation of lightning protection hardware. This shall include lightning rods that are bonded to ground rods.

B. All new construction of buildings or revisions to existing building shall include lightning protection. This shall apply to the following types of architecture:
   1. Brick with Composition roof
   2. Brick with Metal roof
   3. Metal Clad
   4. Metal frame with fiberglass siding
   5. Concrete with metal framing
   6. Steel Structures
   7. Flat roofs
   8. Sloped roofs

C. The Contractor for the installation of lightning protection equipment shall follow these Specifications, the Underwriters Laboratories UL 96 Standards for Safety, Lightning Protection Components, UL 96A and the National Fire Protection Agency 780 Standards for the Installation of Lightning Protection Systems.

D. There shall be one common ground established for each building at or near the power source entering the building. The lightning protection system air terminals, electrical system, telephone, antennas, computers, remote telemetry, and radios shall have their grounds bonded together at this common ground.

22.2 REVISIONS

A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to ensure the latest and most current revision is applied to the project.

22.3 REFERENCED SECTIONS

A. Section 23 - Transient Voltage Surge Suppressors

B. Section 24 - Electrical Materials and Methods

22.4 REFERENCED CODES AND STANDARDS

A. Underwriters Laboratories UL 96 – Standards for Safety, Lightning Protection Components

B. National Fire Protection Agency 780 – Standards for the Installation of Lightning Protection Systems

C. SUMMARY

D. The scope of work is to provide and install an effective, aesthetically acceptable lightning protection system employing the latest technology.

E. The purpose of the system shall be to provide a Faraday cage of protection around the structure, and a path to ground for all lightning protection hardware. This shall include:

1. Air terminals to intercept the lightning strikes.

2. Down conductors to carry lightning from the air terminals to the ground.

3. Ground rods to pass the lightning current into earth ground.

F. The system shall require no external power shall not contain radioactive components, and shall require no scheduled maintenance.

G. The installation of equipment shall all be done as per NFPA 780, and UL96A.

22.5 DESCRIPTION OF WORK

A. All new construction or revisions to buildings for the Board of Water and Sewer Commissioners of the City of Mobile, Alabama shall include lightning protection. Contractor shall provide equipment that is UL approved and install lightning protection equipment on all buildings and structures. This shall include bonding, grounding, and the installation of lightning rods as described in Section 22 of the Specification. Contractor shall also include the installation of surge suppressors as specified in Section 23 entitled “Transient Voltage Surge Suppressors”

B. All construction for lightning protection shall conform to Section 24 entitled “Electrical Materials and Methods”.

22.6 SUBMITTALS

A. Shop Drawings: Submit the type, size, and location of all equipment, grounds, and conductor routing to be furnished by the system supplier.

B. Manufacturer’s catalog data sheets for all components.

C. Any departure from the submittal drawings as deemed necessary by the Contractor shall have all details of such departures and reasons therefore submitted as soon as practicable to the Owner for approval. No such departures shall be used in construction without the prior approval of the Engineer.

22.7 MANUFACTURER REQUIREMENTS

A. The manufacturer of the products employed in the system shall be regularly engaged and experienced in the design and manufacture of lightning protection products and systems and have proof of successfully installed lightning protection system performance.

B. Product and technical support shall be provided by the manufacturer or its authorized representative.

22.8 INSTALLER REQUIREMENTS

A. All installations must be performed by an experienced Underwriters Laboratories Master Label Installer.

B. The installer shall carry appropriate liability and vehicle insurance in the minimum amount of one million dollars and worker's compensation insurance in at least the minimum amount required by law. Certificates of insurance shall be provided as requested to the Owner or his representative before work begins.

C. The installer shall be responsible for accompanying the Owner or his representative on a walk through each structure as the installation on that structure is completed, and on a walk-through of each facility after completion of the project.

D. The installation shall be done in a manner that will allow the Owner to obtain an Underwriters Laboratories Master Label for each site upon completion of the installation of the system.

22.9 GENERAL

A. A. The system shall be designed for installation to provide a Faraday Cage to delay or dissipate the formation of lightning strikes.

B. The system shall be designed in such a manner that it affords protection to the structure upon which it is installed in the event a direct lightning strike to the structure does occur.

C. The system shall require no external power and shall require no extraordinary maintenance.

D. The system shall not be mounted in such a manner as to impose limitations which may interfere with utility use of structure space or otherwise preclude or limit the intended use of the structure or equipment within the structure, around the perimeter, or on top of the structure.

E. The system shall be designed to impose minimum weight and low wind loading burden on the structure upon which it is installed.

F. The lightning protection system shall be grounded at intervals not to exceed one hundred feet, and at no less than two points, around the perimeter of each structure. In the event a separate grounding system is provided on the structure, the lightning protection system shall be additionally bonded to that grounding system. This ground shall qualify as a lightning protection system ground. All connections for wires at the ground rod shall be CAD welded as per 4014 of NFPA 780.

G. If installed on a metallic or otherwise electrically conductive structure, the system shall be electrically bonded to structure upon which it is installed through its mounting clamps and brackets, with additional bonding jumpers to grounded objects or structural members, as required.

H. Individual air terminals shall be mounted on all outside corners of each structure, around the perimeter of each structure at intervals not to exceed twenty feet, and on the interior of each structure in such a manner that no two air terminals are separated by a distance of more than fifty feet. In the event this is not practical, such as on a large open tank, air terminal spacing around the perimeter shall be decreased to not more than fifty feet, with a total number around the perimeter not less than the total of the normally required perimeter air terminals, plus the additional number of air terminals normally required on the interior of the structure.

I. Each air terminal shall be provided with two contiguous, electrically conductive paths to ground. A short, single path jumper between the air terminal and the main conductor system may be employed.

J. All equipment that protrudes above the roof line of a building must have its own air terminals that are properly bonded to the ground rods for that building. This shall include air conditioners,

air handlers, vents, air conditioning ducts, aerators mixer motors, relief valves and control houses such as for filter galleries. Air terminals shall extend into the air and be at least 18" higher than the equipment.

K. On structures with handrails, exposed structural members, or other conductors exposed or hidden, it is permissible to employ those conductors as part of the lightning protection system, provided they meet the minimum requirements for conductors listed in Underwriters Laboratories UL 96 or 96A.

L. In the case of a structure or a portion of the structure where the structure itself is electrically conductive, such as a light pole, tower, steel superstructure, etc., that structure or portion of the structure itself may be employed as part of the lightning protection system, provided it meets the minimum requirements of UL 96 or UL 96A, and dedicated conductors are specifically not required on such structures. In such cases contractor shall ensure complete continuity exists between all metal parts that will be used as a pathway to ground. On steel towers that are subject to corrode or rust, such as those used to support radio antennas, a separate wire shall be installed from the lightning rod to the ground rod.

M. Use of metal downspouts for conductors between the air terminals and ground rods shall not be allowed.

N. On buildings with painted metal roofs, the roofing material itself may be used as a conductor, if it is at least 3/16" thick, but air terminals shall still be required. Installer shall confirm that there is continuous continuity between metal roofing panels or install individual wiring to bond panels together.

O. All equipment shall be installed in accordance with Underwriters Laboratories UL 96A and NFPA 780 to the maximum extent practicable.

P. All equipment shall be installed in a neat, workmanlike manner in the most inconspicuous manner possible.

Q. Dissimilar metals shall not be allowed to be in contact, except lightning rods. Aluminum fittings shall be mounted on aluminum where necessary and bonded to the main system using bi-metal connectors. Lead coating shall not be acceptable as a bi-metal transition.

R. Contractor shall adhere to minimum bending radiuses when routing wiring from the roof line to ground level. On buildings with an eave greater than 6", Contractor shall not bend wire around eaves. Contractor shall instead drill holes in the roof of the building eave and route wire down the side wall. Contractor shall be responsible for sealing all holes in the roof to be watertight upon completion of wiring. Vertical wires down side walls shall be installed in grey colored plastic conduit.

S. The installer shall coordinate the lightning protection work to ensure a correct, neat, and unobtrusive installation. Care shall be taken to ensure that equipment to be protected is not obstructed or made inaccessible by the installation of the lightning protection equipment.

T. Buildings with fiberglass or other non-metallic material on the roof and sides are typically supported by steel. All pieces of steel must be bonded together with metal strapping or electrical wire as per NFPA 780 Standards.

U. The installer shall coordinate his work in such a manner as to not interfere with the normal operation of the structure or facility upon which the installation is performed.

V. All services to each structure upon which air terminals are installed shall be provided, to the maximum extent practicable, with a common connection (single point) at which they are grounded. Any metallic water or other service piping to the structure shall be electrically bonded to the lightning protection system.

W. Upon completion of the installation, the Contractor shall furnish the Owner a certificate for each building stating the work and equipment meets U.L. standards, and that site is ready for the Owner to obtain an Underwriters Laboratories Master Label.

X. Contractor is advised that there are power lines, water lines, sewer pipes, fiber optics, telephone lines, conduit, and instrument signal lines underground. Contractor shall contact the management before doing any trenching or digging to bury ground rods or cabling, or wiring. Site management shall have the option of telling Contractor that certain areas must be dug by hand only to protect the wiring and piping and thereby keep the equipment in operation.

Y. Contractor must repair and/or replace any piping, power lines, fiber optics, or anything else that is damaged during the trenching, digging, or installation of any equipment or materials.

Z. Locations with buildings for sewer lift stations and water booster pumps will typically have a radio for transmitting data back to a central location. These sites will include a pole mounted antenna for the radios. Streamer delaying air terminal rods shall be installed on all poles or towers used for radio antennas. The lightning rod shall be installed in a manner that does not place it in the path of radio waves between that radio, and the radio it is sending data to. The lightning rod must be mounted at least 2' taller than the antenna. The lightning rod should be mounted on a 2" Galvanized pipe and then strapped to the pole.

AA. A lightning rod installed on a pole or tower to protect a radio antenna provides a zone of protection that extends outward and down at a 45-degree angle from the top of the lightning rod. If there is a building adjacent to the antenna pole that is completely within the zone of protection provided by the antenna pole lightning rod, it is not necessary to install lightning rods on the building. This is typically true only where the antenna poles are very tall, and the adjacent structures are relatively small. An example of this would be a 50' pole adjacent to a one story building that was 12' wide and 12' long, and 10' high.

BB. Lightning protection for special structures shall be designed as per the NFPA 780 Standard for the installation of Lightning Protection Systems. This includes:
1. Floating Roof Tanks
2. Metallic
3. Fixed Roof Tanks

CC. Lightning protection for water towers shall include the installation of a ground rod at each leg of the tower. There shall be a number 4 wire buried 1'-6' deep in a ring around the base of the tower. All ground rods shall be bonded together by cad welding this wire to each rod.

DD. Lightning protection for pump motors that are mounted outside shall be installed as follows:
1. Install a 2" pipe vertically beside the pump motor that will allow the mounting of an air terminal. Final height of lightning rod shall be 18" higher than pump motor, or piping attached to motor. Final location of pipe shall be approved by building supervisor.
2. Attach #4 base copper wire to motor casing. Bury wire 18" deep and connect wire from lightning rod and motor casing to common ground for motor control center.

22.10 COMPONENTS

A. All equipment and components shall be design and of construction to suit the application for which it is used, in accordance with accepted industry standards.

B. Each component which may be listed shall be listed under Underwriters Laboratories UL 96 and have the appropriate UL label affixed thereto.

C. All lightning rods shall be long enough to provide a height of 18” above the item it is to protect.

22.11 LIGHTNING RODS (AIR TERMINALS) FOR BUILDINGS

A. Buildings or metal structures.
1. All air terminals for pump stations, water booster stations, and administration buildings, water plants, or sewer plants shall be streamer delaying dissipaters with 500 dissipation electrode wires of .0080” diameter 300 series stainless steel as manufactured by Lightning Master or equal.
2. Air terminal Electrode shall be high quality 316 stainless steel, ½” diameter. Air terminals shall be shipped to the installer ready to install, with no assembly or other set-up required.
3. Air terminals over 24 inches high shall be supported at a point not less than one half of the height of the terminal.
4. All other components such as bonding clamps shall be U.L. labeled and approved. Clamps shall be bolted type.

B. Acceptable Brands

1. Streamer-delaying air terminals shall be manufactured by Lightning Master Corporation, 1920 Sherwood Street, Clearwater, FL 34625 USA; Tel. (813) 447-6800; Fax (813) 461-3177

END OF SECTION

SECTION 23 – TRANSIENT VOLTAGE SURGE SUPPRESSORS

23.0 GENERAL

23.1 DESCRIPTION

A. This section describes the materials and installation requirements for transient voltage surge suppressors (TVSS) for the protection of all AC and DC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

B. These Specifications shall form a part of the Contract Documents and shall govern construction work for all buildings to be built or modified for the Board of Water and Sewer Commissioners of the City of Mobile, Alabama. The work covered by this section includes the furnishing of all parts, labor, equipment, appliances and material and performing all operations in connection with the installation of surge suppressors and grounding.

C. All new construction of buildings and revision to existing buildings for the Board of Water and Sewer Commissioners of the City of Mobile, Alabama shall include the installation of surge suppressors as follows:

1. On the power source side of the transfer switch.
2. On the load side of the transfer switch.
3. If the length of wiring between the transfer switch and the motor control center (MCC) is more than 50', install a third surge suppressor at the MCC.
4. If the length of wiring between the transfer switch and a second MCC in the same building is more than 50' in length, install a fourth surge suppressor at the second MCC.
5. Between the step down transformer and the 3 phase distribution panel for the remote telemetry unit (RTU) used for the Supervisory Control and Data Acquisition Panel (SCADA).
6. On all 4-20 milliamp analog inputs to and outputs from the RTU panel.
7. On the radio antenna cable between the antenna and the radio for the SCADA system.
8. On the 120 VAC power, and the 24 VDC power to the field mounted electronics for magnetic flow meters.
9. On any field mounted breaker, Variable Frequency Drive, Programmable Logic Controller, or instrument that is located in a field location that is likely to be struck by lightning.
10. On low voltage circuits used to start generators after a power failure.
11. On all LAN lines, telephone lines, digital data lines and computer highway cables.
12. On the 120 Volt power lines to all computers, remote telemetry units, radios, or programmable logic controllers.

23.2 REVISIONS

A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to ensure the latest and most current revision is applied to the project.

23.3 REFERENCED SECTIONS

A. Section 22 – Lightning Protection System

B. Section 24 – Electrical Material and Methods

23.4 REFERENCED CODES AND STANDARDS

A. NEMA 12 – Enclosures

B. 4014 of NEPA 780 – National Environmental Policy Act Compliance

C. UL 1449 – Standard for Safety, Transient Voltage Surge Suppressors

D. UL 1283 – Electromagnetic Interference Filters

E. IEEE C62.41-1991 Category C3 – Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

F. ANSI/IEEE C62.41 – 1991 – A Standards for the 90s: IEEE C62.41 Surges Ahead

G. NFPA 780.4.18.3.1 – National Fire Protection Association

H. NEMA LS-1 – Low voltage Surge-Protection

I. NFPA Table 4.18.4 – Standards for Integrated Fire Protection and Life Safety System Testing

J. UL 1449 Ed. 22 X – Standard for Surge protective Devices

23.5 GENERAL REQUIREMENTS

A. This standard addresses the installation of surge suppressors on all levels of AC voltage at or below 277/480 VAC and DC voltages at or below 35 volts.

B. This section shall be used in conjunction with Section 22 entitled “Lightning Protection System” for the application of lightning rods and grounding. Providing full protection requires the installation of lightning rods, grounding, and surge suppressors.

C. Contractor shall utilize Section 24 entitled “Electrical Material and Methods”, for details of enclosures, grounding, and wiring. Section 22 includes specifications for:

1. General electrical requirements.

2. Raceways, boxes, and fittings.

3. Wire and cable.

4. Low Voltage motor control.

5. Variable frequency drives.

6. Grounding.

7. Lightning protection system

23.6 SCOPE

A. The General Contractor shall subcontract with a lightning system supplier to install the lightning protection system on the roofs of the buildings and install surge suppressors as specified for each level of power as shown in the specifications. It shall be the responsibility of the supplier to ensure that all equipment to be purchased is completely compatible with the existing hardware.

B. Upon award of Contract, the system supplier shall be responsible for the following:

1. Visit each existing site, remove the face of the motor control cabinets and panels,

and other equipment.

2. Determine the type of connections, number of phases, Delta versus Y arrangement, voltage level, and number of wires to be hooked up.

3. Specify the actual surge suppressor to be purchased for each site and service.

4. Coordinate and expedite.

5. Delivery of the surge suppressors.

6. Install and check out the operation of the surge suppressors.

7. Provide a two-year warranty on all parts and labor.

8. Test the ground at each site to verify that all grounds are common. If they are not common, install equipment as required to make them common.

C. System supplier shall install a ground wire from each surge suppressor to the common ground for that site. All connections for ground wires to ground rods shall be CAD welded.

D. All surge suppressors mounted outside buildings shall be NEMA 4 X weatherproof enclosures. All surge suppressors mounted inside buildings shall be in NEMA 12 enclosures.

E. Surge suppressors to be mounted inside buildings where panels are recessed into a finished wall shall be installed in a recessed area beside the panel, or in the ceiling area above the panel. In such cases, Contractor shall be responsible for patching and finishing the wall or ceiling and painting the area around the new location to match the existing color.

F. One of the goals of this standard is to provide one single ground point that is common to all electrical equipment at each site. The Contractor shall test the grounding for all electrical equipment at existing locations to verify they are common. If they are not, the Contractor shall run #4 copper wire between grounds and/or equipment as required to make them common. This may require providing a trench in the ground outside or providing additional ground rods.

G. Antenna cables for the SCADA system at lift station and water booster station shall all have an in line surge suppressor. New suppressors shall be installed on the outside of RTU cabinets and include a separate wire for grounding. A #4 bare copper solid wire shall be installed from the surge suppressor to the nearest ground rod.

H. Upon completion of any project, there shall be a separate ground rod at each generator and/or fuel tank mounted outside a building. This ground rod shall be attached to the MCC, or power company ground at that site.

I. Surge suppressors may be mounted inside existing electrical or MCC enclosures where there is adequate space. In such cases where there is inadequate space, the Contractor shall be required to purchase a separate enclosure adequate in size to handle suppressors. Separate enclosure will be required for example at the magnetic flow meters and field mount disconnect switches where surge suppressors are specified.

J. The Contractor shall install surge suppressors at all magnetic flow meter readouts where indicated. The Contractor shall provide a separate box and install it next to the Flow meter electronics in the field. Install a DIN Rail in the box for mounting the suppressors. Suppressors shall be installed to protect 24 VDC, and 120 VAC at read out, and at field location.

K. All connections for ground wires to ground rods shall be CAD welded as per 4014 of NFPA 780. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This interconnection shall include lightning protection, electrical service, telephone, antenna, MCC, generator, and any other electrical system at each site.

L. All surge suppressors shall be installed in close proximity to the equipment to be protected. The Contractor shall keep lead lines as short as possible.

23.7 BRAND SELECTION

A. The surge suppressor equipment has been pre-selected by the staff of the Board of Water and Sewer Commissioners of the City of Mobile, Alabama. The brand shall be “Critec” as manufactured or marked by ERICO or Atlantic Scientific for AC voltages up to and including 208/477 VAC, and Panametrics or Atlantic Scientific for lower voltage and DC applications.

23.8 SUBMITTALS

A. Submit shop drawings, product data and manufacturer’s installation instructions.

B. The surge suppression submittals shall also include:

1. Dimensional drawing of each suppressor type indicating the following:

a. Service Entrance Suppressors

i. Copper bus bars (electrical grade copper 1.5” wide, 0.25” thick)

ii. Redundant modules on each phase

iii. Replaceable 200,000 AIC fuses on each module

b. Subpanel Suppressors Line to neutral, line to ground, and Neutral to ground

suppression paths

2. UL 1449 certification (clamp voltage test results)

3. UL 1283 EMI certification

4. IEEE C62.41-1991 Category C3 (20KV, 10KA, 8/20 usec. Waveform) clamp voltage test results from an independent test lab.

23.9 PRODUCTS

A. Suppressors shall be listed in accordance with UL 1449, Standard for Safety, Transient Voltage Surge Suppressors and UL 1283, Electromagnetic Interference Filters.

B. Suppressors shall be independently tested with the category C3 high exposure waveform (20KV, 10KA, 8/20 see. Waveform) per ANSI/IEEE C62.41 – 1991.

C. Suppressors shall be constructed using surge current modules (MOV based). Each module shall be fused with user replaceable 200,000 AIC rated fuses. The status of each module shall be visible on the front of the suppressor's enclosure as well as on the module.

D. For three phases, four wire ground configurations, redundant suppression modules shall provide the following suppression paths: line to ground, and neutral to ground.

E. Suppressors shall be equipped with an audible alarm which shall actuate when any of the surge current modules has failed. An alarm on/off switch shall be provided to silence the alarm and an alarm push-to-test switch shall be provided to test the alarm. Both switches and audible alarm shall be located on the front cover of the TVSS enclosure.

F. Suppressors shall meet or exceed the following criteria:

1. Maximum single impulse current rating (L-N): 160,000 amperes per phase (8/20 usec. Waveform).

2. Pulse Lift Test: Capable of protecting against and surviving 5000 ANSI/IEEE C62.41 Category C transients without failure or degradation of UL 1449 clamp voltage by more than 10%.

3. UL 1449 clamping voltage must not exceed the following:

Voltage	L-N	**N-G**
120/208	400	400
277/480	800	800

4. The category C3 clamping voltage ANSI/IEEE C.62.41-1991 (20KV-1.2/50us., 10KA-8/20us.) shall not exceed the following:

a. UL 1449 clamping voltage must not exceed the following:

Voltage	L-N	**N-G**
120/208	675	675
277/470	1250	1250

5. Minimum impulse withstand 40KA 8/20us per phase

a. Per NFPA 780.4.18.3.1

b. Rating per NEMA LS-1

G. The suppressor shall have a response time no greater than five nanoseconds for any of the individual protection modes.

H. Suppressors shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage, and maximum suppressed voltage per NFPA Table 4.18.4.

I. Visible indication of proper suppressor connection and operation shall be provided. The indicator lights shall indicate which phase as well as which module is fully operable.

J. Terminals shall be provided for all of the necessary power and ground connections. Each terminal shall accommodate wire sizes of #8 to #1 AWG.

K. Suppressors' manufacturer shall provide certified test data confirming a "fail-short" failure mode.

L. Suppressors shall be manufactured in the United States. All major components shall also be of American manufacture.

M. The suppressor shall have a warranty, incorporating unlimited replacements of suppressor modules if they are destroyed by transients during the warranty period.

N. Suppressors shall be "CRITEC" as manufactured by ERICO or Atlantic Scientific or approved equal.

O. High voltage suppressor shall be designed to handle a sustained voltage two times that of its rated voltage and still function. Unit shall provide protection after UL 1449 Ed. 22 X over-voltage test.

23.10 SECONDARY SERVICE SUPPRESSORS FOR DISTRIBUTION PANELS

A. Suppressors shall be listed in accordance with UL 1449, Standard for Safety, Transient Voltage Surge Suppressors.

B. For 3 phases, 4 wire plus ground configurations, suppressors shall provide suppression elements between all phase conductors, between each phase conductor and the system neutral and between the neutral conductor and ground, for a total of seven suppression modes.

C. The suppressor shall provide certified test data confirming a "fail-short" failure mode.

D. Visible location of proper suppressor connection and operation shall be provided.

E. Suppressors shall be designed for close couple installation. The mounting position of the suppressor shall permit a straight and short lead length connection between the suppressor and the point of connection to the panel board.

F. Suppressors shall meet or exceed the following criteria:

a. Maximum single impulse current rating: 20,000 amperes per phase (8/20 usec. Waveform).

i. Note: If the suppressor utilizes internal fuses, the maximum single impulse current cannot exceed the rating of the fuse, unless pre-approved by the specifying engineer.

b. Pulse life rating: 3,000 amperes (8/20 usec.Waveform): 500 occurrences.

c. Maximum clamping voltage will be listed for a 3KA, 8/20 usec. Current Waveform.

G. Suppressors shall have a turn-on and turn-off times of less than one nanosecond.

H. Suppressors shall be of solid-state components and operate bidirectionally.

I. Suppressors for secondary service shall be “CRITEC” as manufactured by ERICO, Atlantic Scientific or approved equal.

23.11 LOW VOLTAGE SUPPRESSORS

A. Suppressors for use in lower voltages such as 120 VAC and all DC voltages shall be manufactured by PARAMAX, Atlantic Scientific or approved equal.

23.12 WARRANTY

A. The suppressor will have a warranty guarantee as follows:

Suppressor	Warranty Period
High Voltage Panel Suppressor	10 years
Low Voltage Series Panel Suppressor	5 years

END OF SECTION

SECTION 24 – ELECTRICAL MATERIALS AND METHODS

24.0 GENERAL

24.1 SCOPE

A. These specifications shall form a part of the Contract Documents for electrical construction Work for all buildings to be built or modified for the Board of Water and Sewer Commissioners of the City of Mobile, Alabama. The Work covered by this Section includes the furnishing of all parts, labor, equipment, appliances and materials, and performing all operations in connection with the installation of electrical equipment.

B. The Standard shall govern, but not be limited to the following:
   1. Installation of air terminals, bonding, grounding and ground rods.
   2. Branch circuit wiring, including conduits, wireways and supports, wire, outlets, switches, receptacles, and circuits in conduits for items as shown on the Drawings.
   3. Provide grounding systems including ground rods, connections to structural steel and equipment, buried counterpoise wires, Cad-weld joints and mechanical lugs as specified to meet codes.

C. If surge suppressors are not in place in the existing equipment, add to all incoming power and signal lines, and all outgoing signal lines. The surge suppressors shall be as per the Mobile Standard for Water and Sewer Systems, Section 23 entitled “TRANSIENT VOLTAGE SURGE SUPPRESSORS”.

24.2 REVISIONS

A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to insure the latest and most current revision is applied to the project.

24.3 REFERENCED SECTIONS

A. Section 23 – Transient Voltage Surge Suppressors

24.4 REFERENCED CODES AND STANDARDS

A. American National Standards Institute (ANSI)

B. National Electrical Manufacturer’s Association (NEMA)

C. National Fire Protection Association (NFPA); Publication 70, National Electrical Code; Publication 101, Life Safety Code

D. Factory Mutual (FM)

E. Underwriters Laboratory (UL 96) – Standard for Lightning Protection Components

F. Institute of Electrical and Electronic Engineers (IEEE)

G. Instrument Society of America (ISA)

H. Occupation Safety and Health Act (OSHA)

I. National Electrical Code (NEC)

24.5 SAFETY AND INSPECTIONS

A. Observe all OSHA regulations in effect. Do not perform any construction work that is not in adherence to good safety practices. Wear all protective headgear, eye protection and safety shoes as required by OSHA safety regulations. Perform all electrical work on de-energized circuits. When observation (by opening enclosures) of energized equipment is required, wear OSHA approved full face guards, electrician's gloves and fire-resistant overall suit. All panels and boxes shall have factory covers and metal enclosure panels covering energized parts securely attached in place prior to energizing. Temporary covers made of other materials will not be allowed.

B. Provide for inspection of all work by the Engineer and/or Owner's representatives having jurisdiction during the proper phases. Correct all deficiencies found in the work by the above inspectors.

C. Prior to submitting the bid, the Contractor shall visit the site and familiarize himself with the existing conditions and facilities. No charges for additional payment for difficulties encountered due to existing conditions may be submitted.

24.6 CODES AND STANDARDS

A. Comply with the latest editions of the codes of the following organizations listed as a minimum standard unless these Specifications or Drawings require a higher minimum standard:

1. American National Standards Institute (ANSI)
2. National Electrical Manufacturer's Association (NEMA)
3. National Fire Protection Association (NFPA); Publication 70, National Electrical Code; Publication 101, Life Safety Code
4. Underwriters' Laboratories, Inc. (UL)
5. Factory Mutual (FM)
6. Underwriters Laboratory UL 96A
7. Underwriters Laboratory UL 96
8. Institute of Electrical and Electronic Engineers (IEEE)
9. Instrument Society of America (ISA)
10. Occupation Safety and Health Act (OSHA)

24.7 GROUNDING

A. A. Non-Current Carrying Metal Parts of electrical items such as cabinets, enclosures, frames, etc., and the neutral conductor shall be grounded in accordance with the National Electrical Code unless additional grounding requirements are indicated. Grounding conductors, used inside shall be copper, sized as noted. Special grounding system features shall be provided as indicated. The backplane of all enclosures shall be connected to ground.

B. All Conduit Runs installed for lighting power loads shall contain a grounding conductor throughout the entire length of the run forming a part of the grounding system. The grounding system shall be electrically continuous throughout the electrical system and shall be connected to earth ground at the point of power service and as otherwise indicated.

C. Ground Rods shall be copper-coated steel type, ¾ inch diameter, 20'-0" length, minimum. The top of the ground rods shall be driven to 1'-0" (minimum) below finished grade unless otherwise indicated and shall be electrically connected with suitable CAD welding.

D. Resistance to Ground of each ground rod shall not exceed 25 ohms when measured during dry weather. In the event this value is not obtained, one additional rod or rod selection equal to that tested shall be driven. Should the additional rod or section fail to achieve the required value, the Engineer shall be immediately notified. A written record of all resistance measurements and test dates shall be submitted to the Engineer prior to completion of the Project.

E. All wiring connected to ground rods shall be Cad Welded.

F. Ground wire shall be bare, rope lay Class B Stranded aluminum annealed (soft down) above ground, and copper underground. Use wire number 4 or larger.

24.8 CONDUIT

A. A. Galvanized Conduit shall be provided unless otherwise indicated and shall be heavy-wall, rigid type bearing the Underwriters Laboratories, Inc., label of approval. Conduit minimum size shall be ¾ inch. Steel conduit and fittings installed through concrete shall be manufactured with an exterior 40 mil thick polyvinyl chloride bonded jacket “Plasti-Bond” by Robroy or approved equal. Fittings for rigid steel conduit shall be threaded types made up with conductive waterproof compound. Poured seal fittings shall be provided as required by the National Electrical Code and shown on the Drawings. Use ¾ inch diameter minimum for metal conduits and ¾ inch diameter minimum for PVC conduit. Size shall conform to NEC Standards for conduit fill.

B. All conduit shall be clean and free from dents, scars, or other deformities. Connections shall be made up watertight, and bushings shall be provided where smooth hubs are not encountered. Changes in directions shall be made with symmetrical bends or conduit boxes. Field-made bends shall be made with an approved hickey or conduit bending apparatus. Conduit runs shall be installed parallel or perpendicular to structural members. Conduit hangers and supports shall be provided at intervals recommended by the manufacturer and the National Electrical Code. Underground conduit runs shall be installed at least 1’-6” below finish grade unless other depths are indicated. Plain earth used for backfill shall be free from objectional material such as rocks, glass, metals, wood, etc., and shall be tamped to surrounding earth density.

C. Rigid Conduit:

1. Rigid galvanized steel, with threaded fittings and condulets, with locknuts and plastic bushings at sheet metal enclosures. In process areas and where exposed on exterior, not exposed to chemicals, use rigid galvanized steel conduit throughout. Terminate with water-tight hubs, equal to Crouse-Hinds, Myers, or equal, at sheet metal enclosures and fixtures without threaded openings. Use rigid steel conduit where exposed in electrical rooms below 50 inches high (EMT not allowed below this height). Convert all PVC plastic conduit underground runs to PVC coated rigid galvanized steel at 6 in. below grade or concrete slabs, using a plastic female adapter concealed below grade or slab, except in chemical additive areas use only PVC conduit. Exception: In all areas lighting fixture stanchions shall be rigid galvanized steel, 1-1/2 inch minimum size.

D. Flexible Conduit:

1. Galvanized steel interlocking coil, ½ inch diameter minimum. National “Flexsteel” or equal. Flexible conduit shall be provided where equipment vibration may exist and where noted.

2. For process areas, equipment rooms, exterior and damp locations, use water-tight flexible conduit with gray polyvinyl jacket: “Seal-tite” or equal.

E. PVC Conduit:

1. PVC conduit shall be used under slab, underground, and for sleeves protecting grounding wires coming up above grade. When under slab or underground, use schedule 40; ¾ inch minimum size. Use grey PVC for vertical wires from air terminals to ground rods.

F. Fittings:

1. Manufactured for service required.

2. Thread ends and apply locknuts and bushings on rigid conduit. Use galvanized case malleable iron boxes and condulets for all exterior runs and area lighting (except chemical additive areas), and for changes in direction pulling, or branches. Use galvanized steel bullet hubs at sheet steel enclosures or fixtures without threaded entrances.

G. Pulling Wires:

1. Jet Line No. 232, or equal, polyolefin, or nylon cord; working test load shall be 200 lb. minimum.

H. Contractor shall verify or establish electrical classification of building or facility before determining type of conduit to purchase. Use explosion proof condulet for junction boxes, fittings, and enclosures as required to meeting building classification.

24.9 WIRE AND CABLE

A. Wire:

1. All wire to be aluminum, with permanently marked size, grade of insulation, voltage and manufacturer's name at regular intervals on outer covering (600 volt rating).

2. Wire shall be:

a. Aluminum at outside areas and on top of buildings.

b. All aluminum at lift stations, or sewer plants where hydrogen sulfide gases are present.

c. Aluminum for connections between air terminals and ground rods.

d. Copper inside buildings and motor control centers.

3. Feeders and Branch Circuits:

a. Type THWN, 600 Volt insulated, unless otherwise shown.

b. Minimum No. 12, unless otherwise shown, stranded copper.

c. Factory color coded with same color throughout system for same phase. Conform to NEC color code; grounds shall be green, neutrals shall be white. All current or signal carrying wires shall be labeled at both ends; color coding may be used additionally but is not required. Do not use a white or green wire in a power cable or conduit as a line conductor.

d. Bare stranded copper or green colored insulated grounding wire. Buried counterpoise grounding wires shall be bare.

e. Minimum No. 10 for all branch circuit runs exceeding 100 feet to the first device or motor.

f. No. 14 stranded, red insulated. THWN/THHN control wires for 100 to 600 volt control circuits with self-laminating, wrap-on, numbered labels on each wire; No. 18 minimum with manufacturer's standard color code on 24 volt control circuits and alarm wiring. Home runs from instrument junction boxes shall be multi-conductor, heavy PVC jacketed cables, rated TC or underground burial, with No. 14 stranded copper THWN conductors with ICEA "K" color code.

g. Instrumentation Cables:

i. Except where special cables are required for analyzer probes, computer data, etc., use twisted pair shielded, jacketed instrument cables for all analog signal runs. Cable shall be suitable for conduit, tray and underground use; 600-volt insulation, 105 degrees C rated; with No. 16 AWG stranded copper (tinned 7-strand); color coded black and red thermoplastic insulated conductors, 100% foil shielded with No. 20 drain wire; black.

ii. CPE jacketed (low smoke producing); equal to Okonite type, "P-OS".

h. Multi-pair cables similar to g., above, shall have No. 18 AWG conductors, back and red colors, individually shielded twisted pairs, No. 22 drain and communications wires, overall black CPE jacket, type TC, equal to Okonite "SP-OS".

i. Radio Frequency Cables:

j. Cables from all RF antennas to the respective radios shall be 50 ohms impedance, low-loss foam dielectric coaxial type, 0.5 inches diameter, RG/8U, bare stranded copper center conductor, No. 13 AWG and braided bare copper shield with 97% coverage; overall black HDPE jacket. Cable shall be Andrew Corp. No. LDF4-50A, or equal. Confirm this specification with radio supplier.

24.10 CABLE CONNECTORS AND SUPPORTS

A. Conduit runs shall be positioned to suit field conditions to achieve an unobstructed passage for removal and installation of pumping units and shall provide close accessibility to allow removal of the cable connector by maintenance personnel from outside and above the wet-well.

B. Cables entering conduit protection and as otherwise noted shall be fitted with connectors sized to suit the cable and conduit actually installed. Connectors shall be plastic body and threaded cap type with neoprene or equal internal gas-tight compression gland.

C. Cable grips shall be provided as strain relief for cables and shall be wire mesh offset eye, closed mesh type, all fabricated with 304 stainless steel and shall be sized to suit the cable actually installed.

D. For temperature to 105oC, Interior Wiring, use Ideal Wing Nut or 3M Scotchlok, or equal. For wiring in fixtures 150oC and below, use Ideal Wire Nut, or equal.

E. For No. 8 and larger, use hand or hydraulic die-press applied compression lugs and sleeves for splices with heat shrink tubing insulation, T & B Burndy, Blackburn, or equal.

F. Control and signal wiring shall terminate on terminal blocks (wire nuts are not acceptable). Use box/plate type as manufactured by Phoenix Contact, Allen-Bradley or Weidmuller. Furnish all

accessories such as end plates, track, grounding terminals or devices, surge arresters, etc. Surge arresters shall be included as an integral part of all terminals for field wires and cables coming on or going out of I/O racks and control panels; equal to Phoenix “Termi-TRAB”.

G. Mount all surface mounted enclosures on galvanized structural steel members consisting of pipes and/or channels (11 Ga. Minimum thickness) with welded and drilled ½” thick base plates standing on concrete (set with approved grout). Provide material weights to suit loads supported. The use of “strut” type channels shall be kept to a minimum, due to the turned back legs which may collect dirt and corrosion. Channels shall be structural shapes unless otherwise indicated.

24.11 INSTALLATIONS

A. Prior to commencement of work, verify dimensions at site of work. Bring discrepancies or differences to the attention of the Engineer for resolution. Verify limitations of space available for installation clearances of all materials specified herein or indicated on the Drawings.

B. Store materials in secure locations; protect materials from weather and damage prior to installation.

C. Provide accurate layout, grades and elevations; set sleeves and openings in ample time. Take proper precautions to protect work and equipment from damage. Provide all necessary supports required for the safe and proper installation of all materials and equipment. Install underground conduits, concealed conduits, boxes and sleeves in adequate time for other trades to complete concrete pours or other installation work.

D. When not possible to install sleeves, inserts, etc., prior to other trades’ work being placed, cut openings, chases and trenches required for introduction of work and equipment, using approved methods. Do all backfilling and repair floors, wall and ceilings where cutting is done, in conformance with the various foregoing Specification sections.

E. Installation to conform to the applicable paragraphs of NFPA-70 and in accordance with good practice as described in “The Electrician’s Handbook”, by Croft and Summers.

F. Install materials and equipment as recommended by the Manufacturer, in addition to the requirements specified herein.

G. Repair or replace materials damaged during installation. Touch up scratched or marred surfaces.

H. Raceways: Install rigid galvanized steel raceways and cast galvanized boxes exposed on the surface, on process tanks, along walkways, and below 48 in. high, in electrical and equipment rooms. Cable trays shall be used inside electrical rooms, only; conform to NEC requirements and these Specifications for support and minimum size of single conductor wires that may be run in trays. Provide grounding of raceways and trays as specified.
   1. During construction, temporarily plug or otherwise protect all installed raceways from the entrance of moisture, dirt, trash, etc. Replace any raceway which may become clogged with dirt, trash, moisture, etc., without additional expense to the Owner. No kinked, clogged or deformed raceway will be permitted on the job. Cut and thread raceways to proper length so that ends will fit accurately in the outlets; use hubs at sheet steel enclosures. Use hydraulic punches to make knockouts in metal and fiberglass enclosures. Use of hole saws shall be limited to fiberglass and plastic enclosures.
   2. Properly align, group and support raceways. Install exposed raceways at right angles or parallel to the principal structural members. Firmly fasten raceways in place. Run raceways to avoid trapping wherever possible. Provide necessary inserts in poured

concrete areas and furnish and install all necessary sleeves through walls and floors for passage of raceways. Properly seal sleeves through exterior walls of the building. Do not penetrate roof; run conduits to roof mounted fans, etc. inside the limits of the roof curb.

3. Rigid Conduit
   a. Run for all types of wiring, for exterior process and when exposed in buildings.
   b. Make all joints tight with no running threads; use approved thread sealing compound that will aid in the conductivity of the conduit system and prevent corrosion.
   c. Ground all conduits using grounding bushings and/or grip tooth type U-bolt clamps with grounding lugs.
   d. Ream inside edge of cut conduit to prevent wire damage during pulling.
   e. Coat all field-made threads, with two coats of cold galvanizing paint equal to ZRC.
4. Make connections to equipment having motors and vibrating devices with plastic jacketed flexible metal conduit, liquid-tight, such as “Seal-tite” flexible metal conduit.
5. Hangers and Supports:
   a. Rigid Conduit; support all conduits at less than the maximum spacing required by the NEC. Supports of the approved type, Crouse-Hinds, Appleton, Killark, or equal.
6. General Installation:
   a. All bends to be factory made or bent with an approved mandrel type bender. Radius not less than minimum permitted by NEC.
7. Wire and Conduit Identification:
   a. Tag all conductors and identify major conduits in or at wireways, panels, pull boxes, motor controllers, cabinets and similar items to assist in future circuit tracing, at both ends of all wires. Conductor tags to be non-conductive. Identify all circuits and equipment to correspond with the Plans and Specifications.
8. Splices and Terminations:
   a. Feeders shall be spliced only as a last resort. Where required, feeders, sub-feeders and branch circuit conductors, No. 8 and larger shall be spliced with solderless type tin plated copper compression sleeve splices and terminated with compression lugs. Install lugs and splices with a hydraulic powered compression die tool; indenter type tools shall not be used. Use Cad Weld method for grounding connections below grade and split-bolt “Servit” studs, or compression lugs and bolts on exposed steel.
   b. Branch Circuits (Up to No. 10):
      i. Scotchlok, Ideal, or equal, insulated conical spring type connectors over twisted conductors.
   c. Instrumentation and control cables shall be terminated at terminal blocks in all cases. Use box-plate type sectional blocks, 6 mm minimum width; tighten terminal block screws with hardened steel high-torque, large-handled screwdriver.
9. Location of Devices and Outlets
   a. Prior to roughing-in device and outlet boxes, Contractor shall verify from general construction drawings; all features that will affect the function of the device or outlet. Do not scale the plans; location of devices is shown on plans in desired vicinity. Contractor shall carefully locate devices symmetrically and in coordination with structural features.
   b. Use isolated ground specification grade receptacles for all computer power outlets. Provide separate equipment and isolated ground conductors all the way from the receptacles to the panel buses.
10. Pull and Junction Boxes:
    a. Provide pull and junction boxes where required by the National Electric Code, whether or not shown on the Drawings.
    b. Identify conductors where more than one circuit passes through a junction box or pull box with electrical characteristics, system designation, source and designation. Provide barriers where required by Code.
    c. Independently support pull boxes on the building or structure. Do not depend on the conduit system for support.
    d. Use hydraulic punches to make knock-outs in sheet metal enclosures; hole saws shall be used on non-metallic enclosures only.

11. Equipment Grounding Conductors:
    a. All receptacle and lighting circuits shall have a continuous grounding conductor No. 12, minimum, to all devices and back to panel ground bus.
    b. Install on all conduits using bushing and/or clamps, as required by the Owner and the NEC (NFPA 70).
12. Cable Shields:
    a. Instrumentation cable shields shall be grounded at the Input/Output rack or RTU end only and insulated on the field end. At all junction boxes and intermediate terminals, keep the shields continuous and isolated from ground, similar to the signal conductors; i.e., use an insulated terminal on the same terminal block (adjacent to the signal pair) for the shield.

I. If the Contractor finds it desirable to make changes and/or alterations in Plans, equipment or materials in order to facilitate construction, he shall submit a proposal for the changes to the Engineer for approval. The Contractor shall not initiate such changes without the Engineer's written approval. No adjustment in quantities or unit prices shall be made for the changes unless attached to the written approval as an authorization for "Change in Work" or "Extra Work". The Contractor, by his acceptance of the approval, agrees not to submit any "Claims for Damage" in connection with the approved changes or alternatives. Design time required by the "Engineer" to facilitate the change will be charged to the Owner and subsequently deducted from the Contractor's bid price.

J. There shall be no mixing different types of signals within a single conductor, i.e., radio cables or low voltage DC with 120 VAC.

K. Initial calibrations with documentation shall be required for all hardware being installed under this Contract and shall be the responsibility of the Contractor.

L. All trenching, excavation and meter pits required for proper installation shall be performed or supplied by the Contractor under the Owner's supervision.

M. Tape and Control Wire Markers:
1. Tape shall be Scotch 33+ or approved equal. Fill voids with rubber tape or filling compound equal to Scotchfil.
2. Use colored Scotch 33 colored plastic tape for color coding phase wires.
3. Use Brady or equal by T & B wire number markers, self-laminating type, for all control wires at both ends. Use an indelible marker pen, typewriter, or label printer to apply number to labels prior to wrapping on the wires.

24.12 IDENTIFICATION AND LABELING

A. Label all Electrical Junction boxes and equipment with 1-inch high laminated plastic labels with engraved lettering, white letters on black, 3/16 inch high. On main junction boxes, use 2 inch high laminated engraved labels with ½ inch high lettering.

B. Show type of system and voltage of contained wires outside and inside of all junction box covers using ¾ inch high "Dymo" embossed labels.

24.13 WARRANTY

A. The Contractor warrants that there are no defects of material or workmanship in the goods described herein. This warranty shall bind the Contractor for a period of two (2) years beyond the date of acceptance. If within such warranty period it is established that any material or workmanship in the goods was defective, the Contractor shall, at its option, either repair or replace defective materials or workmanship, in either case F.O.B. from its factory. The

purchaser agrees that the Contractor's liability under the foregoing warranty shall be limited as stated and that there are no other warranties which extend beyond the description of the face hereof, and that except as stated, the Contractor shall not be liable for any loss, damage or expense; and that in no event shall the seller be liable for any loss of profits or other consequential damages.

1. No allowance will be made for repairs or replacements not authorized by the Contractor; such allowances will be credited to the purchaser only after he has returned to the Contractor the material which is claimed to be defective. The warranty will provide a two-year limited warranty from the date of installation.

B. This limited warranty does not cover repair of components damaged by abuse, accident, lightning, disaster or misuse.

24.14 MAINTENANCE

A. All suppliers submitting proposals must have available at least one (1) factory parts and service center. This center shall be staffed with full-time technical as well as order and shipping personnel during regular business hours and days. This factory center must have a toll-free telephone service or agree to accept all calls from Owner.

B. Maintenance service will be available from the system supplier either by a maintenance contract or on a per-call basis. The service representative (Contractor) shall also maintain an inventory of replacement modules and major components for quick service for the Owner.

C. If the manufacturer's service center is unable to repair and have ready to return any I/O cards in the system within 48 hours of receipt from the Owner, the service centers shall have available a rental or loaner component for immediate shipment.

24.15 FINAL ACCEPTANCE

A. After the systems, equipment and fixtures are completely installed, and at such time as the Owner shall direct, conduct an operating test for approval and acceptance by the Owner. Perform the test in the presence of the Owner or his authorized representative. Advance approval of equipment or materials will not constitute a waiver of the requirements that the equipment, fixtures or materials be demonstrated to operate in accordance with these Specifications.

END OF SECTION

PART 4

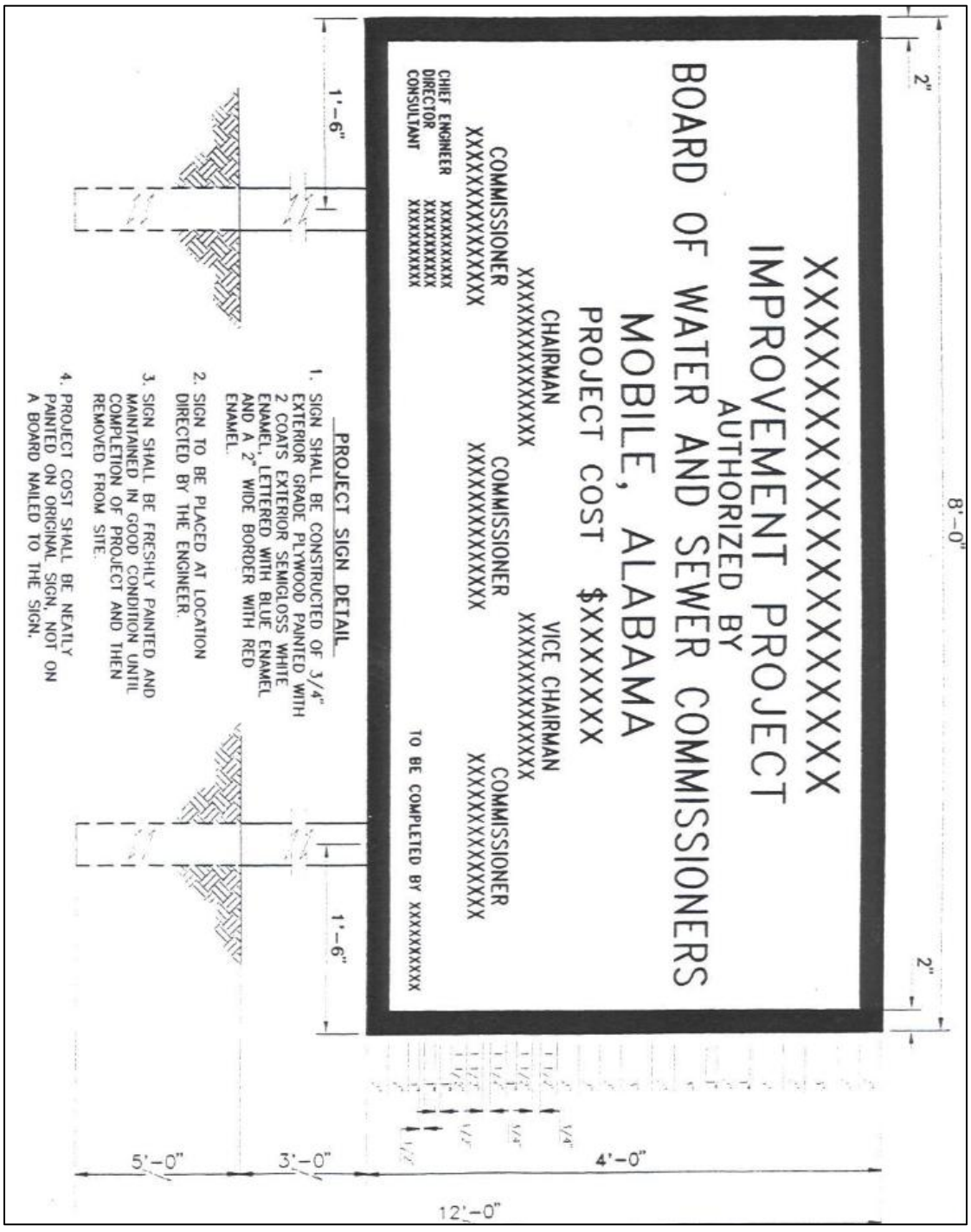
MAWSS SPECIFICATION APPENDICES

APPENDIX A – LIST OF ACCEPTABLE PRODUCTS AND APPROVED MANUFACTURERS

1.1 ACCEPTABLE PRODUCTS AND APPROVED MANUFACTURERS

A. Acceptable products and manufacturers are as listed in the Technical Specifications. Any products or manufacturers not listed and request to be considered as Approved Equal must be submitted to the Owner and Engineer in writing at least 14 calendar days prior to the scheduled bid opening. Owner and Engineer will review the request and provide a response no later than three (3) calendar days before the scheduled bid opening.

APPENDIX F – PROJECT SIGN (REVISED)



END OF SECTION

APPENDIX H – SMALL AND SMALL DISADVANTAGED BUSINESS

The Board has established an office for Small and Underutilized Business Development to assist with Bidders on Request in meeting the requirements of this contract.

This service will be provided at no cost to the Bidders.

END OF SECTION

APPENDIX J – IRREVOCABLE STANDBY LETTER OF CREDIT

IRREVOCABLE STANDBY LETTER OF CREDIT	CREDIT NUMBER_____
IN FAVOR OF: Board of Water and Sewer Commissioners of the City of Mobile, Alabama	For account of: _____ (Contractor) _____ (Address)
AMOUNT: Up to the aggregate amount of $_____	EXPIRATION DATE _____ AT OUR COUNTERS IN MOBILE, ALABAMA

Gentlemen:

We hereby establish our irrevocable standby letter of credit No. _____ in your favor available by your draft(s) drawn on us at sight when accompanied by the following document:
Statement purportedly signed by an authorized representative of the Board of water and Sewer Commissioners of the City of Mobile, Alabama certifying that _____ (Contractor) is in default under the terms of the agreement for the _____(Project No.)

Any reference to the agreement is for informational purpose only, the agreement does not represent an integral part of this letter of credit.
All draft(s) drawn under this credit must be marked: Drawn under _____ (Bank) Mobile letter of credit No. _____, dated _____.
Partial drawings are permitted.

THE ORIGINAL OF THIS LETTER OF CREDIT MUST BE PRESENTED WITH ANY DRAWING.

We hereby engage with you that drafts drawn under and in compliance with the terms of the credit will be duly honored upon presentation and delivery of the documents as specified. Except so far as otherwise expressly stated, this documentary credit is subject to the "Uniform Customs and Practice for Documentary Credits" fixed by the International Chamber of Commerce in effect as of the date of issuance hereof.	_____, Mobile (Bank) _____ Authorized Signature _____ Authorized Signature

END OF SECTION

DIVISION 1

GENERAL REQUIREMENTS

SECTION 01 10 00 – SUMMARY

GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Project information
   2. Summary of Work
   3. Work by Owner or others
   4. Owner-furnished products
   5. Future work
   6. Owner's product Purchase contracts
   7. Owner occupancy
   8. Permits
   9. Specification conventions
   10. Project Design Criteria

B. Related Sections:
   1. Section 01 14 00 – Work Restrictions
   2. Section 01 20 00 – Price and Payment Procedures
   3. Section 01 32 16 – Construction Progress Schedule
   4. Section 01 50 00 – Temporary Facilities and Controls
   5. Section 01 70 00 – Execution Requirements

1.2 PROJECT INFORMATION

A. Name: CC Williams Headworks Rehabilitation and Odor Control
   1. Project Location: Mobile, Alabama

B. Owner: Mobile Area Water and Sewer Service
   1. Owner's Representative: Douglas Cote, PE

C. Project Engineer: Lindsay Tucker, PE
   1. Engineer's Representative: Robert Wesley Cardwell, PE

1.3 SUMMARY OF WORK

A. Work of the Project generally includes concrete surface rehabilitation within the headworks channels and installation of a biotrickling filter odor control system and associated ductwork. More specifically, the Work includes, but is NOT limited to, construction of:
   1. Biotrickling Odor Control System
      a. Foundation slab
      b. Air duct system
      c. Blowers
      d. Biotrickling filter silo
      e. Carbon polishing system
   2. Headworks Structural Rehabilitation
      a. Concrete repair work within the headworks channel to include concrete surface repair, crack repair, and necessary form work.
      b. Epoxy coating within the headworks channels as noted.
      c. Addition of a continuous gas monitoring system within the headworks channels.
      d. Addition of a worker air safety monitoring and notification system.
   3. PCEPS Catwalk
      a. Addition of a platform catwalk on PCEPS to access pumps for maintenance.

4. Rehabilitation of Primary Clarifier Elements
    a. Repair and coating of the primary clarifier effluent boxes (4).
    b. Cleaning and coating of the primary clarifier mechanism center columns (4).
5. Site improvements to support items above including yard piping, paving, grading, fencing, and site restoration.
6. Site electrical improvements to support items above including electrical power supply, control systems, lighting, security, and provisions for integration.

1.4 WORK BY OWNER OR OTHERS

A. Owner, utilities, and others may perform activities within the project site and premises while the Work is in progress. Schedule the Work with Owner, utilities, and others to minimize interference or delays.

B. If Owner-awarded contracts interfere with each other due to Work being performed at the same time or at the same Site, Owner will determine the sequence of Work under all contracts.

1.5 OWNER–FURNISHED PRODUCTS

A. Owner's Responsibilities:
1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples to Contractor.
2. Arrange and pay for delivery to Site.
3. Upon delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.
3. Repair or replace items damaged after receipt.
4. Handle, store, install, and finish products.

SUBSURFACE UTILITY CONDITIONS

A. Coordinate Work with utilities of Owner and public or private agencies. Verify locations of utilities and facilities which may exist by contacting the utility locating service for the state where Work is performed.
1. Alabama 811
2. Abide by easement and right-of-way restrictions.

B. Exercise reasonable care to verify location of existing subsurface facilities and utilities.

C. Areas immediate and adjacent to planned excavations shall be thoroughly checked by means of visual examination and with electronic metal and pipe detection equipment for indications of underground utilities and facilities.

D. Make exploratory excavation where existing underground facilities or utilities may potentially conflict with proposed excavations and facilities, or where there is reasonable cause to verify the presence or absence of underground facilities or utilities. Expose sanitary and storm sewers, water, gas, electric, communication lines, and other underground facilities to permit survey location prior to commencement of Work in affected area:

1. Conduct exploratory excavations prior to proceeding with major excavation in the area, and sufficiently in advance of construction to avoid possible delays to the Work. Promptly take measurements, photographs, and obtain survey data.
2. Notify the Owner when Work will be in progress. Make arrangements for potential emergency repairs as specified in standards of utility owners, including individual or residential facilities.
3. Assume responsibility for repair of facilities damaged by performance of the Work.

E. Relocation of Existing Utilities:
1. During construction it is expected that minor relocations of existing utilities, beyond those explicitly specified in Drawings, will be necessary as part of the Work.
2. When relocation of utilities is required as part of the Work, perform as specified in the standards of affected utility owner. Match materials of existing utilities unless otherwise specified.
3. Adjustment to contract price and contract time for concealed conditions, if any, will be made as stipulated in conditions of the Contract.

F. Construction Plan:
1. Before start of construction, post electronic file to web-based project management software of construction plan regarding access to Work, use of Site, and utility outages for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.

1.7 FUTURE WORK

A. Provide items specified in Drawings and as specified in other divisions to accommodate the anticipated future work, including but NOT limited to structural, mechanical, electrical, and site work provisions.

1.8 OWNER OCCUPANCY

A. Schedule and substantially complete designated portions of the Work, as designated in Specification 01 14 00 – Work Restrictions, for Owner’s use and occupancy before Substantial Completion of the entire Work.
1. Owner's use and occupancy of designated areas before Substantial Completion of entire Project DO NOT relieve Contractor of responsibility to maintain specified insurance coverages on a 100% basis until date of final payment.

B. Owner will occupy Site during entire period of construction for conduct of normal operations. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule Work to accommodate Owner occupancy.

1.9 PERMITS

A. Secure and pay for all necessary permits for construction of Work, including but NOT limited to:
1. Pertinent City of Mobile building permits including plumbing, mechanical, and electrical.
2. Stormwater permit. It is the Contractor’s responsibility to maintain the required controls and record keeping complying with the SWPPP and associated stormwater permit.
3. OSHA excavation permit
4. Department of Transportation permits

B. Comply with codes, ordinances, regulations, orders, and other legal requirements of public authorities having bearing on the performance of the Work.

1.10 SPECIFICATION CONVENTIONS

A. Specification Arrangement:
   1. Specification section numbers and formatting are in CSI Three-Part Section format, and as specified in CSI MasterFormat™, except where departures have been deemed necessary.

B. Specification Content:
   1. The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations.

   2. These conventions are:
      a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
      b. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; NO emphasis is implied by text with these characteristics.
      c. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is NOT residing in the Specifications. Unless otherwise specified, linked information is NOT part of the Contract Documents.
      d. "Provide" means to manufacture, fabricate, deliver, furnish, install, complete, assemble, erect in place, test, render ready for use or operation, including necessary related material, labor, appurtenances, services, and incidentals.
      e. Related documents and sections: the Contract Documents are complementary; what is called for by one is as binding as if called for by all.

C. Drawing Coordination:
   1. Requirements for materials and products identified on Drawings are described in detail in the Specifications.
   2. One or more are used on Drawings to identify materials and products:
      a. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
      b. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
      c. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.11 DESIGN CRITERIA

A. Project Design Criteria:
   1. All equipment and materials for the project are to be suitable for performance in the wastewater treatment plant environment.
   2. Outdoor temperatures: 30F –105°F
   3. Indoor process area temperatures: 50°F – 105F
   4. Indoor conditioned spaces: 60°F – 80°F
   5. Design groundwater elevation: 5 Ft El.
   6. Frost line is assumed 12 inches below grade
   7. Moisture conditions: Defined in Specification Sections
   8. Site elevation: Generally ranges from 10 – 15 ft above mean sea level

B. Anchoring Design Criteria:
   1. Anchorage of electrical and mechanical equipment shall comply with:
      a. Seismic Criteria:
         1) Risk Category: III

2) Soil Site Class: E
3) Design spectral acceleration at short period, S_{DS}: 0.149 g.
4) Design spectral acceleration at short period, S_{D1}: 0.167 g.
5) Seismic Design Category: C
6) Importance Factor, I: 1.25
7) Component amplification factor, a_p: As specified in ASCE 7-16
8) Component response modification factor, R_p: As specified in ASCE 7-16
9) Component importance factor, I_p: As specified in ASCE 7-16
10) DO NOT use friction to resist sliding due to seismic forces.

b. Wind Criteria:
1) Basic wind speed: 179 mph
2) Exposure Category: C
3) Topographic Factor, K_{zt}: 1.0

c. Use anchor bolts, bolts, or welded studs for anchors for resisting seismic and wind forces. Anchor bolts used to resist seismic and wind forces shall have a standard hex bolt head embedded in the concrete. DO NOT use anchor bolts fabricated from rod stock with an L or J shape.

d. DO NOT use chemical anchors, concrete anchors, flush shells, powder actuated fasteners, sleeve anchors, or other types of anchors unless specified in the Drawings or accepted in writing by the Engineer.

e. Seismic and wind forces must be resisted by direct bearing on the fasteners used to resist seismic and wind forces.

f. Complete shop drawings, seismic calculations, and wind calculations signed and sealed by a civil or structural engineer licensed in the state where the Project is located.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 00 – WORK RESTRICTIONS

GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Work restrictions
   2. Work sequencing

B. Related Section:
   1. Section 01 20 00 – Price and Payment Procedures
   2. Section 01 32 16 – Construction Progress Schedule
   3. Section 01 50 00 – Temporary Facilities and Controls
   4. Section 01 70 00 – Execution Requirements
   5. Section 01 77 00 – Closeout Procedures

1.2 GENERAL WORK RESTRICTIONS

Wastewater Treatment Facilities:

1. The existing facility is the Mobile Area Water and Sewer Service's only means of treating domestic and industrial wastewater prior to discharging to the Alabama River. Impairing the operational capabilities of this facility will result in serious environmental damage and monetary fines.
2. Contractor shall bear the cost of penalties imposed on the Owner for discharge violations or other violations caused by actions of the Contractor.
3. Conduct work in a manner that WILL NOT impair the operational capabilities of essential elements of the treatment process or reduce the capacity of the entire treatment plant below levels sufficient to treat the quality of raw wastewater to the water quality limitations specified in the discharge permit.
4. The status of the treatment plant shall be defined as "operational" when it is capable of treating the entire quantity of wastewater received to the water quality limits specified in the discharge permit.

B. Time Restrictions for Performing Work:
   1. Regular operating hours as determined by the Owner.
   2. Special accommodations may be made during specific portions of the work to be performed outside of regular operating hours, as needed and prior approved by Owner.

C. Onsite Workday Restrictions:
   1. DO NOT perform Work on Site during Work blackout days specified by Owner.

D. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

E. Provide safe, continuous access to process control equipment for plant operations personnel.

F. Noise, Vibration, Dust, and Odors:
   1. Coordinate with Owner operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy.
   2. Notify Engineer or Owner NOT less than five days in advance of proposed disruptive operations.
   3. Obtain Engineer's or Owner's written permission before proceeding with disruptive operations.

G. Smoking and Controlled Substance Restrictions:
   1. Use of tobacco products, alcoholic beverages, marijuana, and other controlled substances on Project Site, premises, or on Owner's property is NOT permitted.

H. Employee Identification:
   1. Provide identification tags for Contractor personnel working on Project Site. Require personnel to use identification tags at all times.

I. Employee Screening:
   1. Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project Site.
   2. Maintain list of approved screened personnel with Owner's representative.

1.3 CONTRACTOR'S USE OF SITE AND PREMISES

A. Restricted Use of Site:
   1. Contractor shall have limited use of Project Site for construction operations as specified in Drawings by the Contract limits and as specified in this Section.

B. Limits on Use of Site:
   1. Limit use of Project Site to Work in areas specified.
   2. DO NOT disturb portions of Project Site beyond areas in which the Work is specified.

C. Limits on Use of Site:
   1. Limit use of Site and premises to allow:
      a. Owner occupancy
      b. Work by Owner
      c. Work by Others
      d. Use by the public where required
   2. Driveways, Walkways, and Entrances:
      a. Keep driveways, parking areas, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. DO NOT use these areas for parking or for storage of materials.
      b. Schedule deliveries to minimize use of driveways and entrances by construction operations.
      c. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on Site.

D. Construction Operations:
   1. Limited to areas specified in Drawings.

   2. Noisy and Disruptive Operations (such as Use of Jack Hammers and Other Noisy Equipment):
      a. NOT allowed in close proximity to existing building during regular hours of operation. Coordinate and schedule such operations with Owner to minimize disruptions.

E. Sound Level Restrictions:
   1. Sound pressure level measured at boundary of Site SHALL NOT exceed levels required by local ordinances or codes, and at NO time shall exceed 50 dBA

1.4 FACILITY OPERATIONS

A. Existing Utility Interruptions:

1. DO NOT interrupt utilities serving facilities occupied by Owner or others unless permitted under the conditions, and only after arranging for temporary utility services as specified:
    a. Notify Engineer and Owner NOT less than seven days in advance of proposed utility interruptions.
    b. Submit outage request plan to Engineer and Owner itemizing dates, times, and duration of each requested outage.
    c. Obtain Owner's written permission before proceeding with utility interruptions.

B. Existing Operations Interruptions:
1. DO NOT shutdown, interrupt, or otherwise impair the operational capability of treatment facilities or processes unless permitted under the following conditions. A facility or process shall be considered operational when it can achieve its defined treatment or process objective as defined by the Owner or Engineer.
2. Specify required shutdowns of existing facilities or interruptions of existing operations on Construction Progress Schedule.
3. Where required to minimize interruptions or impairments to systems operations while complying with specified work constraints, provide temporary treatment equipment, pumping, bypass systems, connections, power, lighting, controls, instrumentation, and safety devices.
4. DO NOT remove or demolish systems required to keep the existing facilities operational at the capacities specified until the existing systems are replaced by temporary or new systems.

C. Shutdown Constraints:
1. Perform work within critical operational constraints:
    a. No more than two headworks channels shall be offline at a given time. Preference is to only have one channel down at a time unless common wall repairs require both to be offline.
    b. Shutdown of headworks channels can only be done with half of the facility offline at a time, so only Channels 1 and 2 can be down, or Channels 3 and 4.
    c. A detailed schedule of proposed shutdowns is required from the Contractor and to be approved by the Engineer and MAWSS prior to initiating any shutdown activities.

D. Shutdown Definitions:
1. Minor Shutdown:
    a. Any shutdown requiring less than 2 hrs.
2. Major Shutdown:
    a. Any shutdown other than a minor shutdown.
3. Dry Weather Period:
    a. Generally, June 15 – October 1
    b. Final determination made by Owner based on weather, flows entering the plant, and plant operation requirements.
4. Wet Weather Period:
    a. Any time NOT within the defined dry weather period.
5. Low Flow Period:
    a. 2:00am – 6:00am

E. Shutdown Procedures:
   1. Notify Engineer and Owner NOT less than fifteen (15) days in advance of proposed minor shutdowns.
   2. Notify Engineer and Owner NOT less than thirty (30) days in advance of proposed major shutdowns.
   3. Contractor shall schedule a shutdown coordination meeting with Owner and Engineer one week prior to each shutdown.
   4. Any and all plant shutdowns shall require a shutdown plan, including detailed schedule, backup tools and equipment, personnel involved, contingency plan, and any procedures involved in restarting the process or facility.
   5. Obtain Engineer's or Owner's written permission before proceeding with proposed shutdowns.
   6. Shutdowns may be limited to low flow periods.

1.5 WORK SEQUENCE

A. Use identified work sequences in this section as a guideline for scheduling and performing work. Perform work in a manner that WILL NOT prevent the facility from achieving the final treated water quality requirements established by regulation. It is ultimately the responsibility of the Contractor to execute the work in a sequence that meets all requirements of the contract documents.

B. Work sequence and constraints presented DO NOT include all items affecting completion of the Work. They are intended to describe critical events necessary to minimize disruption to existing operations and to ensure compliance with treatment regulations and permit requirements.

C. Construct Work in phases in order to accommodate Owner's occupancy requirements during construction period. Coordinate construction schedule and operations with Engineer and Owner:
   1. Phase 1: Headworks Concrete Restoration
      a. Mobilization
      b. Empty Screen Channels 3 and 4 and west side of influent channel
         1) Complete cleaning and repairs
         2) Install duct connections for odor control
      c. Empty Screen Channels 1 and 2 and east side of influent channel
         1) Complete cleaning and repairs
         2) Install duct connections for odor control
      d. Empty Screen Channels 1 and 2 and east side of headcell influent channel
         1) Complete cleaning and repairs
         2) Install duct connections for odor control
      e. Empty Screen Channels 3 and 4 and west side of headcell influent channel
         1) Complete cleaning and repairs
         2) Install duct connections for odor control
      f. Empty Discharge Boxes to Clarifiers 3 and 4 and west side of effluent channel
         1) Complete cleaning and repairs
         2) Install duct connections for odor control
      g. Empty Discharge Boxes to Clarifiers 1 and 2 and east side of effluent channel
         1) Complete cleaning and repairs
         2) Install duct connections for odor control
      h. Empty Headcells 1 and 2 and east side of effluent channel
         1) Complete cleaning and repairs
         2) Install duct connections for odor control
      i. Empty Headcells 3 and 4 and west side of effluent channel
         1) Complete cleaning and repairs
         2) Install duct connections for odor control
      j. Empty Headcells 2 and 3 and middle of effluent channel

1) Complete cleaning and repairs
2) Install duct connections for odor control

k. Install handrail around head cell area
l. Install employee gas monitoring system at headworks area

2. Phase 2: PCEPS
   a. Sequence 1: Install elevated catwalk as noted
3. Phase 3: Odor Control
   a. Relocate plant drain
   b. Construct pipe support system and footers for ductwork
   c. Construct pad for BTF, fans, and carbon adsorber
   d. Install fans, BTF, carbon adsorber, and other equipment.
   e. Electrical, plumbing for BTF at pad.
   f. Install ductwork at headworks and aerial piping to connect to BTF pad.
4. Phase 4: Primary Clarifier Effluent Box and Center Column
   a. Coordinate sequencing shutdown plan with MAWSS on Primary Clarifier draining. Coordinate work with Phase 1 Sequence 5 and 6 for Primary Clarifier isolation and draining.
   b. Prep and repair concrete surfaces of all four clarifier effluent boxes.
   c. Sequentially drain primary clarifiers as needed to access center column for cleaning and coating.
5. Final Site Restoration
   a. Final grading, pavement, and site cleanup
   b. Demobilization

1.6 SEQUENCING OF CONSTRUCTION PLAN

A. Before start of construction, post electronic file to Project website of construction plan regarding phasing of project and new Work for acceptance by Owner.

B. After acceptance of plan, comply with accepted plan when coordinating construction sequencing unless deviations are accepted by Owner in writing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

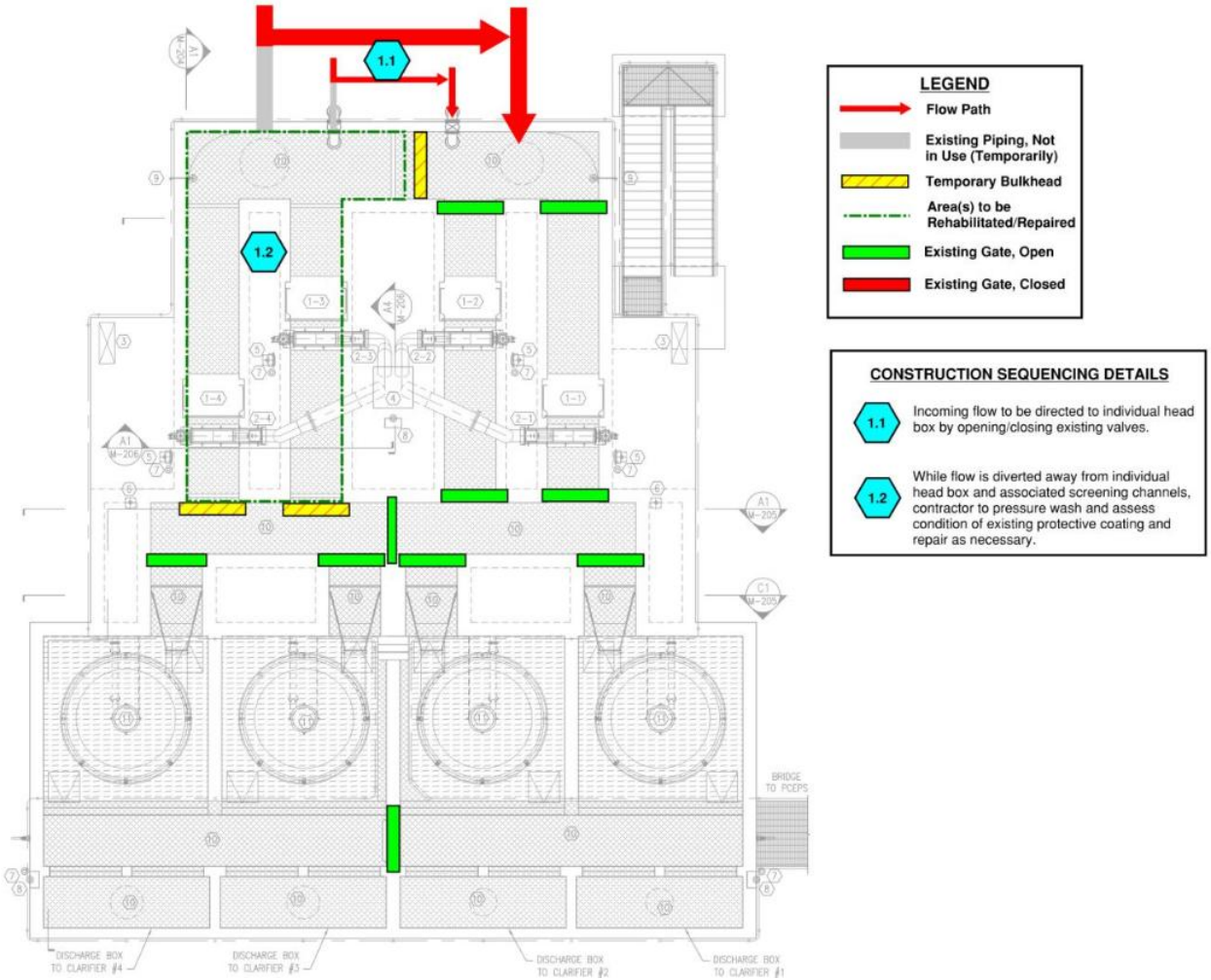
3.1 GENERAL

A. Use identified work sequences in this section as a guideline for scheduling and performing work. Perform work in a manner that WILL NOT prevent the facility from achieving the final treated water quality requirements established by regulation. It is ultimately the responsibility of the Contractor to execute the work in a sequence that meets all requirements of the contract documents.

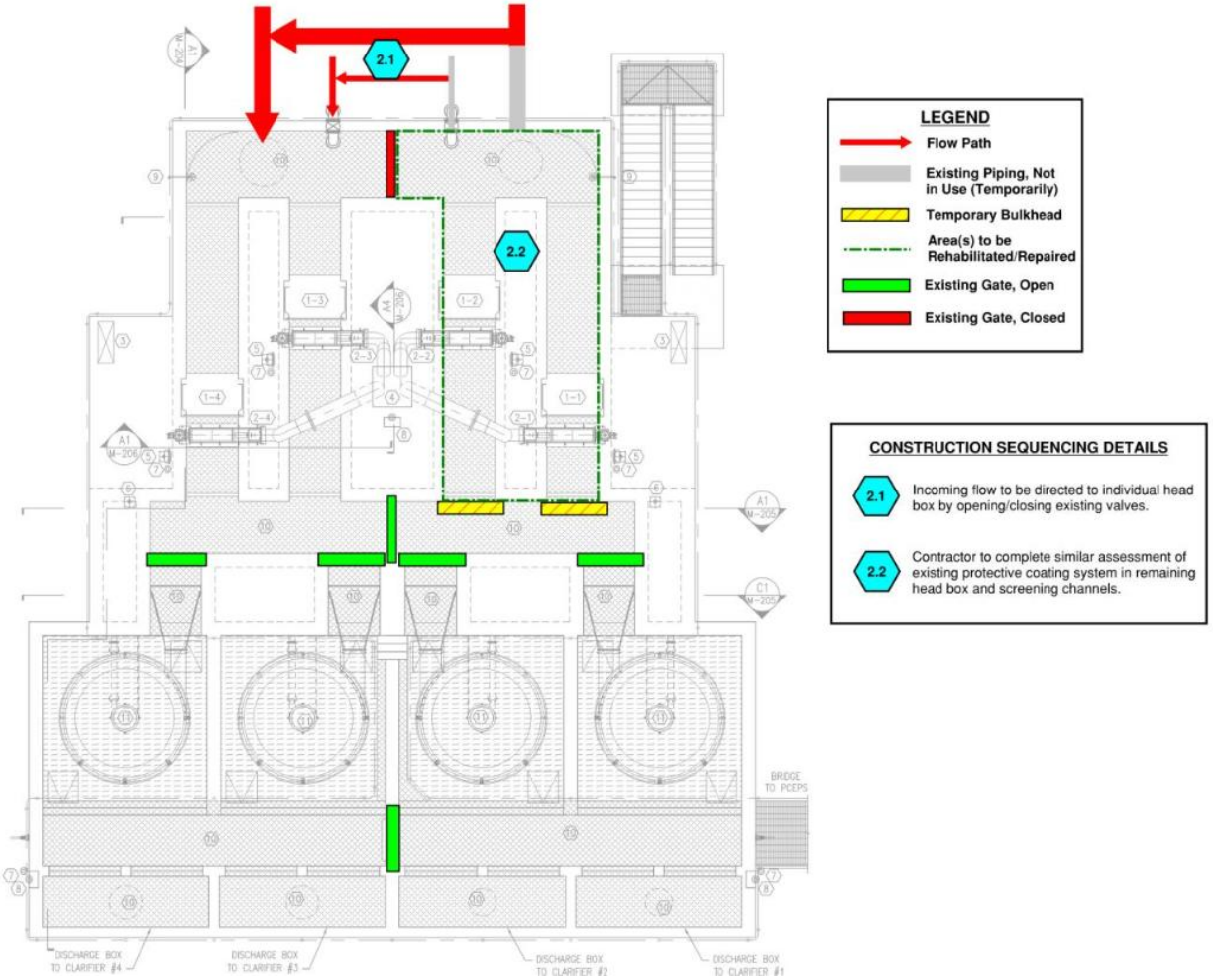
B. Work sequence and constraints presented DO NOT include all items affecting completion of the Work. They are intended to describe critical events necessary to minimize disruption to existing operations and to ensure compliance with treatment regulations and permit requirements.

3.2 PROPOSED PHASE 1 SEQUENCE

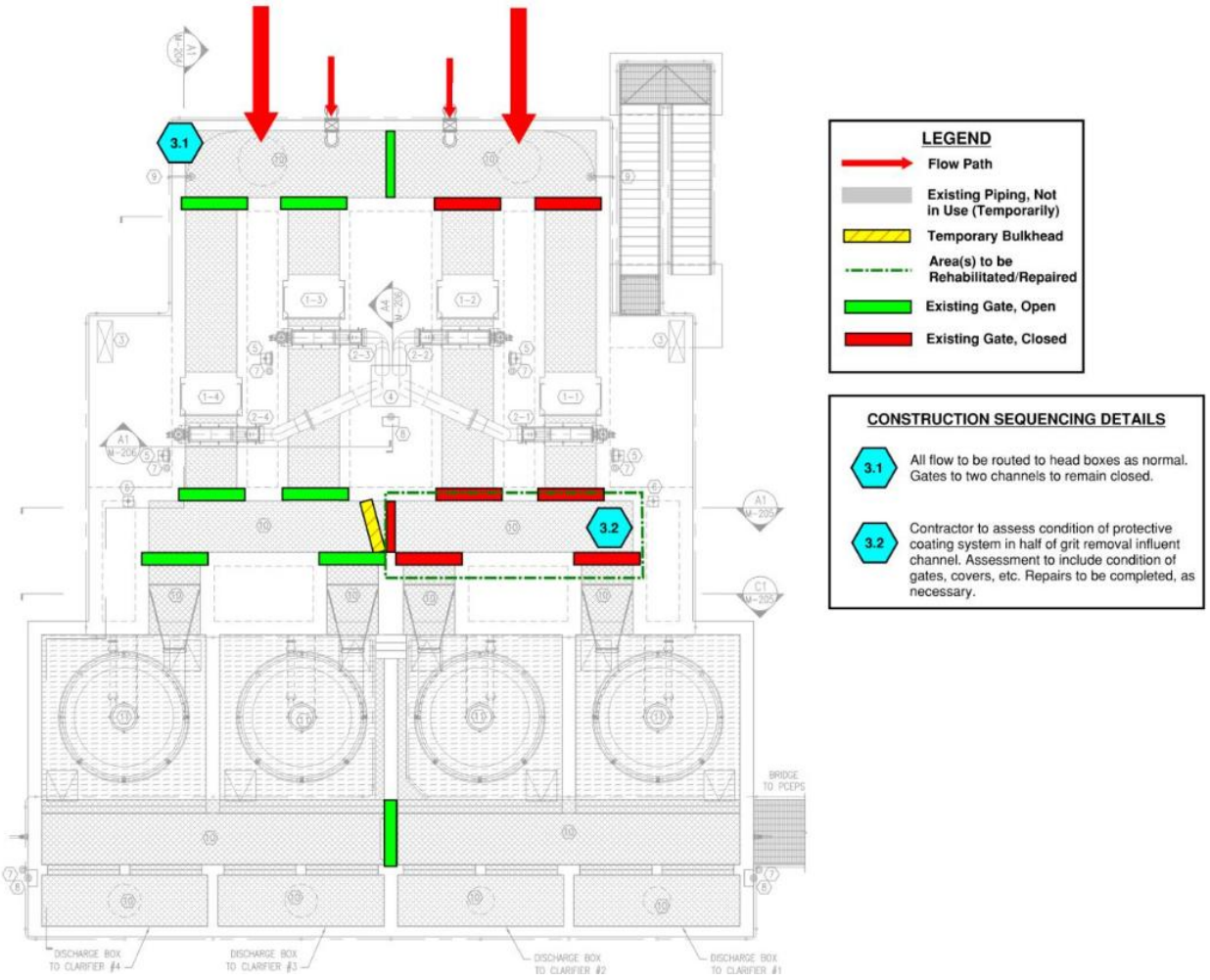
Sequence	Headworks Channel Restoration Sequence 1
Description	Headworks Channel Concrete Restoration
Work to be Completed	Rehabilitate/repair influent channel and screen channels
Shutdowns Required During Sequence	West Chamber of Influent Pump Station Splitter Box
Equipment and Facilities Out of Service	Screens No. 3 and No. 4
Isolation Locations	Influent Channel, Screen No. 3, and Screen No. 4 Bulkheads
Dewatering Locations	West Side of Influent Channel and Screens No. 3 and No. 4
Construction Duration during Shutdown	2 weeks
Total Shutdown	2.5 weeks



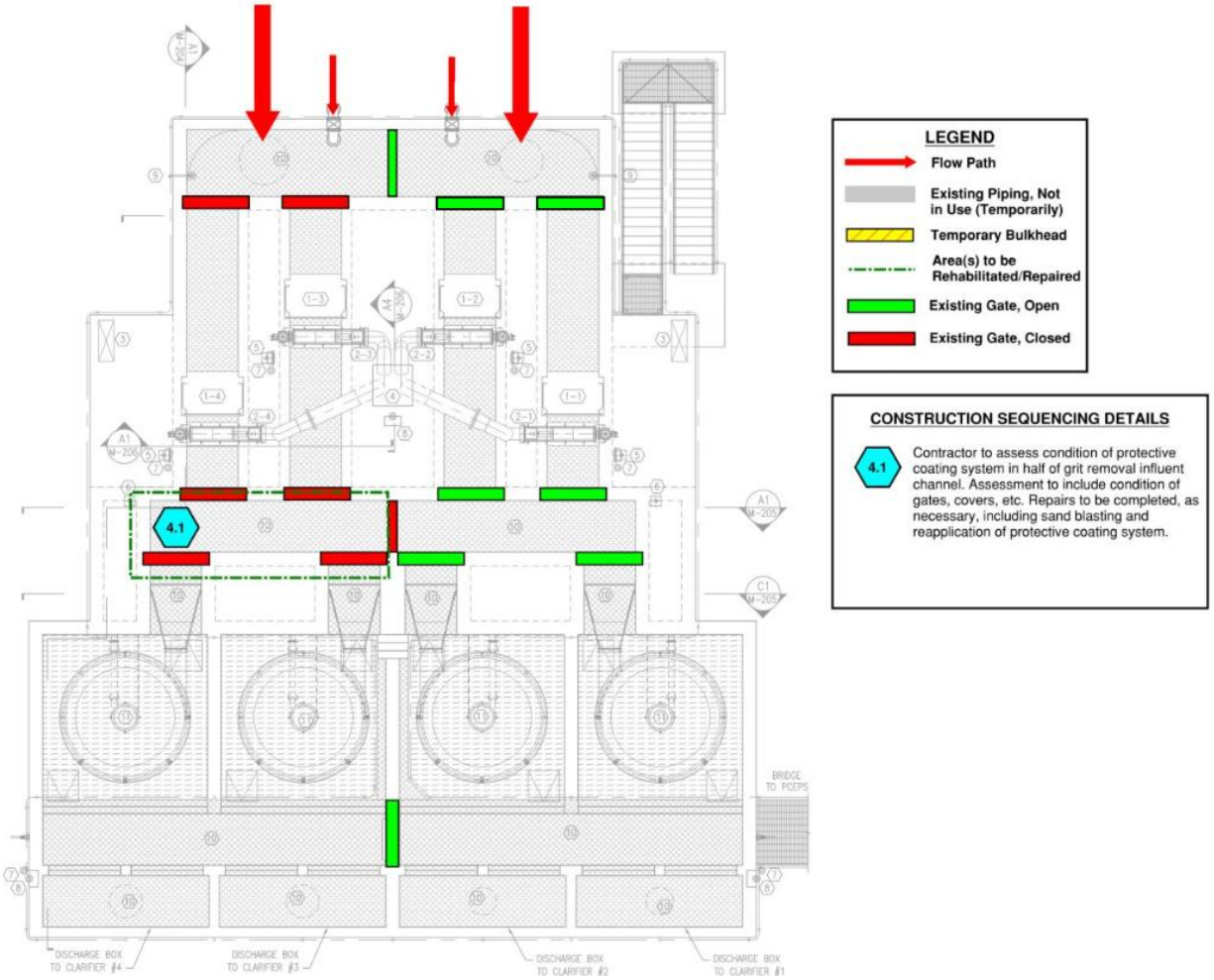
Sequence	Headworks Concrete Restoration Sequence 2
Description	Headworks Concrete Restoration
Work to be Completed	Rehabilitate/repair influent channel and screen channels
Shutdowns Required During Sequence	East Side of Influent Channel and Screens No. 1 and No. 2
Equipment and Facilities Out of Service	Screens No. 1 and No. 2
Isolation Locations	Influent Channel Slide Gate, Screen No. 1 and Screen No. 2 Bulkheads
Dewatering Locations	East Side of Influent Channel and Screens No. 1 and No. 2
Construction Duration during Shutdown	2 weeks
Total Shutdown	2.5 weeks



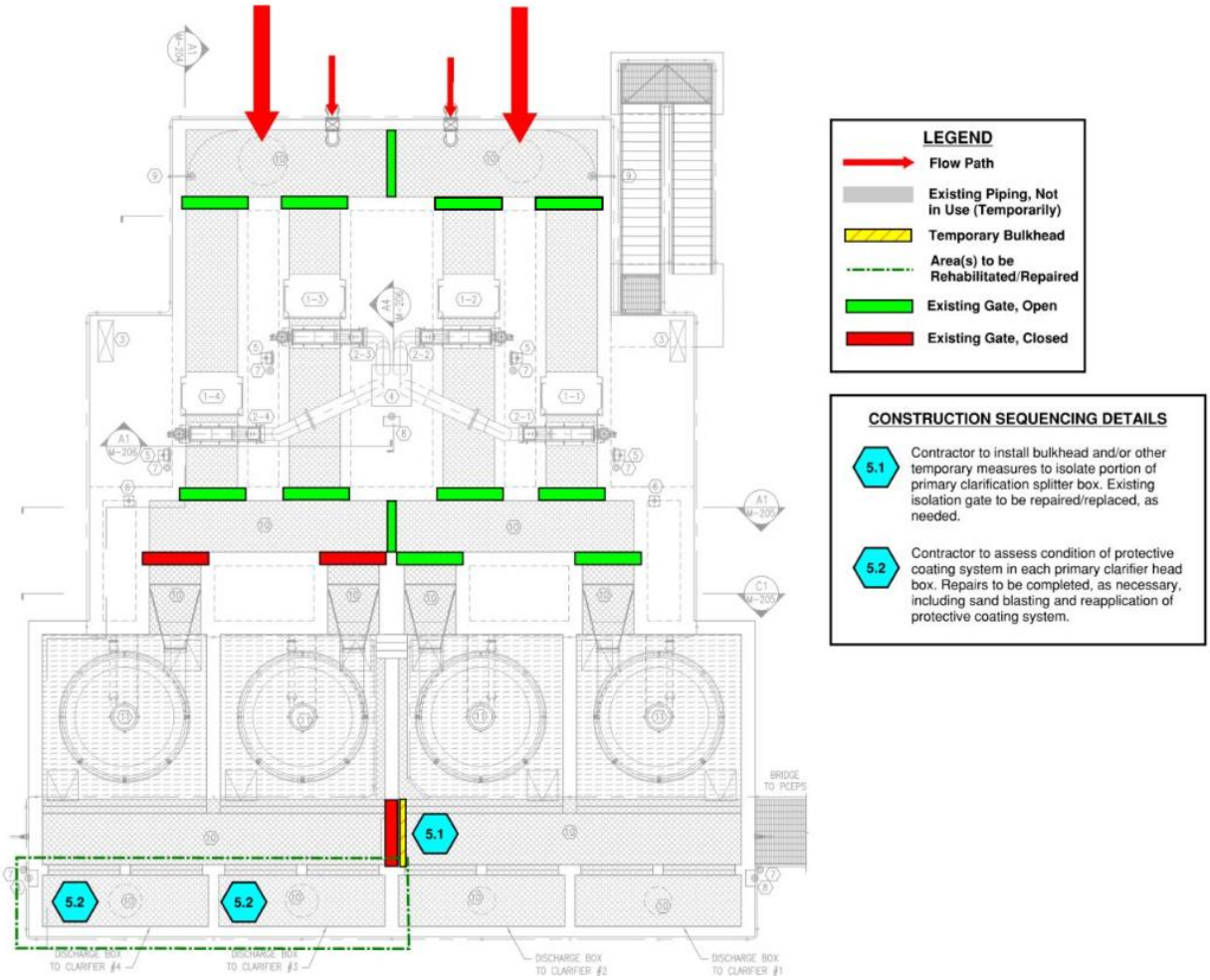
Sequence	Headworks Concrete Restoration Sequence 3
Description	Headworks Concrete Restoration
Work to be Completed	Rehabilitate/repair grit headcell influent channel
Shutdowns Required During Sequence	East Side of Grit Headcell Influent Channel and Screens No. 1 and No. 2
Equipment and Facilities Out of Service	Screens No. 1 and No. 2, Grit Headcells No. 1 and No. 2
Isolation Locations	Screen No. 1 and Screen No. 2 Slide Gates, Grit Headcells No. 1 and No. 2 Slide Gates, Grit Headcell Influent Channel Bulkhead
Dewatering Locations	East Side of Grit Headcell Influent Channel and Screens No. 1 and No. 2
Construction Duration during Shutdown	2 weeks
Total Shutdown	2.5 weeks



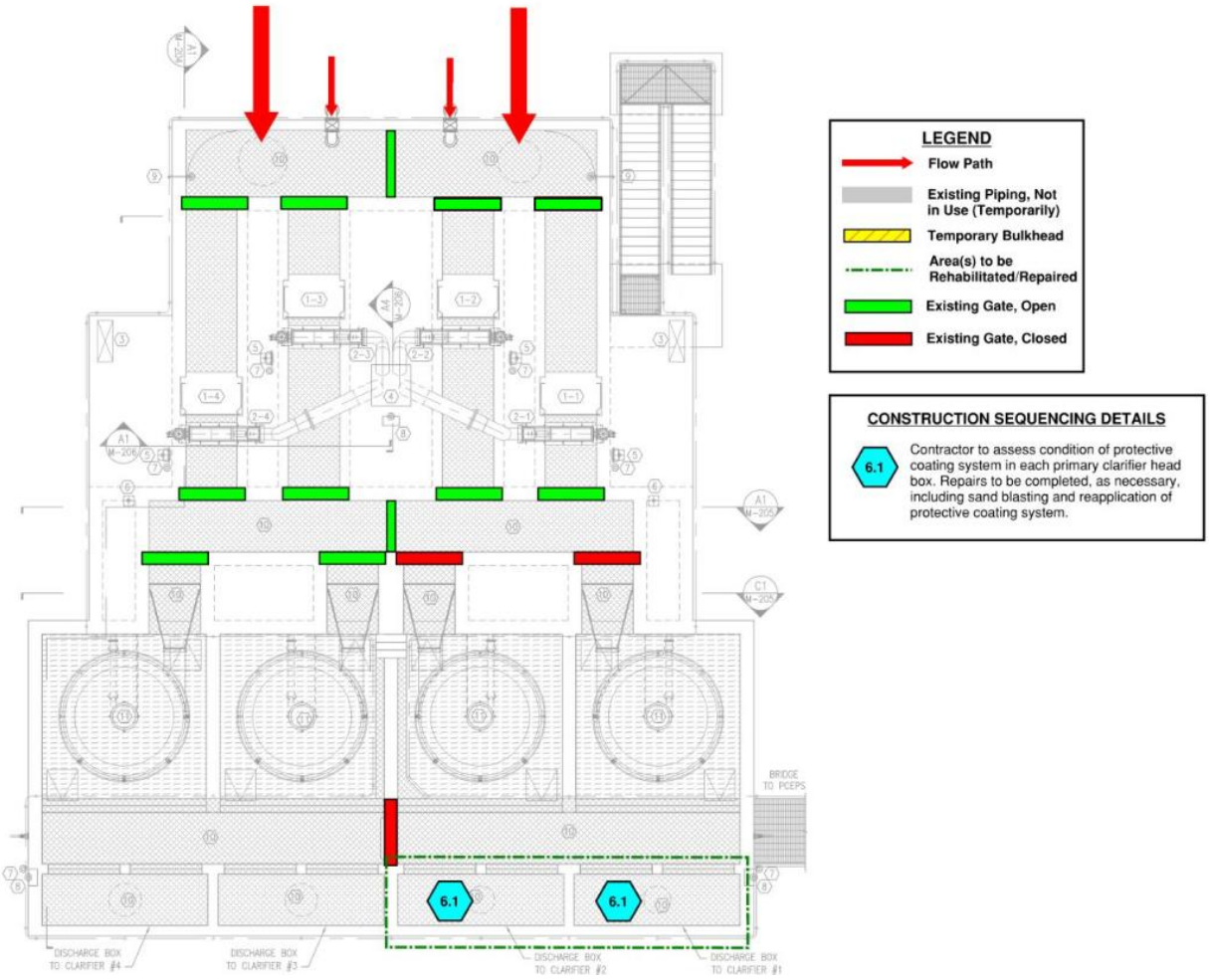
Sequence	Headworks Concrete Restoration Sequence 4
Description	Headworks Concrete Restoration
Work to be Completed	Rehabilitate/repair grit headcell influent channel
Shutdowns Required During Sequence	West Side of Grit Headcell Influent Channel and Screens No. 3 and No. 4
Equipment and Facilities Out of Service	Screens No. 3 and No. 4, Grit Headcells No. 3 and No. 4
Isolation Locations	Screen No. 3 and Screen No. 4 Slide Gates, Grit Headcells No. 3 and No. 4 Slide Gates, Grit Headcell Influent Channel Slide Gate
Dewatering Locations	West Side of Grit Headcell Influent Channel and Screens No. 1 and No. 4
Construction Duration during Shutdown	2 weeks
Total Shutdown	2.5 weeks



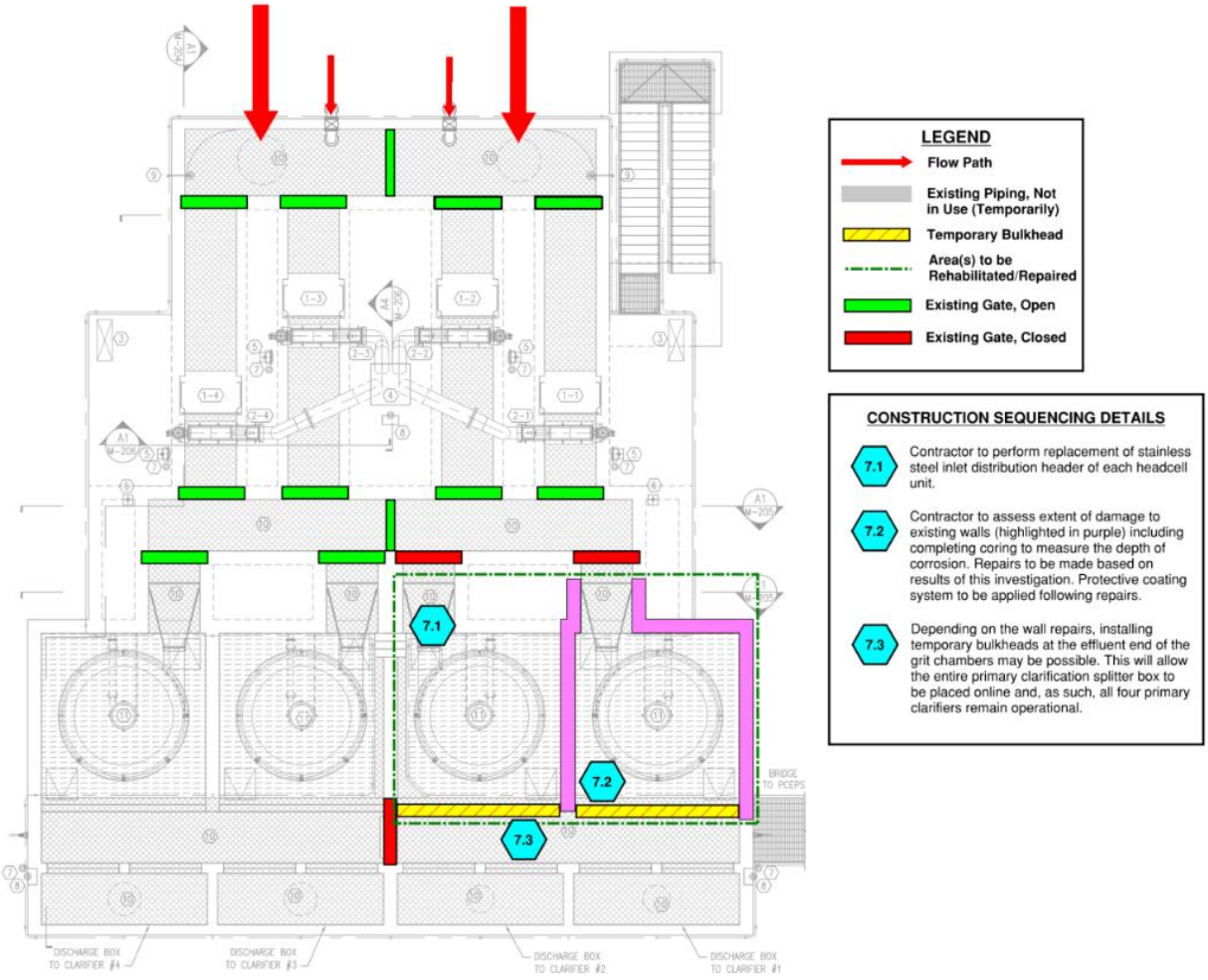
Sequence	Headworks Concrete Restoration Sequence 5
Description	Headworks Concrete Restoration
Work to be Completed	Rehabilitate/repair discharge boxes to clarifiers
Shutdowns Required During Sequence	Grit Headcells No. 3 and No. 4, Discharge Boxes to Clarifiers No. 3 and No. 4, West Side of Effluent Channel
Equipment and Facilities Out of Service	Grit Headcells No. 3 and No. 4, Discharge Boxes to Clarifiers No. 3 and No. 4
Isolation Locations	Grit Headcells No. 3 and No. 4 Slide Gates, Effluent Channel Bulk-head
Dewatering Locations	West Side of Effluent Channel, Discharge Boxes to Clarifiers No. 3 and No. 4
Construction Duration during Shutdown	2 weeks
Total Shutdown	2.5 weeks



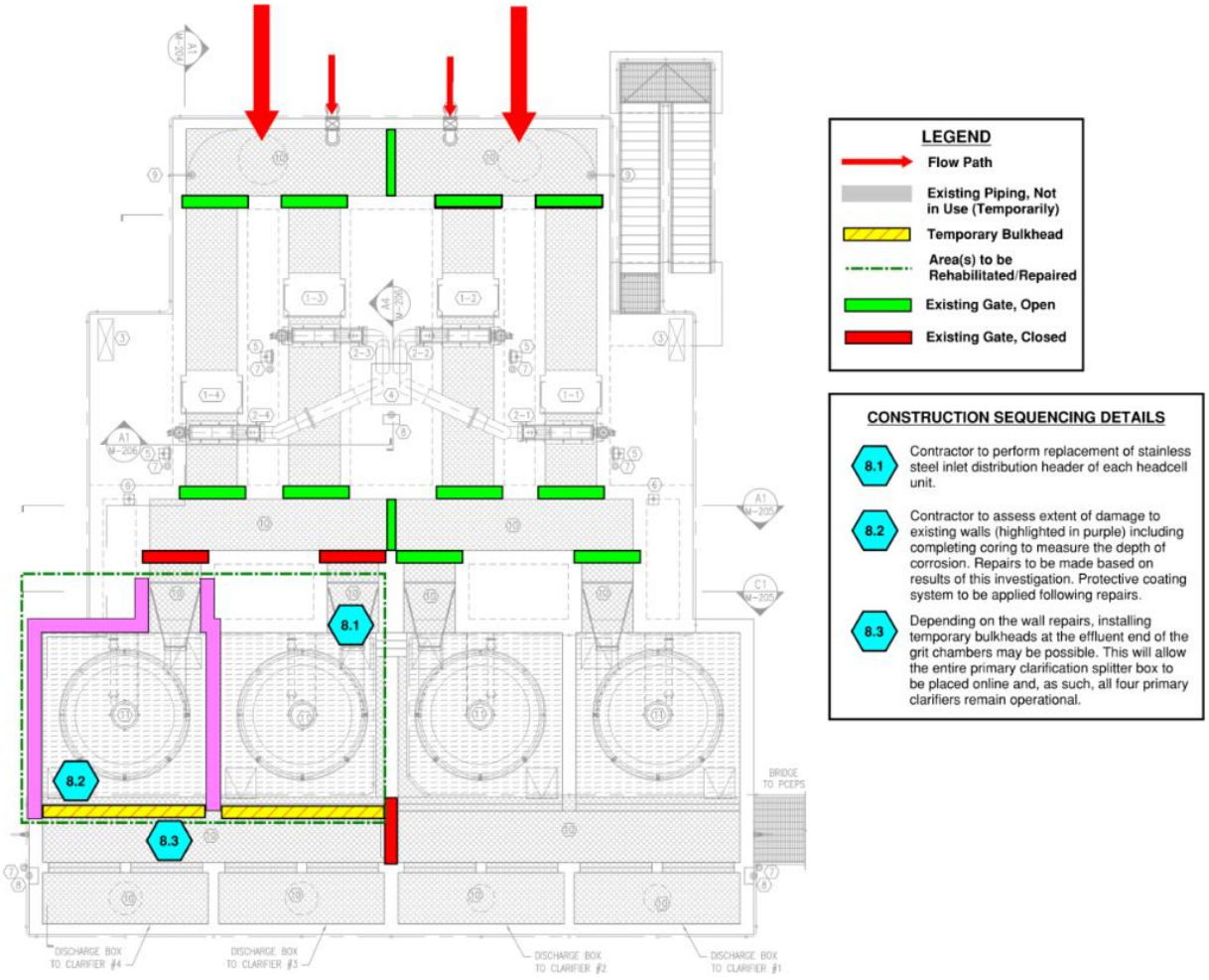
Sequence	Headworks Concrete Restoration Sequence 6
Description	Headworks Concrete Restoration
Work to be Completed	Rehabilitate/repair discharge boxes to clarifiers
Shutdowns Required During Sequence	Grit Headcells No. 1 and No. 2, Discharge Boxes to Clarifiers No. 1 and No. 2, East Side of Effluent Channel
Equipment and Facilities Out of Service	Grit Headcells No. 1 and No. 2, Discharge Boxes to Clarifiers No. 1 and No. 2
Isolation Locations	Grit Headcells No. 1 and No. 2 Slide Gates, Effluent Channel Slide Gate
Dewatering Locations	East Side of Effluent Channel, Discharge Boxes to Clarifiers No. 1 and No. 2
Construction Duration during Shutdown	2 weeks
Total Shutdown	2.5 weeks



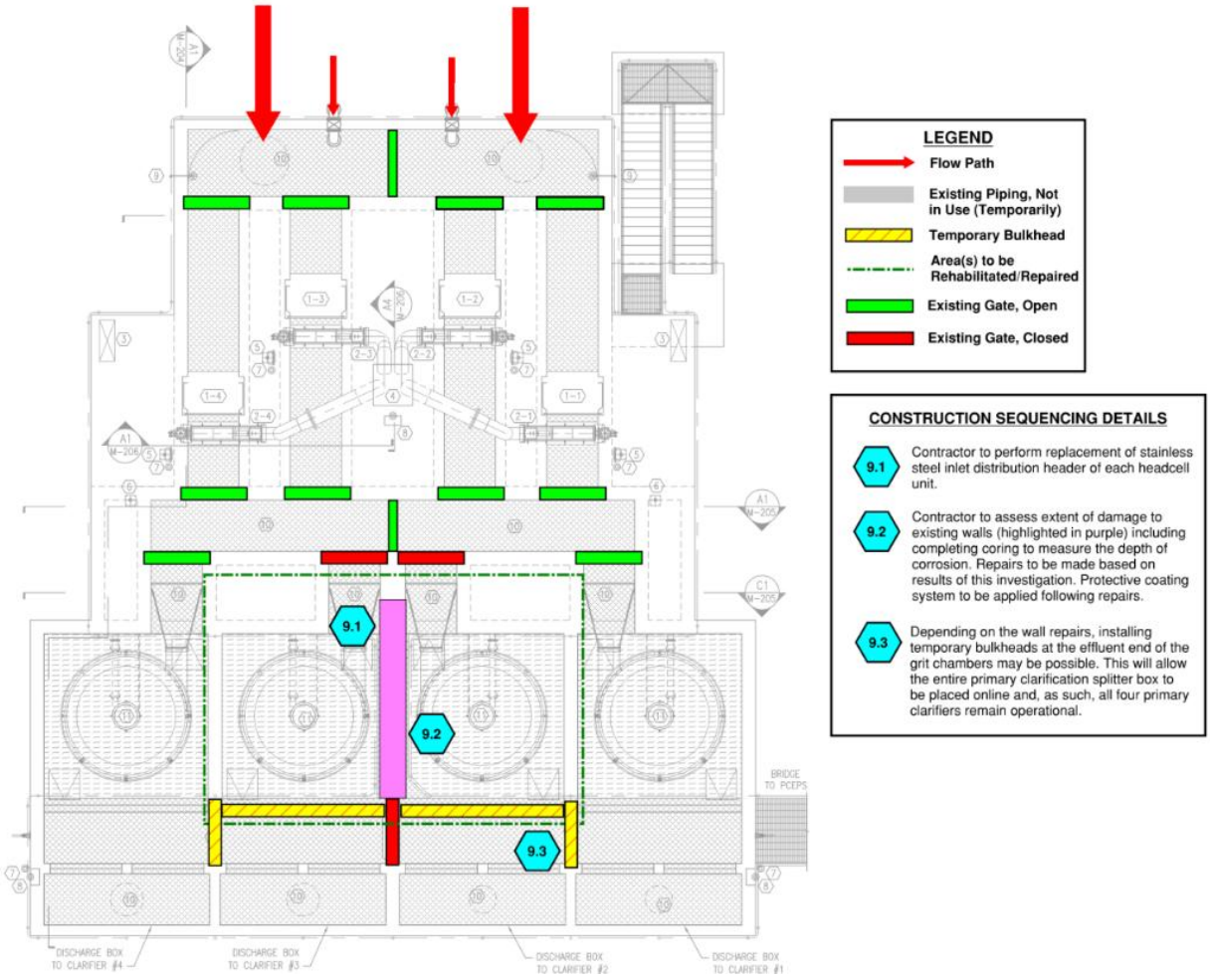
Sequence	Headworks Concrete Restoration Sequence 7
Description	Headworks Concrete Restoration
Work to be Completed	Rehabilitate/repair grit headcells
Shutdowns Required During Sequence	Grit Headcells No. 1 and No. 2, Discharge Boxes to Clarifiers No. 1 and No. 2, East Side of Effluent Channel
Equipment and Facilities Out of Service	Grit Headcells No. 1 and No. 2, Discharge Boxes to Clarifiers No. 1 and No. 2
Isolation Locations	Grit Headcells No. 1 and No. 2 Slide Gates, Grit Headcells No. 1 and No. 2 Bulkheads, Effluent Channel Slide Gate
Dewatering Locations	Grit Headcells No. 1 and No. 2, East Side of Effluent Channel, Discharge Boxes to Clarifiers No. 1 and No. 2
Construction Duration during Shutdown	7 weeks
Total Shutdown	7.5 weeks



Sequence	Headworks Concrete Restoration Sequence 8
Description	Headworks Concrete Restoration
Work to be Completed	Rehabilitate/repair grit headcells
Shutdowns Required During Sequence	Grit Headcells No. 3 and No. 4, Discharge Boxes to Clarifiers No. 3 and No. 4, West Side of Effluent Channel
Equipment and Facilities Out of Service	Grit Headcells No. 3 and No. 4, Discharge Boxes to Clarifiers No. 3 and No. 4
Isolation Locations	Grit Headcells No. 3 and No. 4 Slide Gates, Grit Headcells No. 3 and No. 4 Bulkheads, Effluent Channel Slide Gate
Dewatering Locations	Grit Headcells No. 3 and No. 4, East Side of Effluent Channel, Discharge Boxes to Clarifiers No. 3 and No. 4
Construction Duration during Shutdown	7 weeks
Total Shutdown	7.5 weeks



Sequence	Headworks Concrete Restoration Sequence 9
Description	Headworks Concrete Restoration
Work to be Completed	Rehabilitate/repair grit headcells
Shutdowns Required During Sequence	Grit Headcells No. 2 and No. 3, Discharge Boxes to Clarifiers No. 2 and No. 3, Middle of Effluent Channel
Equipment and Facilities Out of Service	Grit Headcells No. 2 and No. 3, Discharge Boxes to Clarifiers No. 2 and No. 3
Isolation Locations	Grit Headcells No. 2 and No. 3 Slide Gates, Grit Headcells No. 2 and No. 3 Bulkheads, Effluent Channel Bulkheads
Dewatering Locations	Grit Headcells No. 2 and No. 3, Middle of Effluent Channel, Discharge Boxes to Clarifiers No. 2 and No. 3
Construction Duration during Shutdown	7 weeks
Total Shutdown	7.5 weeks



END OF SECTION

SECTION 01 20 00 – PRICE AND PAYMENT PROCEDURES

GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Cash allowances
   2. Contingency allowances
   3. Testing and inspection allowances
   4. Schedule of Values
   5. Application for Payment
   6. Partial Payments
   7. Defect assessment
   8. Unit prices
   9. Alternates

1.2 BID ITEM DESCRIPTIONS

A. The Basis of Payment will be as established in the Contract Documents and as described below:
   1. Bid Item 1: Mobilization and Demobilization (not to exceed 5% of total base bid)
      a. The Work shall consist of the mobilization and demobilization of the Contractor's forces, equipment, insurance, and performance and payment bonding necessary for performing the work required under the Contract. Mobilization shall include completion of closeout procedures specified in Section 01 77 00, Closeout Procedures, permitting fees, shop drawing submittal, schedule of valves, project schedules, construction meetings, temporary site fencing, storage yard, All Work as defined in the Contract Documents for the construction and operational completion of the headworks rehabilitation, except for those listed separately below.
   2. Bid Item 2: All Work as defined in the Contract Documents for The Facility 05 - Site Civil Improvements except for those listed separately.
      a. This item includes all labor, materials, and equipment required to complete the work outlined in the contract documents for site work, including but not limited to demolition, utilities relocation, bypassing, fencing, paving, grading, drainage, sodding, and other associated site work.
   3. Bit Item 3: All Work as defined in the Contract Documents for the construction and operational completion of Facility 10 - Odor Control Improvements except for those listed separately.
      a. This item includes all labor, materials, operational controls, electrical, structural, and equipment required to complete the work outlined in the contract documents for the construction and operational completion of the biological odor control system, including but not limited to air ductwork, dampers, and attachments, biological trickling filter equipment and controls, aerial ductwork supports, concrete pad, and electrical.
   4. Bid Item 4: All work as defined in the contract documents for the Facility 20 - Headworks Improvements, except for those listed separately.
      a. This item includes all labor, materials, operational controls, and equipment required to complete the work outlined in the contract documents for the repair of the headworks channels including but not limited to concrete surface repair, crack injection, wall replacement, wall bracket replacement, and other repair work detailed in the contract documents.
   5. Bid Item 5: All work to furnish and install Toxic Gas Detection System as specified in Section 60 76 20.

a. This item includes all labor, materials, and equipment required to complete the work outlined in the contract documents for the H2S gas monitoring system installed within and above the headworks channels including, but not limited to, the sensor installation, electrical and controls, and SCADA integration as necessary.

6. Bid Item 5: All work to furnish and install Stacked Tray Vortex Grit Removal improvements as specified in Section 46 23 23.16.

   This item includes all labor, materials, and equipment required to complete the work outlined in the contract documents for the necessary modifications to the stacked tray vortex grit removal system. This item includes but is not limited to the weir plate installation.

7. Bid Item 7: Additional System 2 Submerged Metal coating above the quantity required by the Contract Documents and as specified in Section 09 96 00.
   a. Full compensation on a unit price basis for all work, labor, and materials to install additional System 2 coating above the quantity required by the Contract Documents. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, any funds remaining shall be credited to Owner by Change Order.
8. Bid Item 8: Additional System 3 Exposed Metal coating above the quantity required by the Contract Documents and as specified in Section 09 96 00.
   a. Full compensation on a unit price basis for all work, labor, and materials to install additional System 3 coating above the quantity required by the Contract Documents. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, any funds remaining shall be credited to Owner by Change Order.
9. Bid Item 9: Additional Concrete Paving including compacted base above the quantity required by Contract Documents.
   a. Full compensation on a unit price basis for all work, labor, and materials to install additional concrete pavement above the quantity required by the Contract Documents. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, any funds remaining shall be credited to Owner by Change Order.
10. Bid Item 10: Additional Asphalt Paving including compacted base above the quantity required by Contract Documents.
    a. Full compensation on a unit price basis for all work, labor, and materials to install additional asphalt pavement above the quantity required by the Contract Documents. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, any funds remaining shall be credited to Owner by Change Order
11. Bid Item 11: Additional Fencing above amount quantity required by Contract Documents and as specified in Section 32 31 13.
    a. Full compensation on a unit price basis for all work, labor, and materials to install additional fencing above the quantity required by the Contract Documents. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, any funds remaining shall be credited to Owner by Change Order
12. Bid Item 12: Pre-negotiated firm price for the Headcell inlet chutes as defined by Section 46 23 23.16 for the lump sum of XXXXX Dollars.
    a. Pre-selected Headcell inlet chute as defined by manufacturer proposal attached to Section 46 23 23.16, STACKED TRAY VORTEX GRIT REMOVAL EQUIPMENT. Payment shall be lump sum for the equipment only based on the submitted scope of supply. Contractor’s costs for all work necessary to manage/coordinate with manufacturer and provide any requirements of the Contract Documents outside of the submitted scope of supply including overhead and profit, installation, and other required costs necessary to complete all Work shall be included in Bid Item No. 4.
13. Bid Item 13: Owner's Contingency Allowance

a. This contingency allowance provides a method for payment for work items that arise during construction that are deemed out of the scope of the Lump Sum and Unit Prices above and agreed upon by the Owner before the work is performed or materials are ordered. Expenditure of any portion of this item shall only be done following written authorization by the Owner and Engineer. At closeout of the Contract, funds remaining shall be credited to Owner by Change Order.

1.3 ADDITIVE ALTERNATES

A. In addition to the Base Bid Project, Owner may elect to add the following Additive Bid Alternates for which payment is as described below:
   1. Additive Alternate Bid-Item No. 1: PCEPS Facility 30 Catwalks
      a. This work item includes all labor, materials, and equipment for installation of elevated catwalks on the PCEPS building as detailed and specified herein.
   2. Additive Alternate Bid-Item No. 2: All Work as defined in the Contract Documents for the Facility 25 – Primary Clarifier improvements except for those listed separately below.
      a. This alternative bid item includes all the materials and labor to clean and prepare the concrete surface and coat as dictated in the contract documents the four primary clarifier effluent boxes.
      b. This alternative bid item includes all the materials and labor to prepare and coat the four primary clarifier mechanism center columns in accordance with contract documents and manufacturer requirements for proper operation.

1.4 CONTINGENCY ALLOWANCES

Refer to the Bid Form for Contingency Allowance schedule.

B. Include in Contract a stipulated sum/price of $200,000 for use upon Owner's instruction as a contingency allowance.

C. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead, and profit will be included in Change Orders authorizing expenditure of funds from this contingency allowance.

D. Funds will be drawn from contingency allowance only by approval of Engineer and Owner.

E. At closeout of Contract, funds remaining in contingency allowance will be credited to Owner by Change Order.

1.5 SCHEDULE OF VALUES

A. Submit electronic file to Project website of schedule on Progress Estimate schedule on EJCDC C-620 or form approved by Engineer and Owner. Document shall be a Microsoft Excel file type.

Apparent “low-bidder” shall submit a preliminary Schedule of Values as electronic file within 2 days after bid opening.

C. Submit complete Schedule of Values as electronic file to Project website within 10 days after date of Owner-Contractor Agreement.

D. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section. Also identify mobilization, bonds and insurance, progress schedule development, startup and commissioning, contract closeout, and demobilization as separate line items.

E. Include in each line-item amount of allowances as specified in this Section. For unit cost allowances, identify quantities taken from Contract Documents multiplied by unit cost to achieve total for each item.

F. Include within each line item, direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders with each Application for Payment.

H. An unbalanced or front-loaded schedule of values, or a schedule of values substantially different than the preliminary schedule, will not be accepted.

I. Summation of the complete schedule of values representing all Work shall equal the Contract Price.

1.6 APPLICATION FOR PAYMENT

Submit electronic file to project management website of each Application for Payment on EJCDC C-620 – Contractor's Application for Payment or similar form approved by Engineer and Owner.

B. Content and Format:
   1. Use Schedule of Values for listing items in Application for Payment.

C. Submit updated construction schedule with each Application for Payment.

D. Payment Period:
   1. Submit at intervals stipulated in the Agreement.

E. Submit submittals with transmittal letter as specified in Section 01 33 00 – Submittal Procedures.

F. Substantiating Data:
   1. When Engineer requires substantiating information, submit data justifying dollar amounts in question.
   2. Include with Application for Payment:

Current construction photographs specified in Section 01 33 00 – Submittal Procedures.

b. Partial release of liens from major Subcontractors and vendors.
c. Record Documents as specified in Section 01 77 00 – Closeout Procedures, for review by Owner, which will be returned to Contractor.
d. Affidavits attesting to offsite stored products.
e. Construction Progress Schedule, revised and current as specified in Section 01 33 00 – Submittal Procedures.

1.7 PARTIAL PAYMENTS FOR STORED MATERIALS

A. No payments will be made for materials and equipment delivered or stored unless shop drawings and preliminary operations and maintenance manuals are accepted by Engineer. Thereafter, partial payments for materials and equipment delivered and stored, but not yet incorporated into the Work, shall not exceed 90% of the material value.

B. Storage must meet General Conditions requirements, be deemed acceptable by the Engineer and Owner, be located on the Site or a location agreed to by Engineer and Owner, and meet the documented storage recommendations from the Material Manufacturer.

1.8 PARTIAL PAYMENTS FOR UNDELIVERED FABRICATED EQUIPMENT

A. No partial payments will be made for project-specific fabricated equipment except those specifically listed below and under the terms listed herein. Undelivered “Off the shelf” or catalog items are not eligible for partial payment.

B. Payment shall not exceed 15% of the equipment value, not including shipping and handling charges.

C. Payment will only be made when conditions below are met:
   1. Shop drawing and preliminary operations and maintenance manual acceptance by Engineer.
   2. Equipment is adequately insured, maintained, stored, and protected by appropriate security measures.
   3. Each equipment item is clearly marked and segregated from other items to permit inventory and accountability.
   4. Authorization has been provided access to storage site for Engineer and Owner.

1.9 DEFECT ASSESSMENT

Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Engineer or Owner, it is not practical to remove and replace the Work, Engineer or Owner will direct appropriate remedy or adjust payment. Potential remedies may include:
   1. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Engineer or Owner.
   2. Defective Work will be partially repaired according to instructions of Engineer or Owner, and unit sum/price will be adjusted to new sum/price at discretion of Engineer or Owner.

C. Individual Specification Sections may modify these options or may identify specific formula or percentage sum/price reduction.

D. Authority of Engineer or Owner to assess defects and identify payment adjustments is final.

E. Nonpayment for Rejected Products:
   1. Payment will not be made for rejected products for any of the reasons below:
      a. Products wasted or disposed of in a manner that is not acceptable.
      b. Products determined as unacceptable before or after placement.
      c. Products not completely unloaded from transporting vehicle.
      d. Products placed beyond lines and levels of the required Work.
      e. Products remaining on hand after completion of the Work.
      f. Loading, hauling, and disposing of rejected products.

1.10 UNIT PRICES

Engineer will take measurements and compute quantities accordingly. Provide assistance in taking of measurements.

B. Unit Quantities:
   1. Quantities and measurements indicated on Bid Form are for Contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment. Actual quantities provided shall determine payment.
   2. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at contracted unit sum/prices.

3. When actual Work requires 25% or greater change in quantity than those quantities indicated, Owner or Contractor may claim a Contract Price adjustment.

C. Payment Includes:
1. Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application, or installation of item of the Work; overhead and profit.

D. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.

E. Measurement of Quantities:
1. Weigh Scales:
a. Inspected, tested, and certified by applicable Alabama weights and measures department within past year.
2. Platform Scales:
a. Of sufficient size and capacity to accommodate conveying vehicle.
3. Metering Devices:
a. Inspected, tested, and certified by applicable department within past year.
4. Measurement by Weight:
a. Concrete reinforcing steel, rolled or formed steel, or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
5. Measurement by Volume:
a. Measured by cubic dimension using mean length, width, and height or thickness.
6. Measurement by Area:
a. Measured by square dimension using mean length and width or radius.
7. Linear Measurement:
a. Measured by linear dimension, at item centerline or mean chord.
8. Stipulated Sum/Price Measurement:
a. Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the Work.

1.11 ALTERNATES

Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement. The Owner-Contractor Agreement may identify certain Alternates to remain an Owner option for a stipulated period.

B. Coordinate related Work and modify surrounding Work. Description for each Alternate is recognized to be abbreviated but requires that each change shall be complete for scope of Work affected.
1. Coordinate related requirements among Specification Sections as required.
2. Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.
3. Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.

C. Schedule of Alternates:
Alternate No. 1: All Work as defined in the Contract Documents for the Facility 30 – Primary Effluent Pump Station improvements.
a. This alternative bid item includes all the materials and labor to construct the elevated catwalk system on the PCEPS area.
2. Additive Alternate Bid-Item No. 2: All Work as defined in the Contract Documents for the Facility 25 – Primary Clarifier improvements except for those listed separately below.

a. This alternative bid item includes all the materials and labor to clean and prepare the concrete surface and coat as dictated in the contract documents the four primary clarifier effluent boxes.
b. This alternative bid item includes all the materials and labor to prepare and coat the four primary clarifier mechanism center columns in accordance with contract documents and manufacturer requirements for proper operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 25 00 – SUBSTITUTION PROCEDURES

GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Quality assurance
   2. Product options
   3. Product substitution procedures

1.2 QUALITY ASSURANCE

A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.

B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.

C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT OPTIONS

A. See Section 01 60 00 – Product Requirements.

1.4 PRODUCT SUBSTITUTION PROCEDURES

Refer to Instructions to Bidders within the contract documents for time restrictions for submitting requests for substitutions during Bidding period.

B. Engineer will not consider requests for substitutions prior to the date of the Owner-Contractor Agreement.

C. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

D. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
   1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
   2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
   3. Reference to Article and Paragraph numbers in Specification Section.
   4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
   5. Impact to Contract time.
   6. Changes required in other Work.
   7. Availability of maintenance service and source of replacement parts as applicable.
   8. Certified test data to show compliance with performance characteristics specified.
   9. Samples when applicable or requested.
   10. Other information as necessary to assist Engineer's evaluation.

A request constitutes a representation that Bidder or Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for substitution as for specified product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
6. Will reimburse Owner, and Engineer if applicable, for review or redesign services associated with reapproval by authorities having jurisdiction.

F. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.

G. Substitution Submittal Procedure:

Submit requests for substitutions on form approved by Engineer and Owner.

2. Submit electronic files to Project website of Request for Substitution for consideration. Limit each request to one proposed substitution.
3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
4. Engineer will notify Contractor in writing of decision to accept or reject request.

1.5 INSTALLER SUBSTITUTION PROCEDURES

Engineer will consider requests for substitutions within 30 days after date of Owner-Contractor Agreement. Requests received after that time may be considered or rejected at discretion of Engineer.

B. Document each request with:

1. Installer's qualifications;
2. Installer's experience in work similar to that specified;
3. Other information as necessary to assist Engineer's evaluation.

C. Substitution Submittal Procedure:

Submit electronic files to Project website of Request for Substitution for consideration. Limit each request to one proposed substitution.

2. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 26 00 – CONTRACT MODIFICATION PROCEDURES

GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Field Orders
   2. Change Proposals
   3. Work Change Directives
   4. Change Orders

1.2 CHANGE PROCEDURES

Submittals:
   1. Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Engineer of any error, inconsistency, omission, or apparent discrepancy.

C. Requests for Interpretation (RFI) and Clarifications:
   1. Allot time in construction scheduling for liaison with Engineer; establish procedures for handling queries and clarifications.
   2. Use form and method acceptable to Engineer for requesting interpretations.
   3. Engineer may respond with a direct answer on the Request for Interpretation form, or within the project management website used for submittals and RFIs as specified Section 01 33 00 – Submittal Procedures.

1.3 FIELD ORDERS

A. Engineer will advise of minor changes in the Work not involving adjustment to Contract Price or Contract Time by issuing supplemental instructions on EJCDC C-942 or other similar form.

B. Contractor shall acknowledge receipt by signing and returning one electronic copy to Engineer.

1.4 CHANGE PROPOSALS

A. Engineer may, in anticipation of ordering a revision to the Work, issue to the Contractor a Proposal Request including a detailed description and/or supplementary drawings and specifications.

B. Proposal Requests are not instructions either to stop work in progress or to execute the proposed change.

C. Contractor will prepare and submit, within 10 days, a detailed response to the Proposal Request with a detailed breakdown of proposed change in Contract Price and Contract Time. The proposed change in cost and time shall remain firm for a minimum period of 30 days after receipt by Engineer or Owner.

D. Contractor may submit a Change Proposal to the Engineer without receipt of a Proposal Request, describing proposed change and its full effect on the Work. Include a statement

describing reason for the change and the effect on Contract Price and Contract Time with full documentation and a statement describing effect on the Work by separate or other Contractors.

1.5 WORK CHANGE DIRECTIVES

A. Work Directive Change:
   1. Engineer may issue directive, on EJCDC C-940 – Work Change Directive or similar form signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Price or Contract Time. A Work Change Directive is not a Change Order.

B. Promptly execute the change described in the Work Change Directive.

C. Contractor shall keep detailed records of work performed as a result of a Work Change Directive to substantiate resulting change in Contract Time or Contract Price. Detailed records may include but are not limited to:
   1. Date the work was performed;
   2. Parties performing the work;
   3. Time records, wage rates paid, and equipment rental rates;
   4. Invoices and receipts for materials, equipment, and subcontracts.

CHANGE ORDERS

A. Execution of Change Orders:
   1. Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

B. Change Order Forms:
   1. EJCDC C-941 – Change Order or similar form

C. Stipulated Sum/Price Change Order:
   1. Based on Proposal Request and Contractor's fixed price quotation.

D. Unit Price Change Order:
   1. For Contract unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of that which are not predetermined, execute Work under Work Directive Change. Changes in Contract Price or Contract Time will be computed as specified for Time and Material Change Order.

Time and Material Change Order:
   1. Submit itemized account and supporting data after completion of change, within time limits specified in Conditions of the Contract. Engineer will determine change allowable in Contract Price and Contract Time as provided in Contract Documents.

F. Maintain detailed records of Work done on time and material basis. Provide full information required for evaluation of proposed changes and to substantiate costs for changes in the Work.

G. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.

H. Correlation of Contractor Submittals:
   1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Price.

2. Promptly revise Progress Schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of Work affected by the change and resubmit.
3. Promptly enter changes in Record Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 30 00 – ADMINISTRATIVE REQUIREMENTS

GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Coordination and Project conditions
   2. Requests for Information
   3. Construction safety plan
   4. Web-based project management software
   5. Project meetings

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. Coordination Drawings:
   1. Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.
   2. Content shall be drawn to scale and large enough to indicate and resolve conflicts.
   3. Indicate functional and spatial relationships of architectural, structural, civil, mechanical, and electrical systems.
   4. Indicate space requirements for code or maintenance required clearances.

E. Coordination Meetings:
   1. In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.

F. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and cleanup of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.

H. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

1.3 REQUESTS FOR INFORMATION

A. Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

B. Coordinate and submit RFIs in a prompt manner to avoid delays in Work.

C. RFI Content:
   1. Detailed description of item needing information or interpretation
   2. Project name
   3. Owner name
   4. Owner project number
   5. Engineer name
   6. Engineer project number
   7. Date
   8. Contractor name
   9. RFI number
   10. RFI subject
   11. Specification section number, title, and related paragraphs, as appropriate
   12. Drawing number and detail references, as appropriate
   13. Field dimensions and pictures, as appropriate
   14. Contractor suggested resolution. If suggested resolution impacts Contract Time or Contact Price, it shall be explicitly stated in the RFI

D. Engineer will review and respond to RFIs. Incomplete, inaccurate, or frivolous RFIs will be returned without response.

E. Engineer's response may result in a change to the Contract Time or Contract Price. If Contractor believes response warrants this change, notify the Engineer in writing no more than 5 days from receipt of RFI response, and submit Change Proposal as specified in Section 01 26 00 – Contract Modification Procedures.

F. RFI shall be submitted through the web-based project management software system.

1.4 CONSTRUCTION SAFETY PLAN

A. Detail the methods and procedures to comply with federal, state, and local health and safety laws, rules, and requirements for the duration of the Contract Times. Include:
   1. Identification of the Certified or Licensed Safety Consultant, who will prepare, initiate, maintain, and supervise safety programs, and procedures.
   2. Procedures for providing workers with an awareness of safety and health hazards expected to be encountered during construction.
   3. Safety equipment appropriate to the safety and health hazards expected to be encountered during construction. Include warning devices, barricades, safety equipment in public right-of-way and protected areas, and safety equipment used in multi-level structures.
   4. Methods for minimizing employees' exposure to safety and health hazards expected during construction.
   5. Procedures for reporting safety or health hazards.
   6. Procedures to follow to correct a recognized safety and health hazard.
   7. Procedures for investigation of accidents, injuries, illnesses, and unusual events that have occurred at the construction site.
   8. Periodic and scheduled inspections of general work areas and specific workstations.
   9. Training for employees and workers at the jobsite.
   10. Methods of communication of safe working conditions, work practices and required personal protection equipment.

B. Assume responsibility for every aspect of health and safety on the jobsite, including the health and safety of subcontractors, suppliers, and other persons on the jobsite:
   1. Forward available information and reports to the Safety Consultant who shall make the necessary recommendations concerning worker health and safety at the jobsite.
   2. Employ additional health and safety measures specified by the Safety Consultant, as necessary, for workers as specified in OSHA guidelines.

C. Transmit to Owner and Engineer copies of reports and other documents related to accidents or injuries encountered during construction.

1.5 WEB–BASED PROJECT MANAGEMENT SOFTWARE PACKAGE

Web-Based Project Management Software Package:
   1. Use Engineer's web-based Project management software package for purposes of hosting and managing Project communication and documentation until final completion.

Web-based Project management software includes, at a minimum, the following features:
   a. Compilation of Project data, including Contractor, Subcontractors, Engineer, Engineer's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
   b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
   c. Document workflow planning, allowing customization of workflow among Project entities.
   d. Create, log, track, and notify Project members of Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, minor changes in the Work, Construction Change Directives, and Change Orders.
   e. Track status of each Project communication in real time, and log time and date when responses are provided.
   f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
   g. Process and track payment applications.
   h. Process and track contract modifications.
   i. Create and distribute meeting minutes.
   j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
   k. Management of construction progress photographs.
   l. Mobile device compatibility, including smartphones and tablets.

1.6 DIGITAL PROJECT DATA LICENSING

Engineer's Data Files Not Available:
   1. Engineer will not provide Engineer's BIM model or CAD drawing digital data files for Contractor's use during construction.

PRECONSTRUCTION MEETING

A. Engineer will schedule a preconstruction meeting at a mutually agreeable time after Notice of Award.

B. Attendance Required:
   1. Engineer, Owner, Resident Project Representative, any appropriate governmental agency representatives, major Subcontractors, Contractor, and others necessary to agenda.

C. Minimum Agenda:

1. Execution of Owner-Contractor Agreement;
2. Submission of executed bonds and insurance certificates;
3. Distribution of Contract Documents;
4. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule;
5. Designation of personnel representing parties in Contract, and Engineer;
6. Communication procedures;
7. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures;
8. Scheduling;
9. Critical Work sequencing;
10. Scheduling activities of Surveyors;
11. Construction waste management plan;
12. Safety plan;
13. Use of premises by Owner and Contractor;
14. Owner's requirements and partial occupancy;
15. Construction facilities and controls provided by Owner;
16. Temporary utilities provided by Owner;
17. Survey and building layout;
18. Security and housekeeping procedures;
19. Procedures for testing;
20. Procedures for maintaining record documents;
21. Requirements for startup of equipment;
22. Inspection and acceptance of equipment put into service during construction period.

D. Engineer:
1. Will preside over meeting and record minutes and distribute copies to participants, with one electronic copy each to Engineer, Owner, Contractor, and those affected by decisions made.

1.8 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at weekly intervals. Meetings to take place in Contractor’s field office, Engineer’s field office, or mutually agreed upon place.

B. Contractor will make arrangements for meetings and prepare agenda with copies for participants.

C. Attendance Required:
1. Job superintendent, major Subcontractors, Contractors and suppliers, and Engineer and Owner as appropriate to agenda topics for each meeting.

D. Minimum Agenda:
1. Review minutes of previous meetings;
2. Review of Work progress;
3. Field observations, problems, and decisions;
4. Identification of problems impeding planned progress;
5. Review of submittal schedule and status of submittals;
6. Review of offsite fabrication and delivery schedules;
7. Maintenance of Progress Schedule;
8. Corrective measures to regain projected schedules;
9. Planned progress during succeeding work period;
10. Coordination of projected progress;
11. Maintenance of quality and work standards;

12. Effect of proposed changes on Progress Schedule and coordination;
13. Other business relating to Work.

E. Contractor:
1. Record minutes and distribute copies to participants within seven days after meeting, with one electronic copy each to Engineer, Owner, and those affected by decisions made.

1.9 PREINSTALLATION MEETINGS

A. Scheduled by Contractor on a regular basis and as necessary to coordinate with manufacturers and installers before starting Work of major units of construction.

B. Require attendance of parties directly affecting, or affected by, the Work.

C. Notify Engineer and subcontractors seven days in advance of meeting date.

D. Prepare agenda and preside over meeting:
1. Review conditions of installation, preparation, and installation procedures.
2. Review coordination with related Work.

E. Record minutes and distribute copies to participants within three days after meeting, with an electronic copy each to Engineer, Owner, and those affected by decisions made.

1.10 FACILITY STARTUP MEETINGS

A. Schedule and preside over facility startup meetings prior to startup and testing of major process equipment. Prepare a facility startup plan for each process facility as specified in Section 01 75 00 – Startup Testing and Training.

B. Agenda shall include discussion of the facility startup plan including coordination needed between various parties and identified risks with proposed mitigation action plan.

C. Attendees will include Contractor, Engineer’s representative, Owner, subcontractors and equipment manufacturers, and others deemed necessary.

1.11 CLOSEOUT MEETING

A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.

B. Attendance Required:
1. Contractor, major Subcontractors, Engineer, Owner, and others appropriate to agenda.

C. Notify Engineer seven days in advance of meeting date.

D. Minimum Agenda:
1. Startup of facilities and systems;
2. Operations and maintenance manuals;
3. Testing, adjusting, and balancing;
4. System demonstration and observation;
5. Operation and maintenance instructions for Owner's personnel;
6. Contractor's inspection of Work;
7. Contractor's preparation of an initial "punch list;"
8. Procedure to request Engineer inspection to determine date of Substantial Completion;
9. Completion time for correcting deficiencies;

10. Inspections by authorities having jurisdiction;
11. Certificate of Occupancy and transfer of insurance responsibilities;
12. Partial release of retainage;
13. Final cleaning;
14. Preparation for final inspection;
15. Closeout Submittals:
    a. Project record documents
    b. Operating and maintenance documents
    c. Operating and maintenance materials
    d. Affidavits
16. Final Application for Payment;
17. Contractor's demobilization of Site;
18. Maintenance.

E. Record minutes and distribute copies to participants within two days after meeting, with one electronic copy each to Engineer, Owner, Construction Manager, and those affected by decisions made.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 16 – CONSTRUCTION PROGRESS SCHEDULE

GENERAL

1.1 SUMMARY

A. This Section Includes:

Project schedules

2. Review and evaluation
3. Updating schedules
4. Adjustment of Contract Times

1.2 QUALITY ASSURANCE

A. The Contractor shall provide a schedule for the project based on the Critical Path Method (CPM).

B. Scheduler:
   1. Contractor's personnel specializing in CPM scheduling with minimum 2 years of experience in scheduling construction work of complexity comparable to the Project and having use of computer facilities capable of delivering detailed graphic printout within 48 hrs. of request.

C. Software:
   1. Prepare computerized schedule using Primavera or Microsoft Project, most current versions. Provide one licensed copy of the software to the Engineer for the duration of the project.

D. Make all schedule submittals as electronic files using the web-based project management software specified in Section 01 30 00 – Administrative Requirements.

1.3 PRELIMINARY SCHEDULE

Within 10 days after date of Owner-Contractor Agreement, and at least 7 days prior to the preconstruction meeting, submit proposed preliminary schedule in Gannt chart format defining planned operations for first 60 days of Work, with general outline for remainder of Work. Work activities depicted on the schedule shall include, but are not limited to:

1. Notice to Proceed
2. Permits
3. Submittals
4. Early procurement activities
5. Site work
6. Work sequences
7. Contract milestones and completion dates
8. Major facility Work
9. System startup summary
10. Project closeout summary

B. Preliminary schedule shall be accompanied by a list of all shop drawings and submittals anticipated for the project. Acceptance of submittal schedule is required for payment application approval.

C. Participate in review of preliminary schedule jointly with Engineer within 10 calendar days of submission.

D. Within 20 days after joint review of proposed preliminary schedule, submit draft of proposed complete schedule for review. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.

E. An accepted preliminary schedule, in conjunction with the schedule of values specified in Section 01 20 00 – Price and Payment Procedures, shall be the basis for progress payments for the first 60 days of Work. The preliminary schedule shall be updated monthly until the complete project schedule is approved.

1.4 COMPLETE SCHEDULE

A. Within 45 days after Notice of Award, submit complete cost loaded schedule using the Critical Path Method (CPM). The complete schedule shall show sequence and interdependence of all activities required for complete performance of all work, beginning with date of Notice to Proceed and concluding with date of final completion of Contract. Schedule shall be in Gannt Chart format.

B. Acceptance of the complete schedule is required for payment application approval after the first 60 days of Work.

C. Submit updated schedules every 30 days, as part of progress payment process. Failure to do so may result in the Owner withholding all or part of the monthly progress payment until the schedule is updated in a manner acceptable to Engineer.

1.5 COMPLETE SCHEDULE FORMAT

A. Provide a clear, legible, and accurate time-scaled logic diagram in Gantt chart format, indicating interdependence of activities and critical paths for the project.

B. In addition to native electronic file format, provide electronic PDF version in 22 in. by 34 in. drawing size.

C. Illustrate order and interdependence of activities and sequence of Work; how start of given activity depends on completion of preceding activities, and how completion of activity may restrain start of subsequent activities.

D. Illustrate complete sequence of construction by activity, identifying Work of separate stages. Indicate dates for submittals, including dates for Owner-furnished items, and return of submittals; dates for procurement and delivery of critical products; and dates for installation and provision for testing. Include legend for symbols and abbreviations used.

E. Complete schedule shall include all Work activities with the potential to delay project construction, including construction activity, procurement and submittal review activity, Owner activities, startup activities, and closeout activities.

F. Schedules shall include provisions for Weather Days as defined in the Contract Documents.

G. No activity, exclusive of submittal reviews and equipment lead times, shall have a duration longer than 15 days.

H. At a minimum, identify the execution of the list below, omitting items not applicable to Work:
   1. Obtaining permits
   2. Mobilization
   3. Site work
   4. Submittal reviews

5. Equipment lead times
6. Excavation and shoring
7. Dewatering
8. Concrete work, including installation of forms and reinforcement, placement of concrete, curing, finishing, and patching
9. Tests for leakage of concrete structures intended to hold water
10. Structural steel work
11. Masonry work
12. Framing work
13. Finish carpentry work
14. Architectural work.
15. Process equipment including pumps, conveyors, etc.
16. Building specialties
17. Process mechanical work including pipes, vales, gates, etc.
18. Building mechanical work including HVAC and plumbing
19. Electrical work
20. Instrumentation and Control work
21. Grading and paving
22. Fencing and landscaping
23. Testing and startup
24. Project closeout

I. Include information for each Work activity identified in the schedule:
1. Preceding and following event numbers
2. Activity description
3. Estimated duration of activity, in maximum 15-day intervals. Status of critical activities.
4. Earliest start date
5. Earliest finish date
6. Actual start date
7. Actual finish date
8. Latest start date
9. Latest finish date
10. Total and free float
11. Monetary value of activity, keyed to Schedule of Values
12. Percentage of activity completed
13. Responsibility

J. Required Sorts:
1. By preceding Work item or event number from lowest to highest.
2. By longest float, then in order of early start.
3. By responsibility in order of earliest possible start date.
4. In order of latest allowable start dates.
5. In order of latest allowable finish dates.
6. Contractor's periodic payment request sorted by Schedule of Values list.
7. List of basic input data-generating report.
8. List of activities on critical path.

K. Prepare sub-schedules for each stage of Work and Sequencing of Construction Plan identified in Section 01 14 00 – Work Restrictions.

L. Cost Loading:
1. Coordinate contents with Schedule of Values in Section 01 20 00 – Price and Payment Procedures.
2. The sum of all activity costs shall equal the Contract Price.

M. Produce a Summary Schedule alongside each updated Complete Schedule with consolidates groups of activities associated with major items of Work, intended to give an overall indication of the project schedule.

REVIEW AND EVALUATION

A. Participate in joint review and evaluation of schedules with Engineer at each submittal.

B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.

C. After reviews, revise schedules incorporating results of review, and resubmit within 10 days.

D. When schedule reflects Owner's and Contractor's agreement of project approach and sequence, schedule will be accepted by Owner. Use accepted schedule for planning, organizing, directing Work, and reporting progress.

E. Engineer's acceptance of schedule will not make any change in Contract requirements. Schedule remains the Contractor's responsibility and Contractor retains responsibility for performing all activities, activity durations, and sequences required to perform the Work in accordance with the Contract Documents.

1.7 UPDATING SCHEDULES

A. Schedule Updates:
1. Overall percent complete, projected, and actual.
2. Completion progress by listed activity and sub-activity, to within five working days prior to submittal.
3. Changes in Work scope and activities modified since submittal.
4. Delays in submittals or resubmittals, deliveries, or Work.
5. Adjusted or modified sequences of Work.
6. Other identifiable changes.
7. Revised projections of progress and completion.

B. Narrative Progress Report:
1. Submit with each monthly submission of Progress Schedule;
2. Summary of Work completed during the past period between reports;
3. Work planned during the next period;
4. Explanation of differences between summary of Work completed and Work planned in previously submitted report;
5. Current and anticipated delaying factors and estimated impact on other activities and completion milestones;
6. Corrective action taken or proposed.

C. Maintain schedules to record actual start and finish dates of completed activities.

D. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.

E. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

F. Upon approval of a Change Order, include the change in the next schedule submittal.

G. Indicate changes required to maintain Date of Substantial Completion.

H. Submit sorts as required to support recommended changes.

I. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect including effects of changes on schedules of separate Contractors, if applicable.

1.8 ADJUSTMENT OF CONTRACT TIMES

A. Contract time will be adjusted only for causes specified in Contract Documents. Reference the General Conditions and Section 01 26 00 – Contract Modification Procedures.

B. Project delays are defined in these categories:
   1. Inexcusable Delay: Actions or inactions of the Contractor, or events for which the Contractor has assumed contractual responsibility (including actions or inactions of subcontractors or suppliers) which would independently delay the completion of the Work beyond the current Contract completion date shall be designated as inexcusable delay. The Contractor shall not receive any time extension for such delays.
   2. Excusable Delay: Events which are unforeseeable, outside the control of, and without the fault or negligence of either the Owner or the Contractor (or any party for whom either is responsible), which would independently delay the completion of the Work beyond the current Contract completion date shall be designated as excusable delay. The Contractor is entitled to a time extension only and shall not receive any other damages.
   3. Compensable Delay: Actions or inactions of the Owner, or events for which the Owner has assumed contractual responsibility, which would independently delay the completion of the Work beyond the current Contract completion date shall be designated as compensable delay. The Contractor is entitled to a time extension and delay damages.
   4. Concurrent Delay: Concurrent delay is any combination of the above three types of delay occurring on the same calendar date(s), except in cases where the combination consists of two or more instances of the same type of delay occurring on the same calendar date(s). When one cause of delay is Owner-caused or caused by an event which is beyond the control and without the fault or negligence of either the Owner or the Contractor and the other Contractor-caused, the Contractor is entitled only to a time extension and no delay damages.

C. If the Contractor believes that the Owner has impacted its work, such that the project completion date will be delayed, the Contractor must submit proof demonstrating the delay to the critical path. This proof, in the form of a Time Impact Analysis, may entitle the Contractor to an adjustment of Contract Time.

D. Time Impact Analysis:
   1. The Time Impact Analysis submitted by the Contractor shall utilize the accepted schedule update that is current relative to the time frame of the delay event (change order, third party delay, or other Owner-caused delay). The Contractor shall represent the delay event in the schedule by
      a. inserting new activities associated with the delay event into the schedule
         or
      b. revising activity logic
         or
      c. revising activity durations.
   2. If the project schedule's critical path and completion date are impacted as a result of adding this delay event to the schedule, a time extension equal to the magnitude of the impact may be warranted.
   3. The Time Impact Analysis submittal shall consist of:
      a. a fragment of the portion of the schedule affected by the delay event.
      b. a narrative explanation of the delay issue and how it impacted the schedule.

E. When a delay to the project as a whole can be avoided by revising preferential sequencing or logic, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension and no compensation for extended overhead.

F. Indicate clearly that the Contractor has used, in full, all project float available for the work involved in the request, including any float that may exist between the Contractor's planned completion date and the Contract completion date. Utilize the latest version of the Schedule Update accepted at the time of the alleged delay, and all other relevant information, to determine the adjustment of the Contract Time.

G. Float shall be for the mutual benefit of the Owner and the Contractor. Adjustment of the Contract Times will be granted only when the Contract Float has been fully utilized and only when the revised date of completion of the Work has been pushed beyond the contract completion date. Adjustment of the Contract Times will be made only for the number of days that the planned completion of the work has been extended.
   1. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.
   2. Use of float suppression techniques, such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited. Use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of Owner and Contractor.
   3. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs, which:
      a. Impacts Project’s critical path.
      b. Consumes all available float or contingency time.
      c. Extends Work beyond contract completion date.

H. Actual delays in activities which do not affect the critical path work or which do not move the Contractor's planned completion date beyond the Contract completion date will not be the basis for an adjustment to the contract time.

I. The new Progress Schedule data, if accepted by the Owner, shall be included in the next monthly Schedule Update.

J. When the Owner has not yet made a final determination as to the adjustment of the Contract Time, and the parties are unable to agree as to the amount of the adjustment to be reflected in the Progress Schedule, reflect an interim adjustment as acceptable to Engineer. It is understood and agreed that any such interim acceptance by the Engineer shall not be binding and shall be made only for the purpose of continuing to schedule the Work, until such time as a final determination as to any adjustment of the Contract Time acceptable to the Engineer has been made. Revise the Progress Schedule prepared thereafter in accordance with the final decision.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00 – SUBMITTAL PROCEDURES

GENERAL

1.1 SUMMARY

A. This Section Includes:

Definitions

2. Submittal procedures
3. Proposed product list
4. Product data
5. Shop Drawings
6. Samples
7. Other submittals
8. Design data
9. Test reports
10. Certificates
11. Manufacturer's instructions
12. Manufacturer's field reports
13. Erection Drawings
14. Contractor review
15. Engineer review

1.2 DEFINITIONS

A. Action Submittals:
   1. Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals:
   1. Written and graphic information and physical Samples that DO NOT require Engineer's responsive action. Submittals may be rejected for NOT complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer-accepted form. Package submittal information by individual specification section. DO NOT combine different specification sections together in submittal package, unless otherwise directed in specification or items are part of a common system.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify:
   1. Project (Engineer’s project number and title), Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.

D. The Contractor shall review all submittals before submitting to Engineer. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is as specified in requirements of the Work and Contract Documents.

Provide a submittal schedule, in electronic spreadsheet format, at the beginning of the project to identify all expected submittals.

F. Post electronic submittals as PDF electronic files to the web-based project management software. Coordinate submission of related items.

G. For each submittal for review, allow 14 days excluding delivery time to and from Contractor.

H. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

I. Allow space on submittals for Contractor and Engineer review stamps.

J. When revised for resubmission, identify changes made since previous submission.

K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

L. Submittals not requested WILL NOT be recognized nor processed.

M. Incomplete Submittals:
   1. Engineer WILL NOT review. Complete submittals for each item are required. Delays resulting from incomplete submittals are NOT the responsibility of Engineer.

1.4 PROPOSED PRODUCT LIST

A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

A. Action Submittal:
   1. Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.

Post electronic submittals as PDF electronic files to web-based project management software.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review, produce copies and distribute as specified in Paragraph 1.3 "Submittal Procedures" and for record documents specified in Section 01 77 00 – Closeout Procedures.

SHOP DRAWINGS

A. Action Submittal:
   1. Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components specified in Shop Drawings.
   1. Include signed and sealed calculations to support design.
   2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
   3. Make revisions and provide additional information when required by authorities having jurisdiction.

Post electronic submittals as PDF electronic files to web-based project management software.

E. After review, produce copies and distribute as specified in Paragraph 1.3 "Submittal Procedures" and for record documents described in Section 01 77 00 – Closeout Procedures.

1.7 SAMPLES

A. Action Submittal:
   1. Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Samples for Selection as Specified in Product Sections:
   1. Submit to Engineer for aesthetic, color, and finish selection.
   2. Submit Samples of finishes, textures, and patterns for Engineer selection.

C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

D. Include identification on each Sample, with full Project information.

E. Submit number of Samples specified in individual Specification Sections; Engineer or Owner will retain one Sample.

F. Reviewed Samples that may be used in the Work are specified in individual Specification Sections.

Samples WILL NOT be used for testing purposes unless specifically stated in Specification Section.

H. After review, produce copies and distribute as specified in Paragraph 1.3 "Submittal Procedures" and for record documents described in Section 01 77 00 – Closeout Procedures.

1.8 ERECTION DRAWINGS

Action Submittal:
   1. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.

B. After review, produce copies and distribute as specified in Paragraph 1.3 "Submittal Procedures" and for record documents described in Section 01 77 00 – Closeout Procedures.

1.9 OTHER SUBMITTALS

A. Closeout Submittals:
   1. See Section 01 77 00 – Closeout Procedures.

B. Informational Submittal:
   1. Submit data for Engineer's knowledge as Contract administrator or for Owner.

C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.10 TEST REPORTS

Informational Submittal:
   1. Submit reports for Engineer's knowledge as Contract administrator or for Owner.

B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.11 CERTIFICATES

Informational Submittal:
   1. Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

1.12 MANUFACTURER'S INSTRUCTIONS

Informational Submittal:
   1. Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.

B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.

C. Specify special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.13 MANUFACTURER'S FIELD REPORTS

Informational Submittal:
   1. Submit reports for Engineer's knowledge as Contract administrator or for Owner.

B. Submit report in duplicate and in electronic format (pdf) within 5 days of observation to Engineer for information.

C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer. If during the Engineer's review it becomes clear that a submittal was inadequately reviewed by the Contractor, the submittal will be rejected.

B. Contractor Responsibilities:
   1. Determination and verification of materials including manufacturer's catalog numbers.
   2. Determination and verification of field measurements and field construction criteria.
   3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
   4. Determination of accuracy and completeness of dimensions and quantities.
   5. Confirmation and coordination of dimensions and field conditions at Site.
   6. Construction means, techniques, sequences, and procedures.
   7. Safety precautions.
   8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.

D. DO NOT fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

ENGINEER REVIEW

A. DO NOT make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.

B. Informational submittals and other similar data are for Engineer's information, DO NOT require Engineer's responsive action, and WILL NOT be reviewed or returned with comment.

C. Submittals made by Contractor that are NOT required by Contract Documents may be returned without action.

D. Submittal approval DOES NOT authorize changes to Contract requirements unless accompanied by Change Order or Work Change Directive.

E. Action Submittal Dispositions:
   1. Engineer will review, markup, stamp as appropriate, and distribute marked up electronic copies to appropriate parties as noted.
   2. Furnish as Submitted:
      a. Contractor may incorporate product(s) or implement Work covered by submittal.
   3. Furnish as Corrected or Noted:
      a. Contractor may incorporate product(s) or implement Work covered by submittal, as specified in Engineer’s notations.
   4. Revise and Resubmit:
      a. Make corrections or obtain missing portions and resubmit.
   5. Partial Resubmittal:
      a. Except for portions indicated, Contractor may begin to incorporate product(s) or implement Work covered by submittal, as specified in Engineer’s notations.
   6. Rejected:
      a. Contractor may NOT incorporate product(s) or implement Work covered by submittal.

F. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 40 00 – QUALITY REQUIREMENTS

GENERAL

1.1 SUMMARY

A. This Section Includes:

Quality control

2. Tolerances
3. References
4. Delegated Design Services
5. Conflicting Requirements
6. Labeling
7. Mockup requirements
8. Testing and inspection services
9. Manufacturers' field services

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.

B. See specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Perform Work using persons qualified to produce required and specified quality.

D. Products, materials, and equipment may be subject to inspection by Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.

E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.

B. Dating of reference standards may conflict with applicable building codes that reference standards with established dates. Therefore, individual SpecText Sections do not date reference standards, but rely on the first Paragraph below for applicable date of issue. Conversely, some products may be tested to specifically dated standards.

C. Conform to reference standard by date of issue current as of date for receiving Bids except where specific date is established by code.

D. Obtain copies of standards and maintain on Site when required by product Specification Sections.

E. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

F. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria:
   1. Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   2. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

B. Delegated Design Services Statement:
   1. Submit a statement signed and sealed by the responsible design professional licensed in the state of Work, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements:
   1. If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Engineer regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Engineer for clarification before proceeding.

B. Minimum Quantity or Quality Levels:
   1. The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.7 LABELING

A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information:
   1. Include manufacturer's or fabricator's identification, approved agency identification, and the applicable information on each label:
      a. Model number
      b. Serial number
      c. Performance characteristics

C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products:
   1. Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.8 MOCK–UP REQUIREMENTS

A. Use this Article for full-size assemblies for review of construction or for assemblies requiring esthetic review or coordination of several Sections of the Work. An example is a glazed wall, adjacent solid wall, and perimeter construction, which may require testing or assessment for quality of Work.

B. A mockup can also be used to educate and inform installers as to detailed relationship and connections between adjoining and adjacent products as mockup is being assembled or constructed.

C. Individual Specification Sections should specify mockup size and requirements for performance testing such as air or water infiltration or the operation of the item.

D. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.

E. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.

F. Accepted mockups shall be comparison standard for remaining Work.

G. Where mockup has been accepted by Engineer and is specified in product Specification Sections to be removed, remove mockup and clear area when directed to do so by Engineer.

1.9 QUALIFICATIONS

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications:

1. A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications:
1. A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications:
1. A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications:
1. A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists:
1. Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
2. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications:
1. An independent agency with the experience and capability to conduct testing and inspection indicated, as documented as specified in ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications:
1. An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications:
1. An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.10 OWNER’S REPRESENTATIVE

A. Owner’s project representative employed or retained by the Owner is authorized to inspect the Work in determining when the Work is faulty, defective, damaged, or does not conform to Contract Documents. Deficiencies or defects in the Work which have been observed will be called to the Contractor’s attention.

B. Owner’s representative WILL NOT:
1. Alter or waive provisions of the Contract.

2. Inspect Contractor’s means or methods of construction.
3. Accept portions of the Work.
4. Supervise, control, or direct Contractor’s safety programs.

1.11 CONTRACTOR TESTING AND INSPECTION SERVICES

A. Employ and pay for services of an independent testing agency or laboratory acceptable to Owner to perform specified testing and inspection as required in the Specification Sections for various work and materials.
   1. Before starting Work, submit testing laboratory name, address, and telephone number, and names of full-time Professional Engineer or specialist and responsible officer.
   2. Submit copy of report of laboratory facilities' inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of deficiencies reported by inspection.

B. Testing, inspections, and source quality control may occur on or off Project Site. Perform offsite testing as required by Engineer or Owner.

C. Reports shall be submitted by independent firm to Engineer, Contractor, and authorities having jurisdiction, indicating observations and results of tests and compliance or noncompliance with Contract Documents.
   1. Submit final report indicating correction of Work previously reported as noncompliant.

D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
   1. Provide Engineer and independent firm with ample notice before expected time for operations requiring services, no less than 48 hours.
   2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.

E. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work as specified in requirements of Contract Documents.

F. Retesting/Reinspecting:
   1. Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

G. Agency Responsibilities:
   1. Test Samples of mixes submitted by Contractor.
   2. Provide qualified personnel at Site. Cooperate with Engineer and Contractor in performance of services.
   3. Perform indicated sampling and testing of products as specified in standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.
   6. Perform additional tests required by Engineer.
   7. Attend preconstruction meetings and progress meetings.

H. Agency Reports:
   1. After each test, promptly submit a copy of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Engineer, provide interpretation of test results.
   2. Include:
      a. Date issued
      b. Project title and number

c. Name of inspector
d. Date and time of sampling or inspection
e. Identification of product and Specification Section
f. Location in Project
g. Type of inspection or test
h. Date of test
i. Results of tests
j. Conformance with Contract Documents

I. Limits on Testing Authority:
1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.
a. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
5. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor-retained and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
6. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections:
1. Owner may employ and pay for a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction, as defined in Chapter 17 of the International Building Code (IBC). These special tests and inspections are in addition to all other testing and inspection requirements.

B. Contractor’s Responsibilities:
1. The Contractor shall assist the Owner’s special tests and inspections by making available materials for testing, providing advanced notice of needed inspections, and providing sufficient time in project schedule for execution of Owner’s special tests and inspections. The costs of these support activities are included in the Contract Price.
2. Cooperate with Owner’s independent testing firm or laboratory personnel and provide access to construction operations.
3. Secure and deliver to Owner’s independent testing firm or laboratory adequate quantities of representative samples to be used and which require testing.
4. Provide to Owner’s independent testing firm or laboratory preliminary mix design proposed to be used for concrete and other material mixes which require control by testing laboratory.
5. Provide incidental labor and facilities:
a. To provide access to construction;
b. To obtain and handle samples at Project Site or at source of product to be tested;
c. To facilitate tests and inspections;
d. For storage and curing of test samples.
6. Notify Owner’s independent testing firm or laboratory 48 hours in advance of when testing is needed for laboratory to schedule and perform services.

C. See Section 01 45 24 – Special Tests and Inspections for additional special test and inspection requirements.

1.13 MANUFACTURER'S FIELD SERVICES

A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment, and commissioning as applicable, and to initiate instructions when necessary.

B. Submit qualifications of staff 30 days in advance of required observations. Observer is subject to approval of Engineer or Owner.

C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

D. See Section 01 33 00 – Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 24 – SPECIAL TESTS AND INSPECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. This Section describes the requirements of the Contractor to support special tests and inspections performed by the Owner's special inspector and testing laboratory as required by Chapter 17 of the International Building Code (IBC). The Contractor does not perform the tests and inspections described within this section, unless specifically directed to do so by another specification section included in the Contract Documents.

B. Related Sections:
   1. Section 01 40 00 – Quality Requirements

1.2 REFERENCES

A. ASTM International:
   1. C140 – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
   2. C270 – Standard Specification for Mortar for Unit Masonry.
   3. C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
   4. C1019 – Standard Test Method for Sampling and Testing Grout.
   5. C1314 – Standard Test Method for Compressive Strength of Masonry Prisms.

B. IBC (International Building Code)

1.3 DESCRIPTION

A. This Section describes special tests and inspections of structural assemblies and components to be performed in compliance with IBC. The Owner will employ one or more inspectors who will provide special inspections during construction.

B. The Contractor shall support special tests and inspections as required by this document.

1.4 INSPECTION

A. Make available all Work required for inspection by the Owner's Special Inspector. Duties of the Special Inspector are described in the IBC.

1.5 SPECIAL TESTING AND INSPECTIONS

A. Selection of the material required to be tested shall be by the Owner's testing laboratory and not the Contractor. Special tests will be performed by the Owner's testing laboratory.

B. OWNER reserves the right to positive material identification tests.
   1. Contractor must make materials available for testing.

C. The types of work require special inspection or testing as described in IBC.
   1. Refer to General Notes Sheets for required Special Inspections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SCHEDULE

A. The Contractor shall allow time necessary for Special Inspections as listed above.

B. Sufficient notice shall be given so that the Special Inspections can be performed. This includes time for off-site Special Inspectors to plan the inspection and travel to site.

3.2 PROCEDURE

A. The Special Inspector will immediately notify the Engineer, Owner, and Contractor of any corrections required and follow notification with appropriate documentation.

B. The Contractor shall take corrective actions based on Special Inspector’s findings and recommendations at no additional cost to the Owner.

C. The Contractor shall not proceed until the Work is satisfactory to the Special Inspector, Owner, and Engineer.

END OF SECTION

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

GENERAL

1.1 SUMMARY

A. This Section Includes:

Temporary Utilities:

a. Temporary electricity
b. Temporary lighting for construction purposes
c. Temporary heating
d. Temporary cooling
e. Temporary ventilation
f. Communication services
g. Temporary water service
h. Temporary sanitary facilities
i. Temporary process pumping and piping

2. Construction Facilities:
   a. Field offices and sheds
   b. Vehicular access
   c. Parking
   d. Progress cleaning and waste removal
   e. Project identification
   f. Traffic regulation
   g. Fire-prevention facilities
3. Temporary Controls:
   a. Barriers
   b. Enclosures and fencing
   c. Security
   d. Water control
   e. Dust control
   f. Erosion and sediment control
   g. Noise control
   h. Pest and rodent control
   i. Pollution control
4. Removal of utilities, facilities, and controls

1.2 REFERENCES

ASTM International:

1. E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
2. E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
3. E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Temporary Pumping Systems:
   1. Submit pump data, performance curves, and other operating information.
   2. Submit sketches showing layout of temporary pumping system, including pump quantity and location.
   3. Submit all information at least 30 days prior to when temporary pumping system is scheduled to be installed.

C. Temporary Piping Systems:
   1. Submit layout drawings showing proposed routing of piping, including proposed pipe support and pipe restraint locations.
   2. Submit product data for piping, fittings, restraints, supports, and all appurtenances of the piping system.
   3. Submit piping headloss calculations based on proposed layout.
   4. Submit all information at least 30 days prior to when temporary piping system is scheduled to be installed.

1.4 TEMPORARY FACILITIES

A. Temporary Provisions Provided by Contractor:
   1. Temporary barriers, barricades, covered walkways, fencing, exterior closures, and interior closures.
   2. Temporary field offices.
   3. Cleaning during construction.
   4. Access roads and approaches.
   5. Temporary sanitary facilities.
   6. Temporary heating and ventilating after enclosure.
   7. Temporary electrical service and distribution system for power and lighting.
   8. Temporary telephone and internet service.
   9. Temporary tree and plant protection.
   10. Temporary heating before building enclosure.
   11. Temporary fire protection, dust control, erosion and sediment control, water control, noise control, and other necessary temporary controls
   12. Temporary provisions for protection of installed Work

1.5 TEMPORARY ELECTRICITY

Use Owner's existing power service.
   1. Provide temporary electric feeder from electrical service at **location as directed by Owner**. DO NOT disrupt Owner's use of service.

B. Complement existing power service capacity and characteristics as required for construction operations.

C. Provide power outlets with branch wiring and distribution boxes located as required for construction operations. Provide suitable, flexible power cords as required for portable construction tools and equipment. All temporary electrical work shall comply with electrical codes and regulations.

1.6 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations at lighting levels NOT less than required by OSHA (Occupational Safety and Health Administration).

B. Provide and maintain lighting to exterior staging and storage areas and interior work areas after dark for security purposes.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, lamps, and the like, for specified lighting levels.

D. Permanent building lighting may be used during construction. When used, maintain lighting and provide routine repairs including replacement of lamps.

1.7 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. For construction activity is hazardous locations, provide ventilation levels to achieve unclassified ratings in accordance with NFPA 820.

1.8 TEMPORARY WATER SERVICE

Owner will pay cost of temporary water. Exercise measures to conserve. Use Owner's **existing** water system, extended and supplemented with temporary devices as needed to maintain specified conditions for construction operations. Owner will provide a meter for the contractor for a fee that will meter water used for Owner's records. This fee will be reimbursed when the meter is returned at the end of the job.

B. Extend branch piping with outlets located so that water is available by hoses with threaded connections. Provide temporary pipe insulation and heat tape to prevent freezing as necessary.

C. Remove temporary piping and connections and restore affected portions of the facility to original condition before Final Completion.

1.9 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is NOT permitted. Provide facilities at time of Project mobilization. Remove facilities at completion of project and leave Site in neat and sanitary condition.

FIELD OFFICES AND SHEDS

DO NOT use existing facilities for field offices or for storage.

C. Storage Areas and Sheds:
1. Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and inspection of products to suit requirements in Section 01 60 00 – Product Requirements.

D. Preparation:
1. Fill and grade Sites for temporary structures sloped for drainage away from buildings.

E. Installation:
1. Install field office spaces ready for occupancy 15 days after date established by Notice to Proceed.
2. Locate field offices where directed.
3. Raise grade under field offices, as necessary, to elevation adequate to avoid flooding.
4. Provide sanitary facilities in compliance with state and local health authorities.

F. Maintenance and Cleaning:
1. Arrange and pay for Janitorial service including daily trash service, continuous supply of toilet paper, hand towels, and hand soap, and monthly comprehensive cleaning for both Contractor field offices.
2. Maintain walks free of mud, water, snow, and the like.

G. Removal:
1. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas to same or better condition as original condition.

1.10 VEHICULAR ACCESS

A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes. Roads shall be use gravel, crushed rock, or other stabilization material.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

C. Where access roads cross existing fences, install and maintain gates.

D. Maintain road grade and crown to eliminate potholes, rutting, and other irregularities that restrict access.

E. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.

F. Locate as required and within easements, rights-of-way, or Project limits. Obtain Engineer's approval of access roads.

G. Provide unimpeded access for emergency vehicles.

H. Provide and maintain access to fire hydrants and control valves free of obstructions.

I. Provide means of removing mud from vehicle wheels before entering streets.

J. Only use existing onsite roads for construction traffic when designated and with Owner or Engineer approval.

K. Upon completion of construction, restore ground surface disturbed by access road construction to original condition.

1.11 PARKING

A. Arrange for temporary surface parking areas to accommodate construction personnel.

B. Locate as specified in Drawings or as approved by Engineer or Owner.

C. If Site space is NOT adequate, provide additional offsite parking.

D. NO employee or equipment parking will be permitted on Owner's existing parking areas, except as specifically designated for Contractor's use.

E. DO NOT allow heavy vehicles or construction equipment in parking areas.

F. DO NOT allow vehicle parking on existing pavement.

G. Designate parking spaces for Engineer or Owner construction observation personnel.

H. Permanent Pavements and Parking Facilities:
   1. Before Substantial Completion, bases for permanent roads and parking areas may be used for construction traffic.
   2. Avoid traffic loading beyond paving design capacity. Tracked vehicles are NOT allowed.
   3. Use of permanent parking structures is NOT permitted.

I. Maintenance:

1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.
2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

J. Removal, Repair:
1. Remove temporary materials and construction when permanent paving is usable.
2. Remove underground Work and compacted materials to depth of 2 ft; fill and grade Site as specified.
3. Repair facilities damaged by use, to original condition.

K. Mud from Site vehicles:
1. Provide means of removing mud from vehicle wheels before entering streets.

1.12 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, before enclosing spaces.

C. Broom and vacuum clean interior areas before starting surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from Site to maintain a clean and orderly Site and dispose of offsite, at least at weekly intervals.

E. Open free-fall chutes are NOT permitted. Terminate closed chutes into appropriate containers with lids.

1.13 PROJECT IDENTIFICATION

Project Identification Sign:
1. Project signs shall be in accordance with MAWSS and ADEM SRF project requirements. Two signs are required according to details provided in the specifications.

Content: refer to SRF Supplemental General Conditions for SRF required sign and MAWSS Appendix F for MAWSS specific signage requirements.

B. Design signs and structure to withstand 60 mph wind velocity.

C. Finishes, Painting:
1. Adequate to withstand weathering, fading, and chipping for duration of construction.

D. Sign Materials:
1. Structure and Framing: Metal or treated wood, structurally adequate.
2. Sign Surfaces: Exterior grade plywood with medium-density overlay, minimum of 3/4 in. thick, standard large sizes to minimize joints.
3. Rough Hardware: Galvanized or aluminum.
4. Paint and Primers: Exterior quality, two coats.
5. Lettering: Exterior quality paint, contrasting colors.

E. Installation:

1. Install Project identification sign within 15 days after date established by Notice to Proceed.
2. Erect at designated location.
3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
4. Install sign surface plumb and level, with butt joints. Anchor securely.
5. Paint exposed surfaces of sign, supports, and framing.

F. Maintenance:
1. Maintain clean signs and supports; repair deterioration and damage.

G. Removal:
1. Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.14 TRAFFIC REGULATION

A. Signs, Signals, and Devices:
1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
2. Traffic Control Signals: As approved by local jurisdictions.
3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
4. Flag Person Equipment: As required by authorities having jurisdiction.

B. Flag Persons:
1. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

C. Flares and Lights:
1. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

D. Haul Routes:
1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.

E. Traffic Signs and Signals:
1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
3. Relocate signs and signals as Work progresses, to maintain effective traffic control.

F. Removal:
1. Remove equipment and devices when NO longer required
2. Repair damage caused by installation
3. Remove post settings to depth of 2 ft

1.15 FIRE–PREVENTION FACILITIES

A. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does NOT exist.

B. Portable Fire Extinguishers:

1. NFPA 10; 10 lb. capacity, 4A-60B: C UL rating.
2. Provide one fire extinguisher at each stairway on each floor of buildings under construction and demolition.
3. Provide minimum of one fire extinguisher in every construction trailer and storage shed.
4. Provide minimum of one fire extinguisher on roof during roofing operations using heat-producing equipment.

1.16 CONSTRUCTION AIDS

A. Provide railings, kick plates, enclosure, safety devices, and controls as required for adequate protection of life and property as required by applicable laws and regulations.

B. Design temporary supports with adequate safety factor for designed load bearing capability. When requested, provide design calculations by a Professional Engineer prior to application of loads. Submitted design calculations are for information and record purposes only.

1.17 BARRIERS

Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building. All devices shall conform to minimum requirements of OSHA and State agencies.

C. Tree and Plant Protection:
1. Preserve and protect existing trees and plants designated to remain.
2. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
3. Replace trees and plants damaged by construction operations.

Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.

1.18 WATER CONTROL

A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.

B. Protect Site from puddles or running water. Provide water barriers as required to protect Site from soil erosion.

1.19 DUST CONTROL

A. Execute Work by methods that minimize raising dust from construction operations.

B. Provide positive means to prevent airborne dust from dispersing into atmosphere, into Owner-occupied areas, and onto roadways, including dust pollution as a result of dumping and hauling rock or dirt.

1.20 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

F. See sediment and erosion control plan as specified in Drawings.

1.21 NOISE CONTROL

Provide methods, means, and facilities to minimize noise produced by construction operations.

1.22 PEST AND RODENT CONTROL

Provide methods, means, and facilities to prevent pests and insects from damaging the Work.

Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.23 POLLUTION CONTROL

Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.

B. DO NOT cause or permit action to occur which would result in an overflow to an existing waterway.

C. Burning of waste materials, rubbish, or other debris will NOT be permitted on or adjacent to Site.

D. See pollution and environmental control requirements of authorities having jurisdiction, including EPA guidance document 430/9-73-007 “Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity”.

1.24 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials before Substantial Completion inspection.

B. Remove underground installations to minimum depth of 2 ft and grade to match surrounding conditions.

C. Clean and repair damage caused by installation or use of temporary Work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.25 PROTECTION OF WORK AND PROPERTY

A. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and

all other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.

B. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.

C. Maintain original Site drainage wherever possible

1.26 TEMPORARY PROCESS PIPING

A. Contractor shall provide all piping, appurtenances, and other materials as required to provide temporary piping systems as specified herein, as indicated on the Drawings, and as needed to perform the Work.

B. Contractor shall field route piping as needed and as field conditions dictate, unless otherwise indicated on the Drawings, and determine appropriate lengths of piping and quantity/type of pipe fittings needed to construct temporary piping system. DO NOT block access points such as stairs, doors, and walkways to existing facilities unless approved in writing by the Owner.

C. Restrain piping at valves and at fitting where piping changes direction, changes sizes, and at ends:
   1. When piping is buried, use concrete thrust block or mechanical restraints.
   2. When piping is exposed or under water, use mechanical or structural restraints.
   3. Determine thrust forces by multiplying the nominal cross-sectional area of the piping by the operating pressure of the piping.

D. Temporary piping systems shall be installed in a manner that WILL NOT damage existing or new facilities.

E. Piping material, including gaskets, shall be suitable for the process fluid requiring temporary piping.

F. After temporary piping is NO longer required, remove piping, clean and repair damage cause by installation or use, and restore existing facilities to original condition.

1.27 TEMPORARY PROCESS PUMPING

A. Contractor shall provide temporary process pumping where required to complete the Work. Temporary process pumping shall be coordinated with the Owner and Engineer prior to implementation.
   1. Anticipated pressure will vary based on headloss and the final length and size of temporary piping. Contractor shall calculate headlosses and provide pumping with sufficient pressure to meet flow requirements. Calculations shall be sealed and signed by a Professional Engineer registered in the State where the Work is being performed.
   2. Pumps shall be capable of passing solids of a sufficient size for the type of liquid being pumped.
   3. Temporary pump systems must be configured to match the operational condition of permanent systems. Where required, provide variable speed pumping to match incoming flows.
   4. Provide and pay for all power required to operate temporary pump system.
   5. All electrical and instrumentation components shall comply with applicable code requirements.
   6. Contractor shall be responsible for repairing any damage or reimbursing the Owner for any regulatory fines or additional plant staff time resulting from the Contractor’s failure to maintain temporary pumping.

7. Provide N + 1 standby pumping capacity, such that a failure of the largest pumping unit does NOT result in reduced capacity of the pumping system. Standby pump(s) shall be capable of providing required pumping capacity immediately upon failure of duty pump(s).
8. All necessary spare equipment and appurtenances shall be available at the Site to allow immediate repair and/or replacement of any pumping system component that is NOT functioning properly.

B. After temporary process pumping is NO longer required, remove pumping system components, clean and repair damage caused by installation or use, and restore existing facilities to original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 60 00 – PRODUCT REQUIREMENTS

GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Products.
   2. Product delivery requirements.
   3. Product storage and handling requirements.
   4. Product options.

1.2 PRODUCTS

A. At minimum, comply with specified requirements and reference standards.

B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.

C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

DO NOT use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.

E. Furnish interchangeable components from same manufacturer for components being replaced.

F. Special Tools and Accessories:
   1. Furnish to Owner, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are NOT limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, hand wheels, chain operators, special tools, and other spare parts as required for maintenance.

G. Lubricant:
   1. Provide initial lubricant recommended by equipment Manufacturer in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by Owner.

H. Equipment Finish:
   1. Provide Manufacturer’s standard finish and color, except where specific color is indicated.
   2. If Manufacturer has NO standard color, provide equipment with gray finish as approved by Engineer.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products as specified in manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

D. Deliver products as specified in accepted current Progress Schedule and coordinate to avoid conflict with the Work and conditions at Site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.

E. Unload products as specified in Manufacturer's instructions for unloading or as specified, and record receipt of products at Site. Promptly inspect for completeness and evidence of damage during shipment.

F. Remove damaged products from Site, and expedite delivery of identical new undamaged products, and remedy incomplete or lost products to provide that specified, so as NOT to delay progress of the Work.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products as specified in manufacturer's instructions.

B. Store products with seals and labels intact and legible. Include on label, date of manufacture and shelf life, where applicable.

C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.

D. For exterior storage of fabricated products, place products on sloped supports aboveground.

Provide bonded offsite storage and protection when Site does NOT permit onsite storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

J. Store electrical, instrumentation, and control products, and equipment with bearings in weather-tight structures maintained above 60°F. Protect electrical, instrumentation, and control products, and insulation against moisture, water, and dust damage. Connect and operate continuously all space heaters furnished in electrical equipment.

K. Store finished products that are ready for installation in dry and well-ventilated areas. DO NOT subject to extreme changes in temperature or humidity.

L. Hazardous Materials:
   1. Prevent contamination of personnel, storage building, and Site. Meet requirements of product specification, codes, and manufacturer's instructions.

1.5 PRODUCT OPTIONS

Products Specified by Reference Standards or by Description Only:
   1. Products complying with specified reference standards or description.

B. Products Specified by Naming One or More Manufacturers:
   1. Products of one of manufacturers named and complying with Specifications; NO options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions:
   1. Submit Request for Substitution for any manufacturer NOT named, as specified in Section 01 25 00 – Substitution Procedures.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 70 00 – EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Examination
   2. Preparation
   3. Coordination of Owner's portion of the Work
   4. Survey control
   5. Execution
   6. Indoor air quality procedures
   7. Cutting and patching
   8. Protecting installed construction
   9. Work within public right-of-way

1.2 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual Specification Sections.

D. Verify that utility services are available with correct characteristics and in correct locations.

1.3 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance as specified in manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or manufacturer-recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

1.4 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for Owner's construction personnel.
   1. Provide temporary facilities required for Owner-furnished, Contractor-installed or Owner-furnished, Owner-installed products.
   2. See Section 01 10 00 – Summary for other requirements for Owner-furnished, Contractor-installed or Owner-furnished, Owner-installed products.

B. Coordination: Coordinate construction and operations of the Work with Work performed by Owner's construction personnel.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's Work. Attend

preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

1.5 SURVEY CONTROL

A. Employ land surveyor registered in State of Work and acceptable to Engineer and Owner.

B. Coordinate locate with Engineer and Owner and protect survey controls and reference points. Promptly notify Engineer of discrepancies discovered.

C. Control datum for survey is as specified in Drawings.

D. Prior to beginning Work, verify and establish floor elevations of existing facilities, where applicable, to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.

E. Verify setbacks and easements; confirm Drawing dimensions and elevations.

F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices. Accuracy of stakes, alignments, and grades may be checked randomly by Engineer; notice will be given for when checking will be conducted. When notice of checking is given, postpone parts of the Work affected by stakes, alignments or grades until checked.

G. Submit copy of Site drawing signed by land surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.

H. Maintain complete and accurate log of control and survey Work as Work progresses.

I. On completion of foundation walls and major Site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction.

J. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

K. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.

L. Replace dislocated survey control points based on original survey control. Make NO changes without prior written notice to Engineer.

M. Final Property Survey: Prior to Substantial Completion, prepare final property survey illustrating locations, dimensions, angles, and elevations of buildings and Site Work that have resulted from construction indicating their relationship to permanent benchmarks and property lines.
   1. Show significant features (real property) for Project.
   2. Include certification on survey, signed by surveyor, that principal metes, bounds, lines, levels, and elevations of Project are accurately shown.

1.6 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
   1. Secure Work true to line and level and within specified tolerances, or if NOT specified, industry-recognized tolerances.
   2. Physically separate products in place and provide electrical insulation or protective coatings to prevent galvanic action or corrosion between dissimilar metals.
   3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual effect choices to Engineer for final decision.

E. Allow for expansion of materials and building movement.

F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
   1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
   2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.

G. Mounting Heights: Where NOT indicated, mount individual units of Work at industry-recognized standard mounting heights for particular application indicated.
   1. Refer questionable mounting height choices to Engineer for final decision.
   2. Elements Identified as Handicap Accessible: Comply with applicable codes and regulations.

H. Adjust operating products and equipment to ensure smooth and unhindered operation.

I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

1.7 INDOOR AIR QUALITY PROCEDURES

A. Prevent indoor air quality problems resulting from construction and renovation process.

B. Protect HVAC system during construction and renovation, control pollutant sources, and interrupt contamination pathways.

C. Sequence material delivery and installation to avoid exposing insulation, carpeting, acoustical ceilings, gypsum board, and other absorptive materials to contamination and moisture.

D. Enclose buildings before storing and installing moisture-sensitive products within building under construction.

E. Install construction return filter at each return grille before operating permanent air handlers during construction.

F. Replace filters after completing construction.

G. Conduct building flush-out after construction ends.

1.8 ALTERATION PROCEDURES

A. Existing facilities may be occupied for normal operations during progress of construction. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.
   1. Perform Work NOT to interfere with operations of occupied areas.
   2. Keep utility and service outages to a minimum and perform only after written approval of Owner.
   3. Clean Owner-occupied areas daily. Clean spillage, overspray, and heavy collection of dust in Owner-occupied areas immediately.

B. Materials: As specified in product Sections; match existing products with new products for patching and extending Work.

C. Employ skilled and experienced installer to perform alteration and renovation Work.

D. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

E. Remove unsuitable material NOT marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

F. Remove debris and abandoned items from area and from concealed spaces.

G. Prepare surface and remove surface finishes to permit installation of new Work and finishes.

H. Close openings in exterior surfaces to protect existing Work from weather and extremes of temperature and humidity.

I. Remove, cut, and patch Work to minimize damage and to permit restoring products and finishes to specified condition.

J. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes.

K. Where new Work abuts or aligns with existing Work, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

L. When finished surfaces are cut so that smooth transition with new Work is NOT possible, terminate existing surface along straight line at natural line of division and submit recommendation to Engineer for review.

M. Where change of plane of 1/4 in. or more occurs, submit recommendation for providing smooth transition to Engineer for review and request instructions from Engineer.

N. Trim existing doors to clear new floor finish. Refinish trim to specified condition.

O. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.

P. Finish surfaces as specified in individual product Sections.

1.9 CUTTING AND PATCHING

A. Employ skilled and experienced Installers to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:
   1. Structural integrity of element;
   2. Integrity of weather-exposed or moisture-resistant elements;
   3. Efficiency, maintenance, or safety of element;
   4. Visual qualities of sight-exposed elements;
   5. Work of Owner or separate Contractor.

C. Execute cutting, fitting, and patching to complete Work and to accomplish:
   1. Fit the several parts together, to integrate with other Work;
   2. Uncover Work to install or correct ill-timed Work;
   3. Remove and replace defective and nonconforming Work;
   4. Remove samples of installed Work for testing;
   5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products as specified in requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire-rated material to full thickness of penetrated element to maintain fire rating of complete assembly.

J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

K. Identify the hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

1.10 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.11 WORK WITHIN PUBLIC RIGHT–OF–WAY

A. All work within public right-of-way shall be as specified in requirements and standards of the State of Alabama Department of Transportation.

B. Maintain access to critical facilities at all times including fire stations, fire hydrants, and hospitals.

C. Provide traffic control devices, barricades, and signage as required by the regulating agency.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 75 00 – STARTUP TESTING AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Factory testing
   2. Manufacturer’s services
   3. Startup plan
   4. Pre-startup testing
   5. Functional testing
   6. Site Acceptance Test
   7. Demonstration and Training

1.2 FACTORY TESTING

A. Test equipment for proper performance at point of manufacture or assembly when specified.
   1. Demonstrate equipment meets specified performance requirements.
   2. Perform testing as specified in the equipment specification sections.
   3. Provide certified copies of test results. DO NOT ship equipment until receiving written approval of test results.

B. Factory testing may require witnessing by the Owner or Engineer as specified in the equipment specification sections. When required, provide or reimburse the cost for travel, lodging, and meals for up to two (2) representatives, or quantity as specified in the equipment specification section.

1.3 MANUFACTURER’S SERVICES

A. Execute testing and startup under supervision of manufacturer's representative as specified in manufacturer's instructions. Schedule services to avoid conflict with other testing and startup activity.

B. Comply with requirements of individual equipment specification sections, including requirements for an onsite manufacturer’s representative to inspect, check, and approve equipment or system installation prior to startup and supervise placing equipment or system in operation.

C. Manufacturer’s representative shall maintain a log of activities, prepare startup and testing forms, and submit records generated during startup and testing phase of Project.

D. Manufacturer’s Certificate of Proper Installation: Provide a written report prepared and signed by Manufacturer’s representative certifying that equipment:
   1. Has been properly installed, adjusted, aligned, and lubricated.
   2. Is free of any stresses imposed by connecting piping or anchor bolts.
   3. Is suitable for satisfactory full-time operation under full load conditions.
   4. Operates within the allowable limits for vibration.
   5. Controls, protective devices, instrumentation, and control panels furnished as part of the equipment package are properly installed, calibrated, and functioning.
   6. Control logic for startup, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are properly functioning.

1.4 STARTUP PLAN

A. Provide a startup plan for each piece of equipment and each system NOT less than 2 weeks prior to planned initial startup of equipment or system. At a minimum, provide:
   1. Step-by-step instructions for startup of each piece of equipment or system.
   2. Description of the process, including equipment numbers/nomenclature of each item and all included devices.
   3. Detail procedure for startup including valves to be opened/closed, sequence of startup, etc.
   4. Startup requirements including water, power, chemicals, etc.
   5. Provide testing plan with test logs for each item and system when specified. Include testing of alarms, control circuits, capacities, ratings, speeds, flows, pressures, vibrations, sound level, and other specified performance parameters.
   6. Provide a summary of shutdown requirements for existing systems, if any, which are necessary to complete startup of new equipment and systems.

B. Coordinate schedule for startup of various equipment and systems. Allow realistic durations in the Progress Schedule for testing and startup activities, including:
   1. Manufacturer’s services
   2. Pre-startup testing
   3. Functional testing
   4. Site Acceptance Test

C. Revise and update startup plan based upon review comments or to accommodate changes in startup sequence.

1.5 PRE–STARTUP TESTING

A. Prior to startup of any piece of equipment, perform all checks and adjustments required to make the equipment ready for safe and proper operation.

B. Furnish labor, power, chemicals, tools, equipment, instruments, and services required for and incidental to completing all pre-startup testing.

C. Perform pre-startup testing and checks as indicated in the individual equipment specification sections and as required by manufacturer’s literature.

D. Mechanical Systems
   1. Remove rust preventatives and oils applied to protect equipment during construction.
   2. Flush lubrication systems and dispose of flushing oils. Recharge lubrication system with lubricant recommended by manufacturer.
   3. Flush fuel system and provide fuel for testing and startup.
   4. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace defective seals.
   5. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
   6. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
   7. Perform cold alignment and hot alignment to manufacturer's tolerances.
   8. Adjust V-belt tension and variable pitch sheaves.
   9. Inspect hand and motorized valves for proper adjustment. Tighten packing glands to insure NO leakage, but permit valve stems to rotate without galling. Verify valve seats are positioned for proper flow direction.
   10. Tighten leaking flanges or replace flange gasket. Inspect screwed joints for leakage.
   11. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to functional testing.

E. Electrical Systems
   1. Perform testing as indicated in Division 26 including insulation testing, continuity testing, ground testing, circuit breaker testing, and motor testing.
   2. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.

F. Instrumentation and Control Systems
   1. Perform testing as indicated in Division 40 including instrumentation calibration and adjustment, point-to-point wiring checks, signal range testing, and input/output testing.
   2. Verify that tests agree with those required by equipment or system manufacturer.

G. Document results of pre-startup testing on test forms and reports, and submit upon completion of testing. Acceptance of pre-startup testing results is required prior to performing functional testing.

1.6 FUNCTIONAL TESTING

A. Functionally test mechanical, electrical, and instrumentation and control equipment for proper operation after pre-startup testing and adjusting is completed.

B. Furnish labor, power, chemicals, tools, equipment, instruments, and services required for and incidental to completing all functional testing.

C. Functional testing of equipment shall be performed for all possible operational scenarios from NO load to full load conditions. The various tests performed during functional testing shall be designed to demonstrate that systems fulfill all the requirements of the Contract Documents.

D. Functional testing shall be performed utilizing water, air, electricity, chemicals, or other mediums to simulate permanent operating conditions.
   1. Some processes may require the use of temporary clean water for functional demonstration testing.
   2. Contractor shall coordinate with the Owner for availability of water source. Contractor shall be responsible for all temporary piping, pumping, and power to convey clean water to the facility for testing.
   3. Coordinate with Owner removal of test water from process after satisfactory completion of functional testing. DO NOT discharge test water in a manner to cause upset or disruption to plant operations.

E. Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration.

F. Demonstrate that equipment meets performance requirements specified.

G. Demonstrate proper operation of each instrument loop function including alarms, local and remote controls, instrumentation, and other equipment functions. Where required, generate signals with test equipment to simulate operating conditions in each control mode.

H. Document results of functional testing on test forms and reports, and submit upon completion of testing. Acceptance of functional testing results is required prior to performing the Site Acceptance Test.

1.7 SITE ACCEPTANCE TEST

A. After all systems have been functionally tested and are operating as specified in the Contract Documents, the Contractor shall perform a Site Acceptance Test of the comprehensive completed installation.

B. During the testing period, the Owner shall have full use of the system. The Owner will provide operations, personnel, power, fuel, and other consumables for the duration of the site acceptance test.

C. The complete installation must meet all performance requirements for the duration of the Site Acceptance Test.

D. Contractor personnel shall be readily available to address issues onsite during the test. Immediately correct defects in materials, workmanship, or equipment which become evident during the test.

E. The Site Acceptance Test period shall be 30 days, during which time the completed installation must meet specified operation without significant interruption. A significant interruption may include:
   1. Failure to meet specified functional or performance requirements for more than 2 consecutive hours.
   2. Failure of any critical component that is NOT corrected within 8 hours after failure.
   3. Other failures or interruptions as defined by the Engineer.

F. A significant interruption will require restarting of the Site Acceptance Test after the problem is corrected and when directed by the Owner/Engineer. Restarting and satisfactory completion of the Site Acceptance Test shall be conducted at NO additional cost to the Owner.

1.8 DEMONSTRATION AND TRAINING

A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.

B. Provide a training schedule for all training sessions required for the project. Allow for multiple sessions of each training to accommodate multiple operator shifts. Submit training schedules for approval by Owner.

C. Demonstrate Project equipment and instruct in classroom environment located at the Site and instructed by qualified manufacturer's representative who is knowledgeable about the equipment.

D. Provide a lesson plan for each required course, containing, at minimum:
   1. Title and objectives.
   2. Recommended attendees.
   3. Course description and outline.
   4. Instructional materials and equipment requirements.
   5. Instructor resumes.

E. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

F. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time at designated location.

G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

H. Allot the required instruction time for each item of equipment and system as specified in individual equipment specification sections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Closeout procedures
   2. Project record documents
   3. Operation and maintenance data
   4. Manual for materials and finishes
   5. Manual for equipment and systems
   6. Spare parts and maintenance products
   7. Product warranties and product bonds
   8. Maintenance service
   9. Final cleaning

1.2 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion:
   1. Complete items below before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
      a. Submit maintenance manuals, Project record documents, digital images of construction photographs, video recordings, and other similar final record data in compliance with this Section.
      b. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section and 01 75 00 – Startup Testing and Training.
      c. Complete demonstration and training to Owner's operating and maintenance personnel as specified in compliance with this Section and 01 75 00 – Startup Testing and Training.
      d. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
      e. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
      f. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
      g. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
      h. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
      i. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:
   1. When Contractor considers Work to be substantially complete, submit to Engineer and Owner:
      a. Written certificate that Work, or designated portion, is substantially complete.
      b. List of items to be completed or corrected (initial punch list).
   2. After receipt of request for Substantial Completion, Engineer or Owner will make inspection to determine whether Work or designated portion is substantially complete.

3. Should Engineer or Owner determine that Work is NOT substantially complete:
    a. Engineer or Owner will promptly notify Contractor in writing, stating reasons for its opinion.
    b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion.
    c. Engineer or Owner will reinspect Work.
    d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer or Owner inspection.
4. When Engineer or Owner finds Work to be substantially complete, they will:
    a. Prepare Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
    b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
5. After Work is substantially complete, Contractor shall:
    a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
    b. Complete Work listed for completion or correction within period stipulated.

C. Final Completion Prerequisites: Complete items below before requesting final acceptance and final payment.
1. When Contractor considers Work to be complete, submit written certification that:
    a. Contract Documents have been reviewed.
    b. Work has been examined for compliance with Contract Documents.
    c. Work has been completed according to Contract Documents.
    d. Work is completed and ready for final inspection.
2. Submittals:
    a. Final punch list indicating all items have been completed or corrected.
    b. Final payment request with final releases and supporting documentation NOT previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
    c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
    d. Accounting statement for final changes to Contract Sum.
    e. Contractor's affidavit of payment of debts and claims.
    f. Contractor affidavit of release of liens.
    g. Consent of surety to final payment.
3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:
1. After receipt of request for final inspection, Engineer or Owner will make inspection to determine whether Work or designated portion is complete.
2. Should Engineer or Owner consider Work to be incomplete or defective:
    a. Engineer or Owner will promptly notify Contractor in writing, listing incomplete or defective Work.
    b. Contractor shall remedy stated deficiencies and send second written request to Engineer or Owner that Work is complete.
    c. Engineer or Owner will reinspect Work.
    d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer or Owner inspection.

1.3 PROJECT RECORD DOCUMENTS

A. Maintain onsite one set of the following record documents; record actual revisions to the Work:
1. Drawings
2. Specifications

3. Addenda
4. Change Orders and other modifications to the Contract
5. Reviewed Shop Drawings, product data, and Samples
6. Manufacturer's instruction for assembly, installation, and adjusting

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, NOT less than weekly.

E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates used.
3. Changes made by Addenda, bulletin, Change Order, and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
2. Include locations of concealed elements of the Work.
3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
5. Identify and locate existing buried or concealed items encountered during Project.
6. Measured depths of foundations in relation to finish first floor datum.
7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
9. Field changes of dimension and detail.
10. Details NOT on original Drawings.

G. Submit PDF electronic files of marked-up documents to Engineer within 10 days after the date of Substantial Completion and prior to final Application for Payment.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit in PDF composite electronic indexed file.

B. Submit data bound in 8 1/2 in. by 11 in. text pages, three D side ring binders with durable plastic covers.

C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.

D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
      g. Safety precautions to be taken when operating and maintaining or working near equipment.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop Drawings and product data.
      b. Air and water balance reports.
      c. Certificates.
      d. Executed and notarized duplicates of warranties and bonds.

1.5 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.

B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

C. Submit one copy of completed volumes before Substantial Completion. Completed volumes, with Engineer comments, will be returned after Substantial Completion. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes within 10 days after final inspection.

E. Submit in PDF composite electronic indexed file of final volumes within 10 days after final inspection.

F. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for reordering custom-manufactured products.

G. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

H. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

I. Additional Requirements: As specified in individual product Specification Sections.

J. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.6 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

C. Submit one copy of completed volumes before Substantial Completion. Completed volumes, with Engineer comments, will be returned after Substantial Completion. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes within 10 days after final inspection.

E. Submit in PDF composite electronic indexed file of final volumes within 10 days after final inspection.

F. Equipment and Systems: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

H. Include color-coded wiring diagrams as installed.

I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.

J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

K. Include servicing and lubrication schedule and list of lubricants required.

L. Include manufacturer's printed operation and maintenance instructions.

M. Include sequence of operation by controls manufacturer.

N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

O. Include control diagrams by controls manufacturer as installed.

P. Include Contractor's coordination drawings indicating installed color-coded piping diagrams.

Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

S. Include test and balancing reports as specified in Section 01 40 00 – Quality Requirements.

T. Additional Requirements: As specified in individual product Specification Sections.

U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

1.7 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.

B. Deliver to Project Site and place in location as directed by Owner; obtain receipt prior to final payment.

1.8 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within 10 days after completion of applicable item of Work.

B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include table of contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within 10 days after acceptance, listing date of acceptance as beginning of warranty or bond period.

H. Refer to Section 01 78 36 – Warranties and Bonds for additional requirements.

1.9 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in specification sections during warranty period.

B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.

D. DO NOT assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

1.10 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.
   1. Employ experienced personnel or professional cleaning firm.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces**;** and vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.

D. Clean or replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean Site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 36 – WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. General administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

1.2 RELATED WORK

A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.

B. General closeout requirements are included in Section 01 77 00 – Closeout Procedures.

C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in Division 2 – Division 46.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.

C. See Division 2 – Division 46 for specific content requirements, and particular requirements for submittal of special warranties.

D. Contractor shall submit digital copies and a 3-ring binder of warranties for each piece of equipment installed coupled with an overall project summary spreadsheet listing of all equipment items and date warranty starts and expires, etc.

1.4 WARRANTY REQUIREMENT

A. Warranty Period:
   1. Warranties shall commence on the date of Substantial Completion.
   2. Warranties shall be in force from the date of Substantial Completion through the date of Final Acceptance.
   3. Warranties shall be in force for two years following the date of Final Acceptance.
      a. Warranty periods defined in Division 02 – Division 46, longer than the warranty period defined in this section, shall prevail over the requirements in this section.
      b. Warranty periods defined in Division 02 – Division 46, shorter than the warranty period defined in this section, shall be required to meet the warranty period requirements in this section.

B. Related Damages and Losses:
   1. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

C. Reinstatement of Warranty:
   1. When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.

D. Warranties shall stipulate that Work furnished is suitable for the purpose intended and free from defects of material and workmanship for the duration of the warranty period.

E. Replacement Cost:
   1. Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life. Spare parts shall NOT be used to address warranty repairs.

F. Owner's Recourse:
   1. Written warranties made to the Owner are in addition to implied warranties, and SHALL NOT limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

G. Rejection of Warranties:
   1. The Owner reserves the right to reject warranties and to limit selections to products with warranties NOT in conflict with requirements of the Contract Documents.

H. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

I. Disclaimers and Limitations:
   1. Manufacturer's disclaimers and limitations on product warranties DO NOT relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.5 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the Manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

DIVISION 2

EXISTING CONDITIONS

SECTION 02 41 00 – DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Portions of buildings and other areas, equipment and materials selective demolition, and partial demolition work as specified in Drawings.
   2. Equipment and materials to be removed for construction and reinstalled for reuse or continued operation as specified in Drawings.

B. Related Sections:
   1. Section 01 14 00 - Work Restrictions
   2. Section 01 32 16 - Construction Progress Schedule
   3. Section 01 70 00 - Execution Requirements
   4. Section 05 05 19 - Post-Installed Anchors

1.2 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings:
   1. Plans specifying all equipment and materials to be removed and reinstalled for reuse on continued operation including interim storage plans for each item.
   2. Erection drawings for reinstallation of removed materials. Erection drawings shall include connection details matching existing construction.

C. Quality requirements Submittals:
   1. Schedule of demolition, as part of and consistent with the progress schedule specified in Section 01 32 16 – Construction Progress Schedule.
   2. Methods of demolition and equipment proposed to demolish each structure.
   3. Copies of any authorizations and permits required to perform Work.

D. Product Data:
   1. Post Installed Anchors for reinstallation of materials. See Section 05 05 19 - Post-Installed Anchors for acceptable materials and submittal requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Utilities:
   1. Notify Owner and appropriate utilities 72 hrs. prior to turning off affected services before starting demolition or alterations.

B. Removal and Storage of Equipment for Reuse:
   1. DO NOT remove equipment and materials without approval of Engineer.
   2. Properly store and maintain equipment and materials in same condition as when removed.
   3. Engineer shall determine condition of equipment and materials prior to removal.

C. Remove and Storage of Structural Materials for Reuse:

1. See Drawings for framing and misc. fabrications to be stored during partial reconstruction of structure.
2. Size, location, materials, and connections of all framing and misc. fabrications to be temporarily removed and stored shall be documented prior to their removal. Elements shall be identified in a manner that facilitates proper reinstallation.
3. All fasteners and anchors shall be discarded and replaced with equivalent type, length, and diameter upon reinstallation.
4. Keep stored elements off ground and spaced by using pallets, dunnage, or other supports and spacers.
5. DO NOT store materials in a manner that might cause distortion, damage, or overload to elements. Repair or replace damaged materials as directed.

3.2 DEMOLITION

A. Drawings define minimum portion of equipment to be removed and structures to be modified. Unless otherwise specified, rough cuts or breaks may be made exceeding limits of demolition shown.

B. Provide all demolition, removal, temporary storage, and reinstallation of existing equipment as required for implementation of the work.

C. Remove all materials associated with existing equipment that is to be removed or relocated.

D. Cut off concealed or embedded conduit, boxes, or other materials a minimum of 3/4 in. below final finished surface.

3.3 DECOMMISSIONING OF VAPEX SYSTEM

A. Vapex to decommission and remove existing Vapex unit and provide to MAWSS. Vapex shall be responsible for replacement of unit if any component is destroyed or broken during decommissioning.

B. Contractor to demolish piping, appurtenances, and electrical equipment associated with Vapex system.

C. Contractor and Vapex to coordinate Vapex storage location with MAWSS prior to decommissioning Vapex system.

3.4 DISPOSAL

A. Dispose of debris and other non-salvaged materials offsite in licensed landfills.

3.5 SALVAGE

A. Equipment and materials NOT reused or reinstalled, including all metals and piping within the limits of demolition, unless otherwise specified, shall be removed by the Contractor.

END OF SECTION

DIVISION 3

CONCRETE

SECTION 03 01 00 – MAINTENANCE OF CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Repair and resurfacing of new and existing concrete surfaces in preparation for finish materials and final use.

B. Related Sections:
   1. Section 03 20 00 – Concrete Reinforcing
   2. Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

A. AASHTO:
   1. T277 – Standard Method of Test for Rapid Determination of the Chloride Permeability of Concrete.

B. ASTM International:
   1. A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   2. A185 – Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   3. A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   4. C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   5. C78 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
   6. C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
   7. C157 – Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
   8. C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   9. C348 – Standard Test Method for Flexural Strength of Hydraulic Cement Mortars.
   10. C469 – Standard Test Method for Static Modulus of Elasticity and Poisson’s Ratio of Concrete in Compression.
   11. C496 – Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
   12. C531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes.
   13. C596 – Standard Test Method for Drying Shrinkage of Mortar Containing Portland Cement.
   14. C666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
   15. C779 – Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
   16. C882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
   17. C928 – Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repair.
   18. C1012 – Standard Test Method for Length Change of Hydraulic Cement Mortars Exposed to a Sulfate Solution.
   19. C1202 – Standard Test Method for Electrical Induction of Concrete’s Ability to Resist Chloride Ion Penetration.

20. C1583 – Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).
21. D638 – Standard Test Method for Tensile Properties of Plastics.
22. D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
23. D4258 – Standard Practice for Surface Cleaning Concrete for Coating.
24. D4259 – Standard Practice for Abrading Concrete.
25. E699 – Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee.

C. NSF International:
1. 61 – Standard for Drinking Water System Components – Health Effects.

1.3 DEFINITIONS

A. Low Pressure Spray Mortar:
1. Mortar designated by “S” before the product number, applied by low pressure spraying, or in small areas by hand troweling.

B. Defective Area:
1. As defined in Section 03 30 00 – Cast-In-Place Concrete.

C. High-Pressure Water Blasting (sometimes referred to as water demolition):
1. Water projected under pressure and at high velocity which may or may NOT use an abrasive medium. Used for preparation of concrete surfaces including cleaning, removal of existing coatings and roughening.

D. New Concrete:
1. As defined in Section 03 30 00 – Cast-In-Place Concrete.

E. Rebound:
1. Shotcrete material that bounces off the surface against which shotcrete is being applied.

F. Shotcrete:
1. Mortar pumped through a hose and projected at a high velocity against a surface as a construction technique.

1.4 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Action Submittal:
1. Product data sheets for each material supplied.

C. Information Submittals:
1. Mortar System:
   a. Manufacturer’s installation instructions.
   b. Manufacturer’s recommended fabric size for mesh reinforcement.
2. Written description of equipment proposed for hydro-demolition surface preparation.
3. Certificates:
   a. Certificate of Compliance that proposed product systems meet or exceed the requirements of ASTM C928 and specified performance criteria when tested as specified in Article FIELD QUALITY REQUIREMENTS.
   b. Mortar system Manufacturer’s Certificate of Proper Installation.

c. Confirmation that mortar materials meet requirements of NSF 61, where applicable.

4. Statements of Qualification:
   a. Independent testing laboratory
   b. Mortar system Manufacturer's representative
   c. Repair mortar system applicator
5. Mortar system Manufacturer's proposed modified test procedures for ASTM C109 and ASTM C882 test methods.
6. Independent testing laboratory test report

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Independent Testing Laboratory: Based on evaluation of laboratory submitted criteria as specified in ASTM E699.
   2. Mortar System Applicator: For low pressure spray mortar system in lieu of endorsement, complete mortar system manufacturer's demonstration as specified in Article MANUFACTURER'S SERVICES. For Shotcrete Mortar, a trained and experienced applicator certified by the repair mortar manufacturer.

B. Pre-repair Conference:
   1. Required Attendees: Contractor, repair Subcontractor, repair material representative.
   2. Schedule and conduct prior to incorporation of repair products.
   3. Agenda:
      a. Review field conditions
      b. Confirm material selection
      c. Repair material representative shall review proposed preparation, application, finishing and curing of the materials.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver repair mortar in moisture-resistant packaging.

B. Handle as specified in manufacture's written instructions.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 LOW PRESSURE SPRAY MORTAR SYSTEM (FOR VERTICAL AND OVERHEAD REPAIRS)

A. Mortar:
   1. One component, rheoplastic, cement based, fiber reinforced, shrinkage compensated, gray in color, with a minimum 30-minute working time.
   2. Cured materials mixed to a flow of 70%, at five drops shall be as specified:
      a. Minimum Slant Shear Bond Strength: 3,000 psi in 28 days as specified in "modified" ASTM C882 test method.
      b. Minimum Compressive Strength: 11,000 psi at 28 days as specified in ASTM C109.
      c. Minimum Direct Shear Bond Strength: 650 psi in 28 days.
      d. Minimum Tensile Bond Strength (MBT In-House Test): 300 psi. in 28 days.
      e. Minimum Flexural Properties: 1,250 psi in 28 days as specified in ASTM C348.
      f. Modulus of Elasticity: 4.1 to 4.5 by 106 psi as specified in ASTM C469.

g. Maximum Permeability: 1,000 coulombs as specified in AASHTO T 277.
h. System shall NOT produce a vapor barrier.

B. Sprayable, extremely low permeability, sulfate resistant, easy to use, and requiring only the addition of water.

C. Free of chlorides and other chemicals causing corrosion.

D. Manufacturer and Product:
1. BASF Building Systems, MasterEmaco S 488CI
2. Sika Corp., Lyndhurst, NJ; SikaRepair 224

2.2 WATER

A. Clean and free from oil, acid, alkali, organic matter, or other deleterious substances, meeting federal drinking water standards.

2.3 REINFORCEMENT

A. As specified in Section 03 20 00 – Concrete Reinforcing.

2.4 ACCESSORIES

A. Finishing Aid Manufacturer and Product:
1. BASF Building Systems, MasterKure ER 50

B. Flexible Cementitious Rebar Coating Manufacturer and Product:
1. BASF Building Systems, MasterEmaco P 124
2. Sika Corp., Armatec 110 EpoCem.

PART 3 - EXECUTION

3.1 GENERAL

A. Where required because of deficiencies, concrete surface repair system shall be appropriate for the surface type and allowable schedule.

3.2 PREPARATION

A. Remove unsound and deteriorated concrete from Work by high pressure water blasting machines capable of scoring concrete surfaces to minimum amplitude roughness of 3/16 in. or as specified. Remove to provide for maximum thickness specified for mortar.

B. High pressure water blasting machines with 8,000 psi minimum.

C. Collect and dispose of water from removal operations in manner and location acceptable to Owner.

D. DO NOT use power-driven jackhammers and chipping hammers, unless water blasting is prohibited due to potential damage to installed equipment.

E. Remove concrete minimum of 1 in. clearance around rebar for application and bonding of new mortar to entire periphery of exposed rebar if these surface conditions exist:
1. 50% or more of periphery around rebar is exposed during removal of concrete.

2. 25% or more of periphery around rebar is exposed during removal of concrete and corrosion has eventuated to the extent that loss of section has occurred.
3. Bond between existing concrete and reinforcement has deteriorated.

F. Clean exposed reinforcing bars of rust and concrete, and coat with flexible cementitious rebar coating.

G. Maintain surface areas free of slurry where concrete has been removed. Remove slurry from prepared areas before new mortar is applied.

H. Square edges of repair area by sawing or chipping to avoid feathered edges.

I. Clean surface areas to be filled with new mortar of laitance and contamination by high pressure water blasting NOT more than 24 hours before applying bonding agent, Saturated Surface Dry (SSD) existing concrete at time of application of mortar.

3.3 LOW PRESSURE SPRAY MORTAR APPLICATION

A. Mix mortar in mortar-concrete mixer attached to pump-spray equipment for spray application. Mix with a slow speed drill and jiffler-type paddle or small mortar type mixer for hand trowel application.

B. Apply mortar by low pressure spraying with a machine such as Moynotype, MEYCO DEQUNA Model 20.

C. Finish mortar with a hand float application to smooth even surface matching adjacent concrete. Provide finishing aid at full strength.

D. Bonding Agent:
1. Hand apply bonding agent within 20 minutes of troweling on mortar. Prevent bonding agent from drying by reapplying bonding agent to maintain surface tackiness of coat.
2. Work mortar firmly and quickly into area and compact with firm trowel stroke. Finish smooth with finishing aid at full strength.

3.4 CURING

A. Water fog nozzle all of the mortar systems prior to curing as specified in mortar system Manufacturer’s instructions.

B. Commence water curing after mortar system application and when curing shall NOT cause erosion of mortar.

C. Continuously cure mortar system for a period of 7 days.

D. DO NOT membrane cure, unless method is part of mortar system Manufacturer’s instructions and approval has been obtained.

E. Cure intermediate layers of mortar as specified in manufacturer’s instructions.

3.5 FIELD QUALITY REQUIREMENTS

A. Independent testing laboratory shall perform:
1. Secure production samples of mixed materials during construction and test for compliance with the Specifications.
2. Obtain actual core samples from the completed repair Work and test, where required.

3. Perform “modified” ASTM C109 and ASTM C882 test methods as specified in manufacturer’s approved modifications of testing procedures.

B. Construction Testing:
   1. Production Samples:
      a. Obtain mixed mortar material from shotcrete or spray equipment and produce samples, and cure samples prior to testing.
      b. Provide minimum of three samples each test for each 1,000 ft^2 or portion thereof of mortar repair to be installed.
   2. Core Samples of In-Place Repair:
      a. Obtain two core samples and test samples for each 2,000 ft^2 or portion thereof for actual repair Work.
      b. Cores shall be either 2 1/2 in. or 3 in. in diameter and shall be cored through cured mortar repair and into base concrete to total depth equal to at least 2.5 times repair mortar thickness.
      c. Sawcut the cores after removal to trim base concrete thickness to same thickness as mortar so that bond line is at center of repaired sample.
      d. Samples shall be epoxy bonded to steel plates at each end using a bonding agent to prevent failure in bond to steel plates.
      e. Sustain bond line without failure or movement with a minimum of 300 psi in direct tension. The tension test shall use eyebolts or threaded connectors tapped and threaded into base plate so that tension load is concentric with center of core sample.

C. Repair and fill holes where core samples have been removed using same mortar used in repair.

D. If possible, use Direct Tension Bond Test per ASTM C1583 in place of core sampling.

3.6 MANUFACTURER’S SERVICES

A. Provide mortar system manufacturer’s representative at site for installation assistance, inspection and certification of proper installation, and training of mortar system applicators.

B. Mortar System Manufacturer’s Demonstration:
   1. Schedule a time for Manufacturer’s demonstration of repair system proposed for the Project. Prepare mortar, to specified consistency, for testing and placement. Initiate curing on portions of each type of surface to be repaired to include overhead and vertical applications.
   2. Prepare surface area in advance of demonstration and obtain manufacturer’s acceptance of preparation for each type of application.
   3. Demonstrate:
      a. Mixing and application equipment capabilities and procedures, including the flow of material from nozzle or sprayer.
      b. Nozzle operator and person in charge of low-pressure sprayer, capabilities, and ability to follow prescribed application procedures and properly operate equipment and apply surface repair materials.
   4. Make compression test samples during demonstration and deliver to an independent testing laboratory for testing at 1, 7, and 28 days. Take a core of the demonstration placement, or demonstrate Direct Bond Tensile test, and test for tensile bond at 1 day.

3.7 PROTECTION

A. Protect adjacent surfaces, and equipment, from being damaged by overshooting of low-pressure spray mortar.

3.8 CLEANING

A. Remove overshot mortar and deposited rebound materials as Work proceeds. Remove from Work, waste materials, unsound material from concrete surfaces, material chipped from walls, water used in preparation of application and finishing.

END OF SECTION

SECTION 03 10 00 – CONCRETE FORMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. The Work required for furnishing Concrete Forming.

B. Related Sections:
   1. Section 03 35 00 – Concrete Finishing

1.2 REFERENCES

A. ACI:
   1. 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
   2. 350 – Code Requirements for Environmental Engineering Concrete Structures
   3. 347 – Formwork for Concrete.

B. NSF International:
   1. 61 – Drinking Water System Components – Health Effects.

1.3 DESIGN REQUIREMENTS

A. Design formwork as specified in ACI 301, ACI 347, and ACI 350 to provide concrete finishes specified in Section 03 30 00 – Cast-In-Place Concrete.

B. When high range water reducer (superplasticizer) is used in concrete mix, forms shall be designed for full hydrostatic pressure per ACI 347.

C. Make joints in forms watertight.

D. Limit panel deflection to 1/360th of each component span to achieve tolerances specified.

1.4 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Action Submittals:
   1. Shop Drawings:
      a. Form Ties-Tapered Through-Bolts:
         1) Proposed method of sealing form tie hole
         2) Coordinate with details shown
      b. Manufacturer's Data for:
         1) Form-release agent
   2. Samples:
      a. Form ties

C. Information Submittals:
   1. Statement of qualification for formwork designer

1.5 QUALIFICATIONS

A. Formwork Designer:

1. Formwork, falsework, and shoring shall be designed and supervised by an Engineer with 5-years' experience designing similar temporary structures and licensed in the State of the project site.

1.6 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Wall Forms and Underside of Slabs:
   1. Materials: Plywood, hard plastic finished plywood, overlaid waterproof particle board, or steel in “new and undamaged” condition, of sufficient strength and surface smoothness to produce specified finish.
   2. Circular Structures:
      a. Conform forms to circular shape of structure.
      b. Straight panels may be substituted for circular forms provided panels DO NOT exceed 2 ft in horizontal width and angular deflection is no greater than 3 1/2 degrees per joint.

B. All Other Forms:
   1. Materials as specified for wall forms.

C. Form-Release Agent:
   1. Material: Release agent shall NOT bond with, stain, or adversely affect concrete surfaces, and shall NOT impair subsequent treatments of concrete surfaces when applied to forms or form liners. A “ready to use” water-based material formulated to reduce or eliminate surface imperfections, containing no mineral oil or organic solvents. Environmentally safe, meeting local, state, and federal regulations and can be used in potable water facilities. Certified as complying with NSF 61.
   2. Manufacturers and Products:
      a. Atlas Construction Supply; Bio-Guard
      b. Cresset Chemical Company; Crete-Lease 20-VOC
      c. Hill and Griffith; Grifcote LV-50 Plus

D. Rustication Grooves and Beveled Edge Corner Strips:
   1. Nonabsorbent material, compatible with form surface, fully sealed on all sides prohibiting loss of paste or water between the two surfaces.

E. Form Ties:
   1. Material: Steel
   2. Spreader Inserts:
      a. Conical or spherical type.
      b. Design to maintain positive contact with forming material.
      c. Furnish units that shall leave no metal closer than 1 in. to concrete surface when forms, inserts, and tie ends are removed.
   3. Wire ties NOT permitted.
   4. Flat bar ties for panel forms furnish plastic or rubber inserts with minimum 1 in. of depth and sufficient dimensions to permit patching of tie hole.
   5. Water Stop Ties: For water-holding structures, furnish one of the following:

a. Integral steel water stop 0.103 in. thick and 0.625 in. in diameter tightly and continuously welded to tie.
b. Neoprene water stop 3/16 in. thick and 15/16 in. diameter whose center hole is 1/2 the diameter of tie, or molded plastic water stop of comparable size.
c. Orient water stop perpendicular to tie and symmetrical about center of tie.
d. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.

6. Through-Bolts: Tapered minimum 1-inch diameter at smallest end.
7. Elastic Vinyl Plug:
   a. Design and size of plug to allow insertion with tool to enable plug to elongate and return to original length, and diameter upon removal forming watertight seal.
   b. Manufacturer and Product:
      1) Dayton/Richmond Co.
         Miamisburg, OH
         A58 Sure Plug
   c. Sika Corporation
      X-Plug
   d. Recess plug 1 in. minimum and grout over hole.

PART 3 - EXECUTION

3.1 FORM SURFACE PREPARATION

A. Thoroughly clean form surfaces that shall be in contact with concrete or that have been in contact with previously cast concrete, dirt, and other surface contaminants prior to coating surface.

B. Exposed Wood Forms in Contact with Concrete:
   1. Apply form-release agent as recommended by the manufacturer.

C. Steel Forms:
   1. Apply form-release agent to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust.

3.2 ERECTION

A. General:
   1. Unless specified otherwise, follow applicable recommendations of ACI347.

B. Beveled Edges (Chamfer):
   1. Form 3/4-inch bevels at concrete edges, unless otherwise shown.
   2. Where beveled edges on existing adjacent structures are other than 3/4 in., obtain Engineer’s approval of size prior to placement of beveled edge.

C. Wall Forms:
   1. DO NOT reuse forms with damaged surfaces.
   2. Locate form ties and joints in an uninterrupted uniform pattern.
   3. Inspect form surfaces prior to installation to assure conformance with specified tolerances.

D. Form Tolerances:
   1. Provide forms in accordance with ACI 117, 347 and 318.
   2. Wall Tolerances:
      a. Straight Vertical or Horizontal Wall Surface: Flat planes within tolerance specified.
         1) Plumb within 1/8 in. in 10 ft.

2) Depressions in Wall Surface: Maximum 1/8 in. when 10 ft straightedge is placed on high points in all directions.

3. Thickness: Maximum minus 1/4 in. or plus 1/2 in. from dimension shown.
4. Form Offset: Between adjacent pieces of form work, facing material shall NOT exceed 1/8 in. where exposed to public view and 1/4 in. maximum for all other conditions.

3.3 ADDITIONAL REQUIREMENTS

A. Construct forms tight enough to prevent loss of concrete mortar.

B. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses and the like for easy removal.
2. DO NOT use rust-stained steel form-facing material.
3. Use only form or form-tying methods which DO NOT cause spalling of the concrete upon form stripping or tie removal.

C. Elevated Structural Slabs and Beams:
1. DO NOT strip forms until concrete has reached 80% of the specified 28-day strength as determined by test cylinder breaks.

D. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

E. Provide temporary 12 in. wide by 18 in. high openings for cleanouts and inspection ports every 7 ft at the bottom of each lift form and where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations, where possible.

F. Chamfer exterior corners and edges of permanently exposed concrete.

G. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds and bulkheads required in the Work.
1. Determine sizes and locations from trades providing such items.
2. Openings shall be of sufficient size to permit final alignment of pipes or other items without deflection or offsets of any kind. Allow space for packing where items pass through the wall to ensure watertightness. Provide openings with continuous keyways and waterstops. Provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated in the typical structural details. Reinforcing shall be at least 2 in. clear from the opening surfaces and encased items.

H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

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

K. Embedded Items:

1. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts/rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
3. Check special castings, channels or other metal parts that are to be embedded in the concrete prior to and again after placing the concrete.

L. Removing and reusing forms:
1. DO NOT remove forms from concrete which has been placed with outside temperature below 50°F without first determining and verifying with Engineer if the concrete has properly set without regard for time. DO NOT apply loading on green concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.
2. Leave formwork for beam soffits, joists, structural slabs, beams, girders, and other structural elements that support weight of concrete in place until concrete has achieved 100 percent its 28-day design compressive strength.
3. Formwork for sides of beams, walls, columns, and similar parts of the Work that does NOT support weight of concrete may be removed after cumulatively curing at NOT less than 50°F (10°C) for 48 hours after placing concrete, if concrete is hard enough to NOT be damaged by form-removal operations and curing and protection operations are maintained.
4. Leave bracing for walls until the top slab concrete reaches 100% of its 28-day design compressive strength.
5. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
6. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material shall NOT be acceptable for exposed surfaces. Apply new form-release agent.
7. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. DO NOT use patched forms for exposed concrete surfaces.

M. Aluminum surfaces in contact with concrete:
1. Aluminum surfaces in contact with concrete or grout or dissimilar metals shall be protected with a Mylar isolator, bituminous paint or other material approved by Engineer.

N. Shores and reshores:
1. Comply with ACI 318 and ACI 301 for design, installation and removal of shoring and reshoring.
    a. DO NOT remove shoring or reshoring until measurement of slab tolerances is complete.
2. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

END OF SECTION

SECTION 03 15 00 – CONCRETE JOINTS AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Waterstops
   2. Joint Fillers

B. Related Sections:
   1. Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

A. ASTM International:
   1. A36 – Specification for Carbon Structural Steel.
   2. C920 – Specification for Elastomeric Joint Sealants.
   3. D570 – Standard Test Method for Water Absorption of Plastics.
   4. D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   5. D638 – Standard Test Method for Tensile Properties of Plastics.
   6. D2240 – Standard Test Method for Rubber Property – Durometer Hardness.

B. USACE (U.S. Army Corps of Engineers):
   1. CRD-C-572 – Specification for Polyvinyl Chloride Waterstop.

C. NSF International:
   1. 61 – Drinking Water Components – Health Effects.

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures, specifies requirements for submittals.

B. Product Data:
   1. Polyvinyl Chloride (PVC) Waterstop
   2. Dowels

C. Shop Drawings:
   1. Construction Joints: Layout and location for each type. Include joint locations as specified in Drawings, additional required joint locations, and any proposed alternate locations.

D. Samples:
   1. PVC waterstop prefabricated splice, joint and cross of each type used on the project.

E. Manufacturer’s Certificate:
   1. PVC Waterstop meets or exceeds the physical properties requirements of USACE CRD-C-572.

F. Manufacturer’s Instructions:
   1. For storage, handling, application/installation, and repair of:
      a. Waterstop

1.4 QUALITY ASSURANCE

A. Field-Welded Joints:
   1. PVC waterstop field-welded joints shall be free of misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the resistance to water pressure. Replace defective joints.

B. Inspections:
   1. Quality of welded joints shall be subject to acceptance by the Engineer.
   2. PVC Waterstop:
      a. Grounds For Rejection:
         1) Offset of joints greater than 1/16 in.
         2) Exterior crack at joint due to incomplete bond which is greater than 1/16 in.
         3) Any combination of offset and crack resulting in a net reduction of the cross-section greater than 1/16 in.
         4) Misalignment of joint which shall result in misalignment of the waterstop in excess of 1/2 in. in 10 ft.
         5) Porosity in the welded joint detectable through visual inspection
         6) Bubbles or inadequate bonding

1.5 MOCKUPS

A. Welding Demonstration
   1. Demonstrate ability to weld acceptable joints in PVC waterstops before installing waterstops in forms.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials under cover to protect from oil, dirt, and sunlight as required by the Manufacturer.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) WATERSTOP

A. Manufactured from prime virgin PVC. Compound shall have no scrap or reclaimed material.

B. Properties as specified:

Physical Characteristics	Test Method	Required Results
Specific Gravity	ASTM D792	NOT less than 1.3.
Hardness	ASTM D2240	70 to 90 Type A15 Shore durometer.
Tensile Strength	ASTM D638	NOT less than 2,000 psi.
Ultimate Elongation	ASTM D638	NOT less than 300%.
Alkali Extraction	CRD-C-572	7-day weight change between (-0.1)% – 0.25%. Hardness change within 5 points.
Low Temperature Brittle Point	ASTM D746	No sign of cracking or chipping at (-35)°F minimum.
Water Absorption	ASTM D570	NOT more than 0.15% after 24 hours.
Accelerated Extraction Tensile	CRD-C-572	NOT less than 1,600 psi.
Stiffness in Flexure	ASTM D747	NOT less than 600 psi.

Tear Resistance	ASTM D624	NOT less than 225 psi.
Thickness	–	3/8 in.

C. Performance requirements per COE Specification CRD-C-572.

D. Waterstop Types (Unless Otherwise Specified in Drawings):
   1. Construction Joints:
      a. 6 in. wide flat ribbed
   2. Manufacturers (Flat Ribbed):
      a. Vinylex; R638
      b. Sika Greenstreak; 679
      c. Or equal.
   3. Manufacturers (Centerbulb):
      a. Vinylex; RB638H
      b. Sika Greenstreak; 732
      c. Or equal.
   4. Expansion and Contraction Joints:
      a. 9 in. wide centerbulb
   5. Manufacturers:
      a. Vinylex; RB938H
      b. Sika Greenstreak; 735
      c. Or equal.

2.2 HYDROPHILIC WATERSTOP

A. For use only where new concrete is placed against existing concrete and indicated on Drawings.

B. Non-bentonite hydrophilic rubber compound.

C. Manufacturers:
   1. Adeka Ultra Seal; MC-2010M with 3M-2141 adhesive and P-201 sealant
   2. Sika Greenstreak; Hydrotite CJ-1020-2K with Leakmaster LV-1 adhesive and sealant
   3. Or equal.

2.3 RETROFIT PVC WATERSTOP

A. For use where new concrete is placed against existing concrete, unless noted otherwise on Drawings.

B. Material – see PVC waterstop.

C. Stainless Steel Batten Bar – AISI Type 304.

D. Manufacturers:
   1. Vinylex; RET638
   2. Sika Greenstreak; 609
   3. Or equal.

2.4 BOND BREAKER

A. Tape for Joints:
   1. Adhesive-backed glazed butyl or polyethylene tape.

B. Use bond breaker as specified in Section 03 30 00 – Cast-In-Place Concrete, except where bond breaking tape is specifically called out on drawings.

2.5 PREMOLDED JOINT FILLER

A. Sponge Rubber:
   1. Neoprene, closed cell, ASTM D1056 Type 2C5
   2. Manufacturer:
      a. Monmouth Rubber and Plastics
         Durafoam DK5151
      b. Or Equal.

2.6 POURABLE JOINT FILLERS

A. Meet requirements of NSF 61 for potable water containment structures.

B. Self-leveling or non-sag for use in level, sloping, or vertical joints.

C. Manufacturer:
   1. Sika Corp.
      Sikaflex-2c SL
   2. Or Equal.

2.7 PREFORMED CONTROL JOINTS

A. One-Piece, flexible PVC.

B. Manufacturer:
   1. WR Meadows
   2. Keyway
   3. Or Approved Equal.

2.8 JOINT SEALANT

A. One-part polyurethane, moisture curing, ASTM C920, Type S, Grade NS or P, Class 25, capable of being continuously immersed in water.

B. Manufacturer:
   1. Sika Corp.
      Sikaflex-1a
   2. Or Equal.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Construction Joints:
   1. Remove laitance from reinforcement and dowels
   2. Roughen surface to min 1/4 in. amplitude
   3. Protect waterstop, if present

3.2 INSTALLATION OF WATERSTOPS

A. General:

1. Waterstop shall be installed in all wall and slab joints of hydraulic structures and below grade structures, unless noted otherwise.
2. Join waterstop at intersections to provide a continuous seal.
3. The center axis of the waterstop shall be placed at the joint. The waterstop shall be placed in the center of the wall or slab to be sealed, unless noted otherwise on the drawings.
4. Secure waterstop in position using tie wire to reinforcement at a maximum spacing of 24 in. DO NOT displace waterstop during concrete placement.
5. Repair or replace damaged waterstop.
6. Slabs with horizontal waterstop: limit concrete placement to elevation of waterstop in first pass, ensure space beneath waterstop completely fills with concrete, vibrate under waterstop, then place remaining concrete to full height of slab.
7. If any waterstop, once installed on one side of a joint, is exposed to the atmosphere for more than 2 days, suitable precautions shall be taken to protect the exposed waterstop from direct sunlight until embedded in concrete.

B. PVC Waterstops:
1. Install per manufacturer's written instructions.
2. Splice using Teflon-coated thermostatically controlled heating iron at approximately 380°F.
    a. Use only factory-made waterstop fabrications for all intersections, changes of direction and transitions.
    b. Field splice permitted only for straight butt welds.
    c. The continuity of the waterstop ribs and center bulb shall be maintained.
    d. Allow at least 10 minutes before the new splice is strained in any way.
    e. Finished splices shall provide a cross-section that is dense and free of porosity with a tensile strength that is NOT less than 80% of the original materials.

C. Hydrophilic Waterstop:
1. Install as specified in manufacturer's written instructions.
2. Provide a minimum of 2 1/2 in. of concrete cover over waterstop.
3. Lap ends of waterstop strip together at splices and corners and join with sealant.
4. DO NOT allow the vibrator to contact the waterstop.
5. Lap hydrophilic waterstop a minimum of 2 ft with intersecting plastic waterstop.

D. Retrofit PVC Waterstop:
1. Install per manufacturer's written instructions.
2. Apply a bed of epoxy slightly wider than the waterstop base to the concrete surface.
3. Before the epoxy cures, place the waterstop, securing with stainless steel batten bars and stainless steel post-installed anchors. Make sure to eliminate any air pockets or voids between the waterstop and the existing concrete.
4. Butt splice as with PVC waterstop prior to attaching to concrete.

E. Pre-Molded Joint Filler:
1. Install per manufacturer's written instructions.
2. Sufficient in width to completely fill joint space.
3. Where waterstop is present, cut to butt tightly against waterstop and concrete face.

F. Pourable Joint Filler:
1. Install per manufacturer's written instructions and:
    a. Apply primer prior to pouring joint filler.
    b. Fill entire joint above waterstop.
    c. Use masking tape at top of slab at each side of the joint; move tape, and clean spillage.
    d. Sealant products used as fillers need NOT meet sealant geometry parameters.

G. Preformed Control Joints:
   1. Use only as specified in Drawings. DO NOT use in water-holding basins.
   2. Install per manufacturer's written instructions.

END OF SECTION

SECTION 03 20 00 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Reinforcing steel and related items required for cast-in-place concrete.

B. Related Sections:
   1. Section 03 10 00 – Concrete Forming
   2. Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

A. ACI (American Concrete Institute):
   1. SP-66 – Detailing Manual.
   2. 318 – Building Code Requirements for Structural Concrete.
   3. 350 – Code Requirements for Environmental Engineering Concrete Structures.

B. ASTM International:
   1. A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   2. A1064 – Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

C. CRSI (Concrete Reinforcing Steel Institute):
   1. Manual of Standard Practice.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings:
   1. Shop drawings shall be prepared for all reinforcement required by the project. Shop drawings shall be logically and legibly prepared to permit reasonable ease of sorting, selecting, placing reinforcement as well as checking drawings. Preparer and fabricator shall be identified on the drawings.
   2. Reinforcement shall NOT be fabricated until the shop drawings have been processed, approved, and returned.
   3. Check all shop drawings to verify reinforcement dimensions required by drawings are satisfied.
   4. Provide bar sizes, bar lengths, bar material, bar grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and lap lengths, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Reinforcement:
   1. Review of reinforcement shop drawings by the Engineer shall be limited to general compliance with the Contract Documents.
   2. Submit reinforcement shop drawings in a complete package for each specific structure. Partial submittals shall be rejected.

D. Changes to Reinforcing Steel Contract Drawing Requirements:
   1. Specify in separate letter submitted with shop drawings any changes of requirements specified in Drawings for reinforcing steel.

2. Such changes shall NOT be acceptable unless the Engineer has accepted such changes in writing.

1.4 SUPERVISION

A. Workmanship:
1. Always provide qualified supervision reinforcing work is in progress. Workmen shall be experienced iron workers with 5 years experience in completion of similar work.

B. Codes:
1. Reinforcement placement and detailing shall comply with practice specified in the ACI SP-66 – Detailing Manual – latest edition of the American Concrete Institute or its latest revision, unless otherwise specified in this section.

1.5 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 CONCRETE REINFORCEMENT

A. General:
1. All reinforcement shall be free from rust, loose mill scale, and other contaminants.

B. All bars shall be billet steel bars for concrete reinforcement ASTM A615 Grade 60.

C. Steel Wire bar supports located between reinforcing bars and face of concrete:
1. Material:
a. CRSI Class 1 plastic protected steel bar support or steel bar support with plastic tips.
b. CRSI Class 2 Type 304 or 316 stainless steel bar support.
2. Use plastic protected bar support or plastic steel bar support with plastic tip where reinforcing steel is to be supported on forms for a concrete surface that will be exposed to weather, high humidity, or liquid. Use stainless steel bar supports in walls, beams, and elevated slabs. Use stainless steel supports or plastic tipped steel bar supports in all other locations unless otherwise noted on drawings or specified herein.

D. Concrete Bar Supports Located Between Reinforcing Bars and Face of Concrete:
1. Manufactured expressly for supporting reinforcing bars.
2. Manufactured with two annealed steel wires to securely tie concrete bar support to reinforcing steel.
3. Manufactured with minimum f'_c = 5,000 psi concrete.
4. Concrete bar support shall only be used to support reinforcing for concrete placed on ground.

2.2 WWR (WELDED WIRE REINFORCEMENT):

A. See ASTM A185 (withdrawn in 2013, replaced by A1064), 75 ksi minimum tensile strength.

B. WWR may NOT be used in place of reinforcing bars unless accepted in writing by the Engineer.

C. Provide WWR in flat sheet form.

D. If WWR is used, provide WWR having cross-sectional area per linear foot of NOT less than cross-sectional area per linear foot of reinforcing bars specified in Drawings.

2.3 ACCESSORIES

A. General:
1. Accessories shall be subject to Engineer's approval.
2. Tie wire – 18 GA annealed steel wire.
3. Number of chairs shall be adequate to prevent sag during steel and concrete placement.
4. Wall layer spacers shall be 1/4 in. round "Z" bar.
5. Horizontal layer spacers shall be wire bar supports or reinforcing bars bent to support top layer.
6. Dowel bar splicer:
   a. Dowel bar splicer shall be Richmond or approved equal, manufactured from standard specified rebar material, with NC threads and shop fabricated to specified dowel configurations.
7. Mechanical Connectors:
   a. Approved Manufacturers: Dayton Superior, Erico, or approved equal.
   b. The mechanical connection shall meet the code requirements of developing in tension and compression as required by the referenced codes. Install per the manufacturer’s approved procedures.

PART 3 - EXECUTION

3.1 GENERAL

A. Reinforcing bars and welded wire fabric reinforcement:
1. Verify that reinforcement is new stock free from rust scale, loose mill scale, excessive rust, dirt, oil, and other coatings which adversely affect bonding capacity when placed in the work.

B. Other trades:
1. Coordinate all work of other trades to avoid conflict with reinforcement.

C. Shop Drawings:
1. Check all shop drawings to verify dimensions required.

3.2 FABRICATING

A. General:
1. Fabricate steel reinforcement as specified in CRSI's "Manual of Standard Practice."
2. Reinforcement shall be shop fabricated except where straight bars No. 5 or smaller are required.

B. Bending:
1. All bending shall be by using bending jigs and mandrels. All bars shall be bent cold.

C. Cutting:
1. Bars shall be cut by cold shearing. Torch cutting in the field may be permitted in special situations.

3.3 PREPARATION

A. Surface Preparation:

1. Reinforcing bars: thin coating of red rust resulting from short exposure shall NOT be considered objectionable. Thoroughly clean any bars having rust scale, loose mill scale, or thick rust coat.
2. Cleaning of reinforcement materials: Remove concrete or other deleterious coatings from dowels and other projecting bars by wire brushing or sandblasting before bars are embedded in subsequent concrete placement.

3.4 PLACING

A. General:
1. Accurately place all bars to meet tolerances as outlined in ACI 318 and tie in place before placing concrete, include dowels. Tie with 18 GA steel wire.
2. Corner bars required for horizontal reinforcing. Unless otherwise noted on plans corner bars shall be same size and spacing as horizontal bar.
3. No field bending of bars shall be allowed.

B. Clearance:
1. Preserve clearance between bars of 1 in. minimum, NOT less than one bar diameter or 1 1/3 times large aggregate, whichever is larger.
2. Provide concrete coverage over reinforcing steel unless otherwise specified on Drawings:
   a. 3 in. above subgrade in bottom of slabs.
   b. 2 in. from all other faces of concrete.
3. Lap all reinforcing bars as required by ACI 318-latest edition for Class B splices for laps shown in Drawings and where otherwise required by ACI.
4. Stagger splices except where otherwise specified.
5. Welded splices are NOT permitted.
6. Lap welded wire reinforcement a minimum of two spaces.

C. Dowels:
1. All dowels shall be placed and securely anchored before placing concrete.

D. Supports:
1. Provide enough to prevent sagging, to prevent shifting, and to support loads during construction; but in no case less than quantities and at locations as specified in ACI 315 (SP-66).
2. DO NOT use brick, broken concrete masonry units, spalls, rocks, wood, or similar materials for supporting reinforcing steel.
3. DO NOT use reinforcing bars that have less cover than required by the Contract Documents.
4. DO NOT adjust location of reinforcement required by the Contract Documents to provide cover to these bars.
5. Wire chairs shall NOT be accepted to hold reinforcing clearance on walls.

E. Tying of bar reinforcement:
1. Fasten bars securely in place with wire ties.
2. Tie bars sufficiently often to prevent shifting.
3. Provide at least 3 ties in each bar length.
4. DO NOT apply to dowel lap splices or to bars shorter than 4 ft, unless necessary for rigidity.
5. Tie slab bars at every intersection around periphery of slab.
6. Tie wall bars and slab bar intersections other than around periphery at NOT less than every fourth intersection, but at NOT greater than following maximum spacings:

Bar Size	Slab Bar Spacing (in.)	Wall Bar Spacing (in.)
Bars Number 5 and Smaller	60	48
Bars Number 6 – Number 9	96	60
Bars Number 10 – Number 11	120	96

7. After tying wire ties, bend ends of wire ties in towards the center of the concrete section.
    a. The cover for wire ties shall be the same as the cover requirements for reinforcing bars.

F. Openings and Obstructions:
1. Place additional reinforcing around openings as shown on the drawings and standard details.
2. Bend reinforcing around obstructions. Place extra reinforcing where cutting is authorized. Engineer's approval required before cutting steel.
3. Consult Engineer on special situations.

G. Welded Wire Reinforcement:
1. Install necessary wiring, spacing chairs, or supports to keep welded wire fabric in place while concrete is being placed.
2. Bend fabric as specified in Drawings or required to fit work.
3. Unroll or otherwise straighten fabric to make flat sheet before placing in the Work.
4. Lap splice welded wire fabric as specified in Drawings.
5. If lap splice length is NOT specified in Drawings, splice fabric as specified in ACI 318 and ACI 350.

H. Certification:
1. Certify material and type of deformation.

I. Condition:
1. All reinforcement shall be free from loose rust, dirt coating, oil, paint, or any foreign substance.

END OF SECTION

SECTION 03 30 00 – CAST–IN–PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Hydraulic (liquid containing) structures
   2. Beams and Columns
   3. Pier caps and suspended slabs
   4. Slabs on grade
   5. Equipment pads
   6. Drilled piers

B. Related Sections:
   1. Section 03 01 00 – Maintenance of Concrete
   2. Section 03 15 00 – Concrete Joints and Accessories
   3. Section 03 35 00 – Concrete Finishing
   4. Section 03 39 00 – Concrete Curing
   5. Section 03 64 00 – Concrete Repair Crack Injection

1.2 REFERENCES

A. ACI (American Concrete Institute):
   1. ACI 117 – Specification for Tolerances for Concrete Construction and Materials.
   2. ACI 301 – Specifications for Structural Concrete.
   3. ACI 305R – Guide to Hot Weather Concreting.
   4. ACI 306.1 – Standard Specification for Cold Weather Concreting.
   5. ACI 308.1 – Specification for Curing Concrete.
   6. ACI 318 – Building Code Requirements for Structural Concrete.
   7. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures.
   8. ACI 350.1 – Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures.
      a. Manual of Concrete Practice.

B. ASTM International:
   1. C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
   2. C33 – Standard Specification for Concrete Aggregates.
   3. C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   4. C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   5. C94 – Standard Specification for Ready-Mixed Concrete.
   6. C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete.
   7. C150 – Standard Specification for Portland Cement.
   8. C172 – Standard Practice for Sampling Freshly Mixed Concrete.
   9. C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
   10. C227 – Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
   11. C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
   12. C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
   13. C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   14. C330 – Standard Specification for Lightweight Aggregates for Structural Concrete.

15. C494 – Standard Specification for Chemical Admixtures for Concrete.
16. C595 – Standard Specification for Blended Hydraulic Cements.
17. C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
18. C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
19. C989 – Standard Specification for Slag Cement for Use in Concrete and Mortars.
20. C1012 – Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution.
21. C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
22. C1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
23. C1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
24. C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
25. C1116 – Standard Specification for Fiber-Reinforced Concrete.
26. C1218 – Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
27. C1240 – Standard Specification for Silica Fume Used in Cementitious Mixtures.
28. C1260 – Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
29. C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
30. D994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
31. D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-Extruding and Resilient Bituminous Types).
32. D1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
33. E96 – Standard Test Methods for Water Vapor Transmission of Materials.
34. E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
35. E1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
36. E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
37. E1745 – Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

1.3 DEFINITIONS

A. Cementitious Materials:
   1. Portland cement alone or in combination with one or more of:
      a. Blended hydraulic cement
      b. Fly ash and other pozzolans
      c. Ground granulated blast-furnace slag
      d. Silica fume
   2. Subject to requirements.

B. Cold Weather:
   1. Ambient temperature below 40°F or approaching 40°F and falling.

C. Defective Area:
   1. Surface defects, Including:
      a. Honeycomb
      b. Rock pockets

c. Indentations
d. Surface voids greater than 3/16 in. deep

2. Surface voids greater than 3/4 in. diameter
3. Cracks in liquid containment structures and below-grade habitable spaces that are 0.010 in. wide and wider.
4. Cracks in other structures that are 0.015 in. wide and wider.
5. Spalls, chips, embedded debris, lift lines, sand lines, deviations that exceed specified tolerances and include, but are NOT limited to, fins, form popouts, and other projections, stains, and other color variations that can NOT be removed by cleaning.

D. Exposed Concrete:
1. Concrete surfaces that can be seen inside or outside of structure regardless of whether concrete is above water, dry at all times, or can be seen when the structure is drained.

E. Hot Weather:
1. As defined in ACI 305R.

F. Hydraulic Structure:
1. Liquid containment structure

G. New Concrete:
1. Less than 60 days old.

1.4 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
1. Submit data for each type of product indicated.

C. Design Data:
1. Submit concrete mix design for each mix included in the Supplement at the end of this Section.
a. Proportions of all materials in the mix, signed by the mix designer
b. Average strength per ACI 301
c. Manufacturer’s Certificate of Compliance as specified in Section 01 60 00 – Product Requirements.
d. Cementitious materials
e. Admixtures
f. Test Reports – chemical analysis, chloride-ion content, shrinkage test results
g. Coarse and fine aggregate gradations
h. Water to be withheld for later addition at Project site.
2. Detailed plan for placing and curing concrete in cold weather.
3. Detailed plan for placing and curing concrete in hot weather.
a. Thermal control plan for concrete sections greater than 2 ft, 6 in.
b. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
c. Manufacturer Instructions: Submit installation procedures and interfacing required with adjacent Work.
d. Field Quality requirements Submittals: Indicate results of Contractor-furnished tests and inspections, including tightness test results and floor surface flatness and levelness measurements.

D. Ready-Mix Concrete Delivery Tickets
a. Record the amount of water added at the Project site on the delivery ticket.

b. Location of placement shall be noted on the ticket.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 – Closeout Procedures specifies requirements for closeout submittals.

B. Project Record Documents:
1. Record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY ASSURANCE

A. Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.

B. Perform Work as specified in ACI 301 and ACI 117.

C. See ACI 305R when placing concrete during hot weather.

D. See ACI 306.1 when placing concrete during cold weather.

E. Obtain each type or class of cementitious material from a single source, obtain aggregate from a single source and obtain admixtures from a single supplier for the Project. If any of these sources need to, by necessity, change, notify the Engineer.

F. Installer Qualifications:
1. At least one project personnel qualified as an ACI-certified Flatwork Technician and Finisher and at least one supervisor who is an ACI-certified Concrete Flatwork Technician. If an ACI-certified Technician is NOT available, submit flatwork installer qualifications to the Engineer.

G. Manufacturer Qualifications:
1. A firm with a minimum of 5 years of experience in manufacturing ready-mix concrete products that complies with ASTM C94 requirements for production facilities and equipment.
2. Manufacturer certified as specified in NRMCA – “Certification of Ready-Mixed Concrete Production Facilities” or equivalent program.
3. Mix Designer: Certified as NRMCA Concrete Technologist Level 2 or Licensed Engineer. If neither, the Mix Designer’s qualifications shall be submitted to the Engineer.

H. Testing Agency Qualifications:
1. An independent agency, acceptable to the Authority Having Jurisdiction, qualified as specified in ASTM C1077 and ASTM E329 for the testing indicated.
2. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, as specified in ACI CP-1 or an equivalent certification program.
3. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician – Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician – Grade II.

I. Concrete Preinstallation Conference:
1. Schedule and conduct at Project site prior to submitting mix designs.
2. Required meeting attendees:
a. Contractor’s superintendent
b. Structural Engineer in responsible charge or designee

c. Independent testing agency
d. Ready-mix producer
e. Concrete Subcontractor
f. Admixture representative.

3. Agenda shall include:
   a. Concrete testing and special inspection
   b. Mix designs and admixtures
   c. Formwork and formwork removal
   d. Reinforcement
   e. Placement methods
   f. Concrete finishing
   g. Curing procedures
   h. Hot and cold weather placement protections
   i. Joints
   j. Placement of anchors and miscellaneous embeds
   k. Tolerances including floor and slab flatness and levelness
   l. Concrete repair procedures.

1.7 AMBIENT CONDITIONS

A. Section 01 50 00 – Temporary Facilities and Controls, specifies requirements for ambient condition control facilities for product storage and installation.

B. Maintain concrete temperature after installation at minimum 50°F for minimum 7 days.

1.8 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete:
   1. Cement:
      a. Comply with ASTM C150, for cement type, see Supplement at End of Section.
      b. Type: Portland
   2. Blended Cement:
      a. Comply with ASTM C595
      b. For sulfate resistance options, see Supplement at End of Section
      c. Color: Gray
   3. Normal Weight Aggregates:
      a. Comply with ASTM C33
      b. Coarse Aggregate Maximum Size: 1 in. nominal
      c. Coarse Aggregate – NOT more than 15% by weight of thin or elongated pieces having a length of five times the average thickness.
      d. Fine Aggregate – consisting of clean natural sand or of sand prepared from crushed stone or crushed gravel
   4. Water:
      a. Comply with ACI 318
      b. Potable, without deleterious amounts of chloride ions

B. Admixtures:
   1. Manufacturers:
      a. BASF Admixtures, Inc, Shakopee, MN

b. Euclid Chemical Co., Cleveland, OH
c. W.R. Grace & Co., Cambridge, MA
d. Substitutions: As specified in Section 01 60 00 – Product Requirements.

2. Air Entrainment: Comply with ASTM C260.
3. Chemical:
   a. Comply with ASTM C494.
   b. Type A – Water-Reducing.Type B – Retarding
   d. Type C – Accelerating
   e. Type D – Water-Reducing and Retarding
   f. Type E – Water-Reducing and Accelerating
   g. Type F – Water-Reducing, High Range
   h. Type G – Water-Reducing, High Range, and Retarding
4. Fly Ash: Comply with ASTM C618, Class F.
5. Silica Fume: Comply with ASTM C1240.
6. Slag:
   a. Description: Ground-granulated blast-furnace slag
   b. Comply with ASTM C989.
   c. Grade 100 or 120
7. Plasticizing:
   a. Comply with ASTM C1017.
   b. Type I or Type II
8. Shrinkage Reducing Admixture:
   a. BASF; Tetraguard AS20
   b. Euclid; Eucon SRA Series
   c. W.R. Grace; Eclipse Series

2.2 CONCRETE MIX

A. See Supplement at the End of this Section for design requirements for each concrete mix.

B. Select proportions for concrete as specified in ACI 318.

C. Use water-reducing admixture in concrete that is part of a Hydraulic Structure or with a water-cementitious ratio below 0.50.

D. Where fly ash is used, it shall be limited to 25% of total cementitious materials, unless approved in writing by the Engineer.

E. Limit water-soluble chloride-ion content in hardened concrete to 0.15% by weight of cement for nonhydraulic structures and 0.10% for hydraulic structures.

F. Fine aggregate shall be in the range of 36–40 % of total aggregate weight.

G. Concrete Shrinkage Limits:
   1. See Subsection 3.5.J.

H. Target Slump:
   1. Without high-range water reducers – 4 in.
      a. With high-range water reducers – 2 in. prior to the addition of the admixture, 8 in. maximum at point of delivery, unless otherwise permitted.
      b. Target slump for drilled pier – 6 in.–8 in.

I. Admixtures:
   1. Include admixture types and quantities indicated in concrete mix designs only if approved by Architect/Engineer.

2. Cold Weather:
    a. Use accelerating admixtures in cold weather.
    b. Use of admixtures shall NOT relax cold weather placement requirements.
3. Hot Weather: Use set-retarding admixtures.
4. DO NOT use calcium chloride or admixtures containing calcium chloride.
    a. Add air entrainment admixture to concrete mix for Work exposed to freezing and thawing.
    b. Average Compressive Strength Reduction: NOT permitted

J. Ready-Mixed Concrete:
1. Mix and deliver concrete as specified in ASTM C94 and deliver batch ticket information.
2. When air temperature is between 85°F–90°F, reduce mixing and delivery time from 90 minutes to 75 minutes; when air temperature is above 90°F, reduce mixing and delivery time to 60 minutes.
    a. Contractor may coordinate with the concrete producer and admixture manufacturer to demonstrate the efficacy of using a retarding admixture to extend placement times during hot weather.

K. Site-Mixed Concrete:
1. Mix concrete as specified in ACI 318.

2.3 ACCESSORIES

A. Bonding Agent:
1. Manufacturers:
    a. BASF Building Systems Inc.
    b. Euclid Chemical Co.
    c. Prime Resins
    d. Sika Chemical Corp.
2. Substitutions: As specified in Section 01 60 00 – Product Requirements.
3. Furnish materials as specified in ASTM C881, Type V standards.
4. Description: Two-component moisture insensitive, 100% solids epoxy resin.

B. Bond Breaker:
1. Manufacturers:
    a. Dayton Superior: EDOCO Clean Lift Bond Breaker
2. Substitutions: As specified in Section 01 60 00 – Product Requirements.
3. Description: Nonstaining, providing positive bond prevention.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 77 00 – Closeout Procedures, specifies requirements for installation examination.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and shall NOT interfere with placing concrete.

3.2 PREPARATION

A. Section 01 77 00 – Closeout Procedures specifies requirements for installation preparation.

B. Previously Placed Concrete:

1. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
    a. Remove laitance, coatings, and unsound materials.
    b. Doweled Joints: Install dowel bars and support assemblies at joints as indicated on drawings.
    c. Remove debris and ice from formwork, reinforcement, and concrete substrates.

C. Remove water from areas receiving concrete before concrete is placed.

3.3 INSTALLATION

A. Placing Concrete:
1. Place concrete as specified in ACI 301.
2. Notify testing laboratory Engineer minimum 24 hrs. prior to commencement of operations.
3. Make sure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and waterstop are NOT disturbed during concrete placement.
4. Deposit concrete at final position, preventing segregation of mix. Limit vertical free fall to 5 ft.
5. Place concrete in continuous operation for each panel or section as determined by predetermined expansion, control and construction joints.
    a. Place in horizontal layers NOT to exceed 2.0 ft in depth, except for slabs which shall be placed full depth.
    b. DO NOT exceed formwork design pressures.
6. DO NOT use aluminum conveying devices.
7. Retempering of concrete is NOT permitted where cement has partially hydrated.
8. Pumping of Concrete:
    a. Provide standby pump, conveyor system or other system onsite during pumping to ensure completion of concrete placement without cold joints in case of equipment failure.
9. Consolidate concrete using mechanical vibrating equipment per ACI 301
    a. DO NOT use vibrators to transport concrete within formwork. Insert and withdraw vibrators vertically at uniform spacing to quickly penetrate placed layer and at least 6 in. into preceding layer. DO NOT insert vibrators into lower layers that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement, waterstop and other items without causing segregation.
    b. Slabs with horizontal waterstop: limit concrete placement to elevation of waterstop in first pass, ensure space beneath waterstop completely fills with concrete, vibrate under waterstop, then place remaining concrete to full height of slab.
    c. Maintain at least one standby vibrator prior to placing concrete.
10. Maintain records of concrete placement, including date, location, quantity, air temperature, and test samples taken.
11. Maximum Size of Concrete Placements:
    a. Locate expansion, control and contraction joints where shown on drawings.
    b. Locate construction joints where shown on drawings or where approved in joint location submittal per Section 03 15 00 – Concrete Joints and Accessories.
    c. Provide vertical construction joints in walls and slabs at maximum spacing of 40 feet, unless shown or approved otherwise.
    d. Place joints to avoid penetrations.
12. DO NOT interrupt successive placement and DO NOT permit cold joints to occur.
13. Minimum Time Between Adjacent Placements:
    a. Construction or Control Joints: 7 days unless otherwise specified.
    b. Construction joint between top of footing or slab and column or wall: NOT less than 24 hrs.
    c. Expansion or Contraction Joints: NOT less than 24 hrs.
14. Hot Weather Placement:

a. Comply with ACI 305.1.
b. Maintain concrete temperature below 95°F at time of placement. If chilled water or ice are used to maintain concrete temperature, that water equivalent shall be included in the total water used to calculate the water-cement ratio.
c. Fog-spray forms, reinforcement, and subgrade just before placing concrete, without creating standing water or dry areas.

15. Cold Weather Placement:
a. Comply with ACI 306.1.
b. DO NOT place concrete on frozen subgrade or subgrade containing frozen materials. Top 12 in. of subgrade shall be thawed prior to concrete placement.
c. DO NOT place concrete in contact with reinforcement or embedment with surfaces less than 35°F.
d. Provide supplemental heat when other means of thermal protection are insufficient. Vent carbon-based fuel heaters away from concrete surface to avoid concrete carbonation.
e. Provide temperature sensors placed on the concrete surfaces throughout the work. Record surface temperature at least once every 12 hrs.
f. Protect concrete from freezing until the end of the curing period.

16. Screeding:
a. Screed floors and slabs to elevations and slopes shown on drawings.
b. Surface Flatness: FF 20 (conventional slab).

B. Concrete Finishing:
a. Per Section 03 35 00 – Concrete Finishing.

C. Curing and Protection:
1. Per Section 03 39 00 – Concrete Curing.

3.4 BACKFILL AGAINST STRUCTURES

A. Unless otherwise permitted, backfill evenly around structure to prevent differential horizontal pressures.

3.5 FIELD QUALITY REQUIREMENTS

A. Section 01 40 00 – Quality Requirements, specifies requirements for inspecting and testing.

B. Inspection and Testing:
1. Performed by testing laboratory as specified in ACI 318.

C. Provide unrestricted access to Work and cooperate with appointed testing and inspection firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

E. Concrete Inspections:
1. Continuous Placement Inspection: Inspect for proper installation procedures.
2. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.
a. Samples for testing air content in pumped concrete shall be taken at point of placement and point of delivery to establish a correlation to estimate air content at point of placement. All other samples shall be taken at point of delivery.
b. Provide adequate facilities for safe storage and proper curing of concrete test specimens onsite for the first 24 hrs.

F. Strength Test Samples:

1. Sampling Procedures: Comply with ASTM C172.
2. Cylinder Molding and Curing Procedures:Comply with ASTM C31
    a. Cylinder Specimens: Standard cured.
3. Sample concrete and make one set of four 4 in. diameter test cylinders for every 50 yd^3 or less of each class of concrete placed each day, and for every 5,000 ft^2 of surface area for slabs and walls.
    a. Additional cylinders may be requested to demonstrate strength requirements pertaining to early form removal and backfill.
4. If volume of concrete for a class of concrete would provide less than five sets of cylinders, take samples from five random batches, or from every batch if less than five batches are used.
    a. Make one additional cylinder during cold weather concreting and field cure.

G. Field Testing:
1. Slump Test Method: Comply with ASTM C143.
2. Air Content Test Method: Comply with ASTM C173 or C231.
    a. Approved air entrainment admixture may be added on-site as necessary to meet the testing requirements.
3. Temperature Test Method: Comply with ASTM C1064.
4. Frequency of Testing:
    a. Measure slump and temperature for each sample.
    b. Measure air content in air-entrained concrete for each sample.

H. Cylinder Compressive Strength Testing:
1. Test Method: See ASTM C39.
2. Test Acceptance: See ACI 318.
3. Test one cylinder at 7 days.
4. Test three cylinders at 28 days. Retain one cylinder for 56 days for testing when requested by Engineer.
    a. Dispose of remaining cylinders if testing is NOT required.

I. Core Compressive Strength Testing:
1. Sampling and Testing Procedures: Comply with ASTM C42.
2. Test Acceptance: As specified in ACI 318.
    a. Drill three cores for each failed strength test from failed concrete.

J. Shrinkage Testing:
1. As specified in ASTM C157 with modifications:
    a. Prisms shall be moist cured for 7 days prior to the 28-day drying period.
    b. Measurement at the end of the 7-day moist cure shall be considered the initial length.
    c. The reported results shall be the average of three prisms.
2. If the drying shrinkage measurement of a specimen varies from the average by more than.004%, disregard the results from that specimen.
3. Test shrinkage characteristics every 5,000 yd^3 and every 3 months during construction of hydraulic structures.
4. Results at the end of the 28-day drying period shall NOT exceed 0.04% if 3 in. prisms are used or 0.038% if 4 in. prisms are used.
    a. If the 7-day or 14-day field shrinkage tests exceed the limits established by testing of the mix design, furnish an additional 14 days of water cure beyond the original curing period for hydraulic structures. Modify the mix design to reduce shrinkage.

K. Liquid Tightness Tests:
1. As specified in ACI 350.1.
2. Purpose:

a. To determine the integrity and water tightness of finished concrete surfaces of liquid containment structures.
b. Contractor shall perform and pay for all costs associated with liquid tightness tests.
c. Report all test results to the Engineer.

3. For All Water-Holding Structures:
   a. Perform tightness tests after the concrete structure is complete and capable of resisting the hydrostatic pressure of the water test. The concrete shall have achieved its full design strength.
   b. Install all temporary bulkheads, cofferdams and pipe blind flanges and close all valves. Inspect each to assure that it provides a complete seal.
   c. Fill with water to test level shown, or maximum liquid level if no test level is given. Maintain this level for 72 hrs. prior to the start of the test to allow for water absorption, structural deflection, and temperature to stabilize.
   d. Measure evaporation and precipitation by floating a partially filled, transparent, calibrated, open top container.
   e. Measure the water surface at two points 180° apart, when possible where attachments such as ladders exist, at 24-hour intervals. Use a sharp pointed hook gage and fixed metal measure capable of reading to 1/100 in. Continue the test for a period sufficient to produce at least 1/2 in. drop in the water surface based on the assumption that leakage would occur at the maximum allowable rate specified or for 72 hrs., whichever is the lesser time.
4. Acceptance Criteria:
   a. Volume loss shall NOT exceed 0.075% of contained liquid volume in a 24-hour period, correcting for evaporation, participation, and settlement.
   b. No damp spots or seepage visible on exterior surfaces. A damp spot is defined as sufficient moisture to be transferred to a dry hand upon touching.
5. Repairs when test fails:
   a. Dewater the structure; fill leaking cracks with crack repair epoxy as specified in Section 03 64 00 – Concrete Repair Crack Injection. Patch areas of damp spots previously recorded and repeat tightness test in its entirety until the structure successfully passes the test.

L. Water-Soluble Chloride-Ion Concentration Test Method:
1. Comply with ASTM C1218.
2. Test at 28 days.
   a. Maximum Chloride-Ion Concentration: As permitted by applicable code.
3. If not available by mix supplier, Chloride-Ion Concentration Test shall be provided by one of two options:
   a. Contractor shall hire an outside testing agency to prepare test on mix design
   b. Mix Supplier shall furnish a written statement ensuring that the concrete mix meets the requirements of the test.

M. Patching:
1. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
2. Honeycombing or Embedded Debris in Concrete:
   a. NOT acceptable.
   b. Notify Engineer upon discovery.
   c. Patch imperfections per Section 03 01 00 – Maintenance of Concrete.

N. Defective Concrete:
1. Description: See Definitions.
2. Repair or replacement of defective concrete shall be determined by Engineer.
3. DO NOT patch, fill, touch up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

3.6 SUPPLEMENTS

A. Requirements of concrete mix designs after “End of Section” are a part of this section.

END OF SECTION

5000 PSI CONCRETE MIX

A. Use for partial wall and slab reconstruction at Headworks (Facility 20)

B. Mix Design Properties:
   1. Maximum water / cementitious ratio of 0.40.
   2. Minimum compressive strength at 28 days of 5,000 psi.
   3. Conform to shrinkage limits.
   4. Air content of 4.5%–7.0%, assuming 3/4 in. or 1 in. maximum aggregate size.
   5. Provide Cementitious Materials as Specified in Either:
      a. ASTM C150 Type V – type F fly ash may be included as an option
   6. Minimum cementitious materials content in the mix shall be:
      a. 560 lbs/ cu. yd. for 3/4 in. maximum aggregate size.
      b. 535 lbs/ cu. yd. for 1 in. maximum aggregate size.
      c. Limit maximum cementitious content to 100 lbs/ cu. yd. greater than specified minimums.
   7. Limit water-soluble, chloride-ion content in hardened concrete to 0.10%.
      a. Test if total chloride-ion content of individual ingredients, calculated on the basis of concrete proportions, exceeds 0.10%.
      b. Refer to this Section for additional requirements.

4500 PSI CONCRETE MIX

A. Use for all other concrete structures and foundation systems

B. Mix Design Properties:
   1. Maximum water / cementitious ratio of 0.45.
   2. Minimum compressive strength at 28 days of 4,500 psi.
   3. Air content of 5.5%–7.0% for 3/4 in. and 1 in. maximum aggregate size.
   4. Provide Cementitious Materials as Specified in Either:
      a. ASTM C150 Type II – type F fly ash may be included as an option.
      b. ASTM C595 Type IP – complies with moderate sulfate resistance option.
      c. ASTM C595 Type IL – complies with moderate sulfate resistance option.
   5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30%.
      a. Test if total chloride-ion content of individual ingredients, calculated on the basis of concrete proportions, exceeds 0.30%.
      b. Refer to this section for additional requirements.

4000 PSI CONCRETE MIX

A. Use for secondary non-structural elements including below grade electrical duct banks and pipe encasements NOT cast monolithically with structural slabs.

B. Mix Design Properties:
   1. Maximum water / cementitious ratio of 0.50.
   2. Minimum compressive strength at 28 days of 4,000 psi.
   3. Air content of 1.5%–4.5% for 3/4 in. and 1 in. maximum aggregate size.
   4. Provide Cementitious Materials as Specified in Either:
      a. ASTM C150 Type II – type F fly ash may be included as an option.
      b. ASTM C595 Type IP – complies with moderate sulfate resistance option.
      c. ASTM C595 Type IL – complies with moderate sulfate resistance option.
   5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30%.
      a. Test if total chloride-ion content of individual ingredients, calculated on the basis of concrete proportions, exceeds 0.30%.
      b. Refer to this section for additional requirements.

SECTION 03 35 00 – CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Finishing Methods
   2. Flatness Tolerances
   3. Schedule of Concrete Finishes

B. Related Sections:
   1. Section 03 64 00 – Concrete Repair Crack Injection
   2. Section 09 90 00 – Painting and Protective Coatings

1.2 REFERENCES

A. ACI (American Concrete Institute):
   1. 117 – Specification for Tolerances for Concrete Construction and Materials.

B. ASTM International:
   1. E1155 – Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

1.3 QUALITY ASSURANCE

A. Mockup Panels for Architectural Wall Finishes:
   1. Construct as specified in Contract Documents to demonstrate wall finish types WF-3, WF-4, WF-5, or WF-6, if used on the project.
   2. Panel dimension 6 ft by 8 ft, minimum.
   3. Construct panel with the same materials, forming and curing methods as the final product.

B. Flatwork Finisher:
   1. Unless otherwise permitted, there shall be at least one ACI-certified Flatwork Finisher on the finishing crew. An equivalent certification shall be considered.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONCRETE WALL FINISHES

A. Type WF-1 (Rough-form Finish):
   1. Patch tie holes.
   2. Chip or rub off projections over 1/2 in.
   3. Leave surfaces with the texture imparted by the forms.
   4. Repair defective areas.
   5. Inject cracks per Section 03 64 00 – Concrete Repair Crack Injection.

B. Type WF-2 (Smooth-form Finish):
   1. Patch tie holes.
   2. Grind off projections level to surface.
   3. Repair defective areas to provide smooth uniform appearance.
   4. Inject cracks per Section 03 64 00 – Concrete Repair Crack Injection.

C. Type WF-3 (Smooth Rubbed Wall Finish):
   1. Water cure only for this finish type.
   2. Remove forms as early as permitted and patch as required.
   3. Produce finish with one day of removing forms.
   4. Wet surface and rub with carborundum brick or abrasive of equal quality until uniform color and texture are produced.
   5. Use no cement grout other than the paste drawn from the concrete itself.
   6. Float or brush produced paste uniformly over surface.
   7. Continue water cure for the required time as soon as water shall NOT erode the rubbed surface.

D. Type WF-4 (Grout-cleaned Rubbed Wall Finish):
   1. Meet requirements of WF-3, 1–3.
   2. Mix grout consisting of one-part Portland cement and 1 1/2 parts fine sand with enough water to produce the consistency of thick paint – match color of surrounding concrete.
   3. Wet surface of concrete sufficiently to prevent absorption of water from grout and apply uniformly over surface.
   4. Scrub grout into voids and remove excess grout.
   5. When the grout whitens from drying, rub the surface with clean burlap.
   6. Continue to water cure until the curing period is complete.

E. Type WF-5 (Architectural Fractured Fin Wall Finish):
   1. Form with appropriate form liner.
   2. Patch tie holes.
   3. Break off tips of ridges with light bush-hammering, or other approved process.
   4. For consistency of finish, use the same person or people to complete any given structure.

F. Type WF-6 (Architectural Abrasive Blast Wall Finish):
   1. Repair cracks before blasting.
   2. Abrasives shall be clean silica sand free of foreign materials.
   3. Concrete shall have achieved at least 50% of specified strength before blasting.
   4. All surfaces to have the same blast finish shall be worked when the concrete is the same age.
   5. Unless otherwise specified, blasting shall expose fine aggregate with occasional exposure of coarse aggregate, NOT to exceed a reveal of 1/16 in.
   6. When abrasive grit contains water for dust abatement, wash debris from wall before drying occurs.

3.2 CONCRETE SLAB FINISHES

A. Type SF-1 (Float Slab Finish):
   1. Screed slab with straightedges to create surface at required finish plane.
   2. Float once bleedwater sheen has disappeared and the surface has stiffened sufficiently to permit the operation.
   3. Remove laitance and clean surface.

B. Type SF-2 (Steel Trowel Slab Finish):
   1. Float surface per SF-1.
   2. Hand trowel to produce smooth dense surface, free of trowel marks.
   3. For air-entrained slabs, provide light steel trowel finish, (two troweling).
   4. For non-air-entrained slabs, provide hard steel trowel finish (ringing sound from the trowel).

C. Type SF-3 (Broomed Slab Finish):
   1. Finish per SF-2, light steel trowel finish, then draw a fine-hair broom lightly across the surface.

2. Broom in consistent direction.
3. For inclined slabs, broom perpendicular to slope.

D. Type SF-4 (Sidewalk Slab Finish):
1. Use broomed finish per SF-3.
2. Slope walks 1/4 in. per foot away from structures, unless shown otherwise.
3. Broom surface at right angles to the direction of traffic.

3.3 CONCRETE SLAB TOLERANCES

A. Thickness:
1. Maximum minus 1/4 in. or plus 1/2 in. from thickness and elevation shown.

B. Slab Flatness and Levelness:
1. Finish floor tolerances shall be measured as specified in ASTM E1155.
2. Levelness tolerances shall NOT apply to inclined or cambered surfaces.
3. Levelness tolerances shall be measured within 72 hrs. of concrete placement.
4. Flatness F_F and Levelness F_L numbers for slabs NOT designated as Flat Slabs:
   a. Minimum Overall $F_F = 20$
      Minimum Local $F_F = 15$
   b. Minimum Overall $F_L = 15$
      Minimum Local $F_L = 10$
5. Flatness F_F and Levelness F_L numbers for slabs designated as Flat Slabs:
   a. Minimum Overall $F_F = 30$
      Minimum Local $F_F = 15$
   b. Minimum Overall $F_L = 20$
      Minimum Local $F_L = 10$

3.4 SCHEDULE OF CONCRETE FINISHES

A. Exterior Wall Surfaces:
1. Below grade – WF-1
2. Above grade, exposed – WF-2
3. Above grade, covered – WF-1

B. Interior Wall Surfaces:
1. Covered water-holding structures, NOT coated – WF-1
2. Open top water-holding structures, NOT coated – WF-2
3. Water-holding structures, coated – WF-2 and Section 09 90 00 – Painting and Coating.
4. Dry areas, NOT coated – WF-2
5. Dry areas, coated – WF-2 and Section 09 90 00 – Painting and Coating

C. Exterior Slabs:
1. Roof slab, NOT covered – SF-3
2. Roof slab, covered (roofing material) – SF-2
3. Water-holding base slabs – SF-2
4. Top of footing – SF-1
5. Stairs and landings – SF-3
6. Sidewalks – SF-4

D. Interior Slabs:
1. Dry areas – SF-2
2. Slabs to receive carpet or resilient flooring – SF-2
3. Slabs to receive mortar bed for tile – SF-1
4. Hydraulic channels – SF-2

E. Beams and Columns:
   1. As specified in instructions for similar areas for slabs and walls.

END OF SECTION

SECTION 03 39 00 – CONCRETE CURING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Curing Methods
   2. Curing Products

1.2 REFERENCES

A. ASTM International:
   1. C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

B. American Concrete Institute:
   1. 308.1 – Specification for Curing Concrete.

C. NSF International:
   1. 61 – Drinking Water Components – Health Effects.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Manufacturer's Product Data:
   1. Curing Compound
   2. Evaporation Retardant
   3. Penetrating Water Repellant Sealer

C. Curing Methods:
   1. For each type of element in the facility such as slabs, walls, beams, or columns.

1.4 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Curing Compound:
   1. Water-based, high-solids, white pigmented, nonyellowing curing compound meeting the requirements of ASTM C309, Type 2, Class A.
   2. Manufacturers:
      a. Euclid Chemical; Kurez VOX White Pigmented
      b. WR Meadows; 1640 – White
      c. Vexcon; Certi-Vex Envio Cure White

B. Evaporation Retardant:
   1. Manufacturers:
      a. BASF; MasterKure ER 50
      b. Euclid Chemical; Eucobar

C. Penetrating Water Repellant Sealer:
   1. Water-based, single component, silane/siloxane, penetrating, clear water repellant sealer.
   2. Manufacturers:
      a. BASF; MasterProtect H 400
      b. Euclid Chemical; Baracade WB 244

PART 3 - EXECUTION

3.1 CONCRETE CURING

A. General:
   1. Cure all concrete per project specifications and ACI 308.1.
   2. Use only water curing procedures where surfaces are to receive paint or other coatings.
   3. Use only water curing procedures on potable water structures.
   4. If the result of the 7-day concrete strength test is less than 50 percent of the specified 28-day strength, extend the moist curing period for an additional 7 days.
   5. Protect concrete from freezing during curing period.

B. Use one of the curing methods below as approved by the Engineer:
   1. Vertical Surfaces:
      a. Method 1 – leave concrete forms in place and keep surfaces of forms and concrete wet for 7 days
      b. Method 2 – apply curing compound, where allowed, immediately after removal of forms
   2. Horizontal Surfaces:
      a. Method 1 – water pond surface for 7 days
      b. Method 2 – continuously sprinkle surface for 7 days
      c. Method 3 – cover surface with material that will retain moisture such as burlap or cotton mats, sand or sawdust and keep continuously wet for 7 days
      d. Method 4 – apply curing compound, where allowed, immediately after final finishing

C. All slabs for structures defined as Environmental Structures per ACI 350 – Code Requirements for Environmental Engineering Concrete Structures shall be cured per the Horizontal Surfaces Methods 1, 2 or 3.

3.2 EVAPORATION RETARDANT APPLICATION

A. Use when environmental conditions will cause rapid drying of the concrete surface. DO NOT use on potable water structures unless NSF 61 approved.

B. Apply and reapply as required per manufacturer’s written instructions.

3.3 PENETRATING WATER REPELLENT SEALER APPLICATION

A. Apply as specified in Drawings.

B. Water cure concrete to receive sealer. DO NOT use membrane curing compounds. Keep surface clean and unpainted.

C. Apply per manufacturer’s recommendations for coverage and curing time.

END OF SECTION

SECTION 03 60 00 – GROUT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Non-shrink grout
   2. Topping grout
   3. Concrete Fill
   4. Cement grout for pipe invert fill
   5. Construction joint mortar

B. Related Sections:
   1. Section 03 10 00 – Concrete Forming
   2. Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

A. ASTM International:
   1. C230 – Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.
   2. C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nontrunk).

B. Cement Grout (Non-Shrink):
   1. COE (Corps of Engineers):
      a. CRD-C 611 – Flow of Grout for Prep laced Aggregate Concrete.
      b. CRD-C 621 – Specification for Non-shrink Grout.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product data for each type of product specified.

C. Certified test results verifying compliance with compressive strength, shrinkage and expansion requirements and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of non-shrink and epoxy grout.

D. Fine aggregate gradation.

E. One copy of each 30 consecutive strength test results and mix design used from a record of past performance, or one copy of laboratory trial mix and design and results, and one copy of the mix design proposed for each cementitious mixture and use under this contract.

F. Qualification for testing agency.

G. Material test reports:
   1. From a qualified testing agency, as specified in requirements.
   2. Aggregates; include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
   3. Non-shrink grout
   4. Epoxy grout

H. Material certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials

2. Non-shrink grout
3. Epoxy grout

I. Field quality-control tests and observation reports.

J. Ready mix concrete (Cement Grout)
1. Provide delivery tickets for ready-mix concrete (cement grout) or weigh master's certificate per ASTM C 94, include weights of cement and each size aggregate and amount of water added at the plant and a record of placements. Record the amount of water added at the job site on the delivery ticket. Water added at the plant shall account for the moisture in aggregate. If water is added at the job site, then the total water content shall not exceed the water content of the approved design mix.
2. Keep records showing time and place of each placement of concrete, joint mortar bed material or cement grout, together with transit delivery slips certifying the contents of the placement. Furnish records to Engineer.

K. Joint Mortar Bed:
1. Provide material analysis and certification for each placement.

L. Shop Drawings:
1. Product data of grouts.
2. Curing method for grout.
3. Mix design of cement-sand grout mixture for pipe invert/structure fill.
4. Mix design of Joint Mortar Bed.

M. Information Submittals:
1. Manufacturer's written instructions for mixing of grout.
2. Manufacturer's Certificate of Compliance: Grout free from chlorides and other corrosion-causing chemicals.
3. Manufacturer's Certificate of Proper Installation.
4. Statements of Qualification: Non-shrink grout manufacturer's representative.
5. Test Reports: Test report for 24-hour evaluation of non-shrink grout.

1.4 QUALIFICATIONS

A. Manufacturer's qualifications for cement grout and joint mortar bed:
1. A firm experienced in manufacturing ready-mixed concrete products and a firm that complies with ASTM C94 requirements for production facilities and equipment.

B. Testing Agency Qualifications:
1. An independent agency, acceptable to authorities having jurisdiction, qualified as specified ASTM C1077 and ASTM E329 for testing specified, as documented as specified ASTM E548.
2. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, as specified ACI CP-01 or an equivalent certification program.
3. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician – Grade I, Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician – Grade II.

C. Source limitations:
1. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source and obtain admixtures through one source from a single manufacturer.

1.5 QUALIFICATIONS

A. Non-shrink Grout Manufacturer's Representative:
   1. Authorized and trained representative of grout manufacturer, with minimum of 1 year experience that has resulted in successful installation of grouts like those for this Project.

B. For grout suppliers not listed herein, provide completed 24-hour Evaluation of Non-shrink Grout Test Form, attached at the end of this section. Independent testing laboratory to certify that testing was conducted within last 18 months.

1.6 GUARANTEE

A. Manufacturer's guarantee shall not contain disclaimer on the product data sheet, grout bag, or container limiting responsibility to only the purchase price of products and materials furnished.

B. Manufacturer guarantees participation with Contractor in replacing or repairing grout found defective due to faulty materials, as determined by industry standard test methods.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cementitious Material:
   1. Use the same type, brand, and source throughout project.
   2. Portland Cement (Nonhydraulic Above Grade Structures): ASTM C150, Type I or II or combination of Type I with fly ash.
   3. Portland Cement (Hydraulic and Below Grade Structures): ASTM C150 Type II or combination of Type I with fly ash.
   4. Fly Ash: ASTM C618, Class F, fly ash shall not exceed 15%.

B. Fine aggregates:
   1. ASTM C 33, Class 4S or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. Aggregates shall be free of materials with deleterious reactivity to alkali in cement. Aggregates for cement grout and/or mortar bed shall be provided from the same source as aggregate for the cast-in-place concrete.

C. Water:
   1. ASTM C94 and potable.

2.2 ADMIXTURES

A. As specified in Section 03 30 00 – Cast-In-Place Concrete.

2.3 NON–SHRINK GROUT SCHEDULE

A. Furnish non-shrink grout for applications in grout category in the following schedule:

Application	Temperature Range	Max. Placing Time	
	40 – 100°F	20 min	Greater than 20 min
Filling tie hole	I	I	I
Machine bases 25 hp or less	II	II	II
Through-bolt openings	II	II	II
Patching Concrete Walls	II	II	II
Machine bases 26 hp and up	III	III	III
Base plates and/or soleplates with vibration, thermal movement, etc.	III	III	III
Other applications not listed	II	II	II

2.4 NON–SHRINK GROUT

A. Category I:
1. Nonmetallic and non-gas-liberating.
2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Test as specified in ASTM C1107:
   a. Flowable consistency 140%, five drops in 30 sec, as specified in ASTM C230.
   b. Flowable for 15 minutes
4. Grout shall not bleed at maximum allowed water.
5. Minimum strength of flowable grout: 3,000 psi at 3 days, 5,000 psi at 7 days, and 7,000 psi at 28 days.
6. Manufacturers and Products:
   a. Chemrex, Inc., Shakopee, MN; Set Grout
   b. Euclid Chemical Co., Cleveland, OH; NS Grout
   c. Dayton Superior Corp., Miamisburg, OH; 1107 Advantage Grout
   d. US MIX Products, Denver, CO; US Spec Multi-Purpose Grout
   e. L & M Construction Chemicals, Inc., Omaha, NE; Duragrout
   f. Master Builders

B. Category II:
1. Nonmetallic, non-gas-liberating.
2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Aggregate shall show no segregation or settlement at fluid consistency – at specified times or temperatures.
4. Test as specified in COE CRD-C 621 and ASTM C 1107, Grade B:
   a. Fluid consistency 20 sec – 30 sec as specified in COE CRD-C 611.
   b. Temperatures of 40, 80, and 100°F.
5. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
6. Minimum strength of fluid grout: 3,500 psi at 1 day, 4,500 psi at 3 days, and 7,500 psi at 28 days.
7. Maintain fluid consistency when mixed in 1 yd – 9 yd loads in ready-mix truck.
8. Manufacturers and Products:
   a. Chemrex, Inc., Shakopee, MN; Master Flow 928
   b. Five Star Products Inc., Fairfield, CT; Five Star 100
   c. Euclid Chemical Co., Cleveland, OH; Hi Flow Grout
   d. Dayton Superior Corp., Miamisburg, OH; Sure Grip High Performance Grout
   e. L & M Construction Chemicals, Inc., Omaha, NE; Crystex
   f. Master Builders

C. Category III
   1. Metallic and non-gas-liberating flowable fluid.
   2. Prepackaged aggregate grout requiring only the addition of water.
   3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
   4. Test as specified in CRD-C 621 and ASTM C 1107, Grade B:
      a. Fluid consistency 20 sec – 30 sec as specified in CRD-C 611.
      b. Temperatures of 40°F and 100°F.
   5. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
   6. Minimum strength of grout: 4,000 psi at 1 day, 5,000 psi at 3 days, and 9,000 psi at 28 days.
   7. Maintain fluid consistency when mixed in 1 to 9 yard loads in ready-mix truck.
   8. Manufacturers and Products: Chemrex, Inc., Shakopee, MN; EMBECO 885.

2.5 TOPPING GROUT AND CONCRETE/GROUT FILL

A. Where fill is thicker than 3 in, structural concrete 03 30 00 – Cast-In-Place Concrete, may be used when accepted by the Engineer.

B. Grout for topping of slabs and concrete/grout fill for built-up surfaces of tank, channel and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water and admixtures proportioned and be mixed as specified. Bonding Agent shall be used to enhance adhesion to basin concrete. Materials and procedures specified for normal concrete in Section 03 30 00 – Cast-In-Place Concrete, shall apply unless otherwise specified.

C. Topping grout and concrete/grout fill shall contain a minimum of 564 lbs. of cement per cubic yard with a maximum water cement ratio of 0.45. Topping grout in clarifiers shall contain between 750 lbs.–8,900 lbs. of cement per cubic yard with a maximum water cement ratio of 0.42.

D. Aggregate shall be graded:

U.S. STANDARD SIEVE SIZE	PERCENT BY WEIGHT PASSING
1/2 in.	100
3/8 in.	90 – 100
No. 4	20 – 55
No. 8	5 – 30
No. 16	0 – 10
No. 30	0

E. Final mix design shall be as determined by trial mix design as specified in Section 03 30 00 – Cast-In-Place Concrete except that drying shrinkage tests are not required.

F. Topping grout and concrete grout/fill shall contain air-entraining agent per Section 03 30 00 – Cast-In-Place Concrete.

G. Strength:
   1. Minimum compressive strength of topping grout and concrete/grout fill at 28 days shall be 4,000 psi.

H. Topping grout used in clarifiers shall contain fiber reinforcing. Fiber shall be 100% virgin polypropylene fibrillated fibers specifically manufactured in a blended gradation for use as concrete secondary reinforcement. Fibers shall be added at a rate of 1.5 lbs/yd^3 of concrete. Fibers shall conform to ASTM C1116 – Fiber Reinforced Concrete and Shotcrete. Type III.

2.6 CEMENT–GROUT (CEMENT–SAND GROUT) MIXTURE FOR PIPE INVERT/STRUCTURE FILL

A. Prepare Design Mixture:
   1. Proportions based on laboratory trial mixture, field test data, or both, as specified in ACI 301.
   2. Submit proposed mixture design to Engineer for review.
   3. As specified in Section 03 30 00 – Cast-In-Place Concrete.
   4. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based upon laboratory trial mixtures.

B. Cementitious Materials:
   1. Limit percentage, by weight, of cementitious materials other than Portland cement in concrete and cement grout:
      a. Fly Ash, 15%, Class F

C. Admixtures:
   1. All materials other than Portland cement, water and aggregates that are added to the concrete or cement grout, shall be subject to the approval of the Engineer. If so approved, use admixtures as specified in manufacturer's written instructions.
   2. Use water reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   3. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   4. Use water-reducing admixture in pumped concrete, concrete for heavy-use slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

D. Minimum compressive strength:
   1. 2,000 psi at 28 days

E. Minimum cementitious material of 846 lbs. (9 bags) per cubic yard of cement grout.

F. Air content:
   1. ASTM C94, 5%, plus or minus 1.0% at point of delivery.

G. Aggregate shall be sand, three parts sand to one part cementitious material by volume. The sand gradation shall be such that 100% shall pass the No. 16 sieve and not more than 30% shall be retained on a No. 30 sieve.

H. Water
   1. Cementitious material ratio. The Contractor shall submit a proposed mix design to the Engineer for review. The amount of water shall be the minimum amount of water necessary to make a workable mixture.

I. Slump:
   1. Maximum of 4 in.

2.7 JOINT MORTAR BED

A. Joint Mortar Bed:
   1. Mortar placed on horizontal construction joints shall be a mixture of cement, sand and water in the same proportions used in the approved 4000 psi cast-in-place concrete mix design and/but with the coarse aggregate omitted.

PART 3 - EXECUTION

3.1 NON–SHRINK GROUT

A. General:
1. Mix, place, and cure non-shrink grout as specified in grout Manufacturer's representative's training instructions.
2. Used for repair of holes and defects and at locations indicated where epoxy grout is not indicated. Execution shall follow manufacturer's recommendations.
3. Base plates and equipment where indicated. Execution shall follow manufacturer's recommendations.

B. Form Tie or Through-Bolt Holes:
1. Provide non-shrink grout, Category I and II, fill space with dry pack dense grout hammered in with steel tool and hammer. Through-bolt holes; coordinate dry pack dense grout application with vinyl plug in Section 03 10 00 – Concrete Forming, and bonding agent in Section 03 30 00 – Cast-In-Place Concrete.

C. Grouting Machinery Foundations:
1. Block out original concrete or finish off at distance shown below bottom of machinery base with grout. Prepare concrete surface by sandblasting, chipping, or by mechanical means to remove any soft material.
2. Set machinery in position and wedge to elevation with steel wedges, or use cast-in leveling bolts.
3. Form with watertight forms at least 2 in. higher than bottom of plate.
4. Fill space between bottom of machinery base and original concrete as specified in Manufacturer's representative's training instructions.

3.2 CEMENT GROUT

A. Place cement grout topping over concrete slabs as specified in Drawings. Place as specified in the procedures of this section and the manufacturer's or suppliers of equipment recommendations. The finish surface of the grout topping shall be similar to a steel trowel finish and which will facilitate the proper operation of the mechanical equipment. The finish of the structural slab below the cement grout topping shall be a heavy broom finish.

B. Where cement grout is to be placed without mechanical equipment, the fresh surface of the cement grout shall be a smooth trowel finish.

C. Placement Procedure at Areas With Mechanical Equipment:
1. Notify Project Representative or Engineer a minimum of 48 hrs. in advance of placement.
2. Make a trial cement grout batch of not less than 1/2 yd^3 to allow time for adjustment in mix design if required.
3. Clean the exposed structural slab by sandblasting and washing clean.
4. Thoroughly broom a neat cement paste containing an epoxy binder into the concrete slab surface immediately ahead of placing the cement grout topping.
5. Where applicable, install level and trial operate mechanical screed equipment over the floor slab to provide a minimum thickness of 2 in. plus or minus 1/4 in. In areas where the distance between the mechanical screed and the structural slab is less than the above clearances, grind surface as directed by Engineer to provide such clearance. The mechanical screed shall operate at a speed acceptable to the cement grout topping placement procedures. Screeding procedures shall account for the effects of differential temperatures on the mechanical screed equipment.
6. Place cement grout topping in a continuous operation. If grouting operations are interrupted, clean the edge of the previously placed topping by water jetting and add a coat of cement paste to provide a bond to the fresh topping.

7. Temporarily equip the mechanical screed mechanism on at least two arms with a 2 in. by 10 in. continuous wood plate with light gauge metal angles and surface plates or channels. The bottom of the screed plates or steel plates shall be adjustable and set to elevations which allow the proper operation of equipment and as recommended by the equipment manufacturer or supplier.
8. Screed the topping immediately after consolidation with vibrators or tampers and provide a steel trowel finish.
9. Cure cement grout topping with water and cover with PVC sheeting to prevent damage from foot traffic for seven days. When/If the cement grout topping is found not to be acceptable, remove and replace. Cement grout topping not acceptable shall include, but is not limited to, poor bonding with the concrete slab, low strength, excessive cracking and unevenness in finish or elevation.

3.3 JOINT MORTAR BED

A. Joint Mortar Bed:
1. Immediately prior to placement of fresh concrete at horizontal joints, or as specified, place joint mortar bed to cover horizontal joint and protect water stop as applicable. Spread uniformly and work into all irregularities of the surface. The water cement ratio of the joint mortar bed shall not exceed that of the concrete being placed and the consistency of the mortar shall be suitable for placing and working. The fresh concrete shall then be immediately placed in a time and manner so that the joint mortar bed and the fresh concrete mix to form a homogenous concrete meeting all requirements.

3.4 EPOXY GROUT

A. Used to embed all anchor bolts and reinforcing steel set in grout, specific machinery base plates as indicated and at other locations where indicated. Execution shall follow manufacturer's recommendations.

3.5 FIELD QUALITY CONTROL

A. Evaluation and Acceptance of Non-shrink Grout:
1. Consistency:
a. As specified in Paragraph 2.4 – Non-Shrink Grout.
b. Grout with consistencies outside range requirements shall be rejected.
2. Segregation:
a. As specified in Paragraph 2.4 – Non-Shrink Grout.
b. Grout when aggregate separates shall be rejected.

3.6 MANUFACTURER'S SERVICES

A. Coordinate demonstrations, training sessions, and applicable site visits with grout manufacturer's representative.

3.7 SUPPLEMENTS

A. The supplement below is part of this Section.
1. 24-hour Evaluation of Non-shrink Grout Test Form and Grout Testing Procedures.

END OF SECTION

SECTION 03 63 00 – CONCRETE DOWELING – ADHESIVE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. The Work required for furnishing concrete doweling – adhesive.

B. Related Sections:
   1. Section 03 20 00 – Concrete Reinforcing

1.2 REFERENCES

A. ANSI (American National Standards Institute)

B. ASTM International:
   1. C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
   2. E488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.

C. ICC (International Code Council):
   1. IBC (International Building Code).
   2. Evaluation Services Reports.

D. NSF International:
   1. 61 – Drinking Water System Components – Health Effects.

1.3 DEFINITIONS

A. ICC Evaluation Services Report:
   1. Published by ICC for products provided by concrete adhesive anchor manufacturers.

B. Special Inspection:
   1. As defined in the ICC IBC and as specified in the Supplement located at the end of Section 01 40 00 – Quality Requirements.

1.4 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Action Submittals:
   1. Product Data: Manufacturer’s catalog information.

C. Informational Submittals:
   1. Manufacturer’s instructions for preparation, placement, drilling of holes, installation of anchors and adhesive, and handling of cartridges, nozzles, and equipment.
   2. ICC Evaluation Services Report: Specific to proposed doweling system manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: At least three similar projects with same products within last 3 years
   2. Installer: Trained and certified by manufacturer

B. Adhesive shall be certified as meeting NSF 61 for use in potable water structures where required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store adhesive components as specified in manufacturer's written instructions.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Adhesive:
   1. Approved by an ICC Evaluation Services Report or equal for conformance to IBC requirements for doweling of steel reinforcing bars in cracked concrete.
   2. Suitable for long-term loads as well as for wind and seismic loads.
   3. Meet requirements of ASTM C881.
   4. Disposable, Self-Contained Cartridge System:
      a. Capable of dispensing both components in proper mixing ratio.
      b. Fit into manually or pneumatically operated caulking gun.
   5. For Potable Water Structures:
      a. Adhesive shall be acceptable for use by NSF 61.
   6. Manufacturers and Products:
      a. Hilti, Inc.
         Tulsa, OK
         HIT-RE 500 V3 (ESR-3814)
      b. DeWalt Industrial Tool Co.
         Towson, MD
         PURE110+ Epoxy (ESR-3298).
      c. Simpson Strong-Tie Co., Inc.
         Pleasanton, CA
         SET-3G Epoxy Adhesive (ESR-2508 for concrete)

B. Mixing Nozzles:
   1. Disposable manufactured in several sizes to accommodate size in reinforcing dowels.

C. Reinforcing Dowels:
   1. As specified in Section 03 20 00 – Concrete Reinforcing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Drilling Equipment:
   1. Electric or pneumatic rotary type with medium or light impact. Hollow drills with flushing air systems are preferred.
   2. Where edge distances are less than 2 in., use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.

B. Hole Diameter:
   1. As recommended by the manufacturer.

C. Obstructions in Drill Path:
   1. When existing steel reinforcement is encountered during drilling, obtain Engineer approval for proposed fix.

D. Doweling:
   1. Install per details shown on Drawings and as specified in adhesive manufacturer's instructions.

E. Adhesive:
   1. Install as specified in written manufacturer's instructions.
   2. Dispense components through specially designed static mixing nozzle that thoroughly mixes components and places mixed adhesive at base of predrilled hole.

3.2 FIELD QUALITY ASSURANCE AND QUALITY REQUIREMENTS

A. Proof Loading:
   1. To be performed where continuous inspection of concrete dowels is required.
   2. Testing shall be performed by an Independent Testing Agency.
   3. Proof loading to be performed only after adhesive has achieved proper cure per manufacturer's requirements.
   4. Testing shall be conducted on a minimum of 10% of installed dowels, with a minimum of two tension tests. A minimum of two cartridges per box or packaging unit shall be tested.
   5. Testing shall be conducted as specified in ASTM E488.
   6. Failure of dowel bar or failure within base concrete shall cause dowel to be rejected. For each rejected dowel, two additional dowels shall be tested. Replace rejected dowels as approved by Engineer.

B. Quality Assurance:
   1. As specified in IBC Chapter 17 requirements.
   2. Provided in the Supplement located at end of Section 01 40 00 – Quality Requirements.

END OF SECTION

SECTION 03 64 00 – CONCRETE REPAIR CRACK INJECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Related Sections:
   1. Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

A. ASTM International:
   1. D638 – Standard Test Method for Tensile Properties of Plastics.
   2. D648 – Standard Test Method for Deflection of Plastics Under Flexural Load.
   3. D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
   4. D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.3 DEFINITIONS

A. Defective Area:
   1. Per Section 03 30 00 – Cast-In-Place Concrete.

B. Large Cracks:
   1. Wider than 0.015 in.

C. Small Cracks:
   1. Width equal to 0.015 in. or less

D. Hydraulic Structure:
   1. Structure designed to contain liquid and/or keep liquid from entering.

E. Leak/Leakage:
   1. Crack showing presence of moisture or recent efflorescence.

1.4 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings:
   1. Physical and chemical properties for epoxy adhesives.
   2. Technical data for metering, mixing, and injection equipment.

C. Information Submittals:
   1. Manufacturer's recommended surface preparation procedures and application instructions for epoxy adhesives.
   2. Installation instructions for repairing core holes with epoxy grout.
   3. Manufacturer's Certificate of Compliance: Certified test results for each batch of epoxy adhesive.
   4. Statements of Qualification for Epoxy Adhesive:
      a. Manufacturer's site representative
      b. Injection applicator
      c. Injection pump operating technician
   5. Epoxy adhesive two component ratio and injection pressure test records for concrete crack repair work.

1.5 QUALITY ASSURANCE

A. Qualifications for Epoxy Injection Staff:
   1. Manufacturer's Site Representative:
      a. Capable of instructing successful methods for restoring concrete structures utilizing epoxy injection process.
      b. Understands and can explain technical aspects of correct material selection and use.
      c. Experienced in the operation, maintenance, and troubleshooting of application equipment.
   2. Injection crew and job foreman shall provide written and verifiable evidence showing compliance with the following requirements:
      a. Licensed and certified by epoxy Manufacturer.
      b. Minimum 3 years of experience in successful epoxy injection for at least 10,000 LF of successful crack injection including 2,000 LF of wet crack injection to stop water leakage.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping:
   1. Package adhesive material in new sealed containers and label with following information:
      a. Manufacturer's name
      b. Product name and lot number
      c. ANSI Hazard Classification (formerly SPI Classification)
      d. ANSI recommended precautions for handling
      e. Mix ratio by volume

B. Storage and Protection:
   1. Store adhesive containers at ambient temperatures between 32–120°F.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Epoxy Manufacturers and Products:
   1. Sika Corp., Lyndhurst, NJ; Sikadur 35 Hi-Mod LVPL
   2. Euclid Chemical Co., Cleveland, OH; Eucopoxy injection resin

2.2 EPOXY ADHESIVE

A. Two-component A and B structural epoxy adhesive for injection into cracks or other voids in concrete structures for bonding or grouting.

B. Adhesive Properties:
   1. When cured for 7 days at 77°F plus or minus 3°F and conditioned at test temperature 12 hrs. prior to test, unless otherwise specified.

	Test Method	Large Cracks	Small Cracks
Ultimate Tensile Strength (psi)	ASTM D638	8,000 min.	5,000 min.
Tensile Elongation @ Break (percent)	ASTM D638	3.7 max.	3.7 max.
Flexural Strength (psi)	ASTM D790	10,000 min.	10,000 min.
Flexural Modulus (psi)	ASTM D790	5.5 x10^5 min.	4.5 x10^5 min.
Compressive Yield Strength (psi)	ASTM D695*	15,000 min.	12,000 min.
Compressive Modulus (psi)	ASTM D695*	3.8 x10^5 min.	3.8 x10^5 min.
Heat Deflection Temperature	ASTM D648*	130°F min.	140°F min.
Slant Shear Strength: (5,000 psi Compressive Strength Conc.)	AASHTO T 237**		
Cured 3 days @ 40°F – Wet Concrete			3,500 psi min
Cured 1 day @ 77°F – Dry Concrete			5,000 psi min.
Cured 3 days @ 77°F plus or minus 3°F			5,000 psi min.
**Cure test specimens so that peak exothermic temperature of adhesive does NOT exceed 100°F*			
***See referenced specifications for preparation method of test specimens*			

2.3 SURFACE SEAL

A. Sufficient strength and adhesion for holding injection fittings firmly in-place, and to resist pressures preventing leakage during injection.

B. Capable of removal after injection adhesive has cured.

PART 3 - EXECUTION

3.1 GENERAL

A. Structurally repair cracks in structures as specified in Section 03 30 00 – Cast-In-Place Concrete.

B. Cracks:
   1. Repair by injection of epoxy adhesive.

3.2 PREPARATION

A. Free cracks from loose matter, dirt, laitance, oil, grease, salt, and other contaminants.

B. Clean cracks as specified in epoxy adhesive manufacturer's instructions.

C. Clean surfaces adjacent to cracks from dirt, dust, grease, oil, efflorescence, and other foreign matter detrimental to bond of surface seal system.

D. DO NOT use acids and corrosives for cleaning, unless neutralized prior to injecting epoxy.

3.3 APPLICATION

A. Sealing:

1. Apply surface seal as specified in Manufacturer's instructions to designated crack face prior to injection. Seal surface of crack to prevent escape of injection epoxy.

B. Entry Ports:
   1. Establish openings for epoxy entry in surface seal along crack.
   2. Determine space between entry ports equal to thickness of concrete member to allow epoxy to penetrate to the full thickness of the wall.
   3. Provide a means to prevent concrete dusts and fines from contaminating the crack or ports when drilling.
   4. Space entry ports close together to allow adjustment of injection pressure to obtain minimum loss of epoxy to soil at locations where:
      a. Cracks extend entirely through wall.
      b. Backfill of walls on one side.
      c. Difficult to excavate behind wall to seal both crack surfaces.
   5. Core drill to verify epoxy depth where only one side of wall is exposed.

C. Epoxy Injection:
   1. Store epoxy at minimum of 70°F.
   2. Start injection into each crack at lowest elevation entry port.
   3. Continue injection at first port until adhesive begins to flow out of port at next highest elevation.
   4. Plug first port and start injection at second port until adhesive flows from next port.
   5. Inject entire crack with same sequence.

D. Finishing:
   1. Cure epoxy adhesive after cracks have been completely filled to allow surface seal removal without draining or runback of epoxy material from cracks.
   2. Remove surface seal from cured injection adhesive.
   3. Finish crack face flush with adjacent concrete.
   4. Indentations or protrusions caused by placement of entry ports are NOT acceptable.
   5. Remove surface seal material and injection adhesive runs and spills from concrete surfaces.

3.4 EQUIPMENT

A. Portable, positive displacement type pumps with in-line metering to meter and mix two adhesive components and inject mixture into crack.

B. Discharge Pressure: Automatic pressure controls capable of discharging mixed adhesive at pressures up to 200 psi, ±5%, and able to maintain pressure.

C. Automatic Shutoff Control: Provide sensors on both Component A and B reservoirs for stopping machine automatically when only one component is being pumped to mixing head.

D. Proportioning Ratio Tolerance: Maintain epoxy adhesive Manufacturer's prescribed mix ratio within a tolerance of plus or minus 5% by volume at discharge pressure (p) to 160 psi.

E. Ratio/Pressure Check Device:
   1. Two independent valved nozzles capable of controlling flow rate and pressure by opening or closing valve to restrict material flow.
   2. Pressure gauge capable of sensing pressure behind each valve.

3.5 FIELD QUALITY REQUIREMENTS

A. Epoxy Adhesive Two Component Ratio Tests:

1. Disconnect mixing head and pump two adhesive components simultaneously through ratio check device.
2. Adjust discharge pressure to 160 psi for both adhesive components.
3. Simultaneously discharge both adhesive components into separate calibrated containers.
4. Compare amounts simultaneously discharged into calibrated containers during same time period to determine mix ratio.
5. Complete test at 160 psi discharge pressure and repeat procedure for 0 psi discharge pressure.
6. Run ratio test for each injection unit at beginning and end of each injection workday, and when injection work has stopped for more than 1 hour.
7. Document and maintain complete accurate records of ratios and pressure checks.

B. Injection Pressure Test:
   1. Disconnect mixing head of injection equipment and connect two adhesive component delivery lines to pressure check device.
   2. Pressure Check Device:
      a. Two independent valved nozzles capable of controlling flow rate and pressure by opening or closing of valve.
      b. Pressure gauge capable of sensing pressure buildup behind each valve.
   3. Close valves on pressure check device and operate equipment until gauge pressure on each line reads 160 psi.
   4. Stop pumps and observe pressure; DO NOT allow pressure gauge to drop below 150 psi within 3 minutes.
   5. Run pressure test for each injection equipment unit:
      a. Beginning and end of each injection workday.
      b. When injection work has stopped for more than 45 minutes.
   6. Check tolerance to verify equipment capable of meeting specified ratio tolerance.

C. Crack Injection Tests:
   1. Initial Cores:
      a. 4 in. diameter for full crack depth taken from Engineer selected locations.
      b. Take three cores in first 100 LF of crack repaired and one core sample for each 500 LF thereafter.
   2. Provide suitable containers for storage, curing, and transportation of test specimens.
   3. Methods of Testing Cores:
      a. Penetration: Visual examination.
      b. Bond Strength/Compression Test: Concrete failure prior to adhesive failure.
   4. Test Requirements:
      a. Penetration: Minimum of 90% of crack shall be full of epoxy adhesive.
      b. Bond Strength/Compression Test: Concrete failure before adhesive failure, or 6,500 psi with no failure of either concrete or adhesive.
   5. Evaluation and Acceptance of Tests:
      a. If initial cores pass tests as specified, epoxy adhesive injection Work at area represented by cores will be accepted.
      b. If initial cores fail either by lack of penetration or bond strength, crack repair Work shall NOT proceed further until areas represented by cores are reinjected or repaired and retested for acceptance.
      c. Obtain verifying core samples, number and location as selected by Engineer, after rework of areas represented by failed initial core is complete.
   6. Core Hole Repair:
      a. Correct Work as result of testing upon notification from Engineer.
      b. Refill initial and verifying core holes with an epoxy grout tamped and rodded in-place to form a dense fill.
      c. Finish surface to blend with adjacent concrete.

END OF SECTION

DIVISION 5

METALS

SECTION 05 05 19 – POST–INSTALLED ANCHORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. The Work required for post-installed concrete anchors.

1.2 REFERENCES

A. ACI (American Concrete Institute):
   1. 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
   2. 355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.

B. AISI (American Iron and Steel Institute):
   1. Stainless Steel Type 316.

C. ANSI

D. ASTM International:
   1. A194 – Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
   2. A380 – Practice for Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems.
   3. A385 – Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
   4. A967 – Specification for Chemical Passivation Treatments for Stainless Steel Parts.
   5. E488 – Standard Test Methods for Strength of Anchors in Concrete Elements.
   6. F436 – Specification for Hardened Steel Washers.
   7. F593 – Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   8. F594 – Specification for Stainless Steel Nuts.
   9. F1554 – Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

E. IAPMO-UES (International Association of Plumbing and Mechanical Officials Uniform Evaluation Service):
   1. Evaluation Reports for Concrete and Masonry Anchors.

F. ICC-ES (International Code Council Evaluation Service):
   1. Evaluation Reports for Concrete Anchors.
   2. AC70, Acceptance Criteria for Fasteners Power-driven into Concrete, Steel, and Masonry Elements.
   3. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
   4. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

G. SSINA (Specialty Steel Industry of North America):
   1. Specifications for Stainless Steel.
   2. Design Guidelines for the Selection and Use of Stainless Steel.
   3. Stainless Steel Fabrication.
   4. Stainless Steel Fasteners.

1.3 DEFINITIONS

A. Corrosive Area:
   1. Containment area or area exposed to delivery, storage, transfer, or use of chemicals.

B. Exterior Area:
   1. Location NOT protected from weather by a building or other enclosed structure.

C. Submerged:
   1. Location at or below top of water surface, either interior or exterior, of an environmental structure.

1.4 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Action Submittals:
   1. Shop Drawings:
      a. Specific instructions for anchor installation, including drilled hole size and depth, preparation, placement, dust mitigation, procedures, and instructions for safe handling of anchoring systems.
      b. Documentation of existing anchorage design used at fabrications to be temporarily removed for partial concrete reconstruction. See Section 02 41 00 - Demolition.

C. Informational Submittals:
   1. Concrete Anchors:
      a. Manufacturer's product description and installation instructions.
      b. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
      c. Adhesive Anchor Installer Certification
   2. Passivation method for stainless steel anchors.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Installers of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Installer Certification Program or equivalent.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package stainless steel items in a manner to provide protection from carbon impregnation.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Required steel, unless otherwise specified:
   1. Stainless Steel:
      a. Threaded Rods: F593, AISI Type 316, Condition CW
      b. Nuts: F594, AISI Type 316, Condition CW

B. Bolts, Washers, and Nuts:
   1. Use stainless steel types as indicated on Drawings.

2.2 POST–INSTALLED CONCRETE ANCHORS

A. General:
   1. AISI Type 316 stainless, as indicated on Drawings.
   2. Post-installed anchor systems used in concrete shall be approved by ICC Evaluation Services Report or IAPMO-UES Report for use in cracked concrete and for short-term and long-term loads including wind and earthquake.
   3. Mechanical Anchors: Comply with the requirements of ICC-ES AC193 or ACI 355.2.
   4. Adhesive Anchors: Comply with the requirements of ICC-ES AC308 or ACI 355.4.

B. Torque-Controlled Expansion Anchors (Wedge Anchors):
   1. Manufacturers and Products:
      a. Hilti, Inc., Kwik Bolt TZ2 SS 316
      b. DeWalt, Power-Stud+SD4
      c. Simpson Strong-Tie Co., Strong-Bolt 2

C. Self-Tapping Concrete Screw Anchors:
   1. Manufacturers and Products:
      a. Hilti, Inc., KH-EZ SS 316
      b. DeWalt, 316 Stainless Steel Wedge-Bolt
      c. Simpson Strong-Tie Co., Titen HD

D. Adhesive Anchors:
   1. Threaded Rod:
      a. Diameter as shown on Drawings.
      b. Length as required to provide minimum depth of embedment indicated and thread projection required.
      c. Clean and free of grease, oil, or other deleterious material.
   2. Adhesive:
      a. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
      b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
   3. Packaging and Storage:
      a. Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
      b. Store adhesive on pallets or shelving in a covered storage area.
      c. Package Markings: Include manufacturer’s name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
      d. Dispose of When:
         1) Shelf life has expired.
         2) Stored other than in accordance with manufacturer’s instructions.
   4. Manufacturers and Products:
      a. Hilti, Inc., HIT-RE 500 V3
      b. Simpson Strong-Tie Co., SET-3G.
      c. DeWalt, Pure 220+.

E. Adhesive Threaded Inserts:
   1. Type 316 stainless steel, internally threaded inserts

PART 3 - EXECUTION

3.1 CONCRETE ANCHORS

A. Begin installation only after concrete to receive anchors has attained design strength.

B. Locate existing reinforcing with Ground Penetrating Radar or other method approved by Engineer prior to drilling. Coordinate with Engineer to adjust anchor locations where installation would result in hitting reinforcing.

C. Install in accordance with written manufacturer's instructions.

D. Provide minimum embedment, edge distance, and spacing as indicated on Drawings.

E. Use only drill type and bit type and diameter recommended by anchor manufacturer.

F. Clean hole of debris and dust per manufacturer's requirements.

G. When unidentified embedded steel, rebar, or other obstruction is encountered in drill path, slant drill to clear obstruction. If drill must be slanted more than indicated in manufacturer's installation instructions to clear obstruction, notify Engineer for direction on how to proceed.

H. Adhesive Anchors:
   1. Unless otherwise approved by Engineer and adhesive manufacturer:
      a. ONLY install adhesive anchors when temperature of concrete is 40°F–100°F.
      b. DO NOT install prior to concrete attaining an age of 21 days.
      c. Remove any standing water from home with oil-free compressed air. Inside surface of hole shall be dry.
      d. DO NOT disturb anchor during recommended curing time.
      e. DO NOT exceed maximum torque as specified in manufacturer's instructions.

3.2 FIELD QUALITY ASSURANCE AND QUALITY REQUIREMENTS

A. Owner-Furnished Quality Assurance:
   1. As specified in IBC Chapter 17 requirements.
   2. Is provided in the Statement of Special Inspections Plan in Supplement located at end of Section 01 40 00 – Quality Requirements.

B. Contractor-Furnished Quality requirements:
   1. Inspection and testing as required in Section 01 40 00 – Quality Requirements.

3.3 MANUFACTURER'S SERVICES

A. Conduct Site Training of installation personnel for proper installation, handling, and storage of anchor systems.

END OF SECTION

SECTION 05 05 23 – WELDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. The Work required for welding.

1.2 DEFINITIONS

A. CJP: Complete Joint Penetration

B. CWI: Certified Welding Inspector

C. MT: Magnetic Particle Testing

D. NDE: Nondestructive Examination

E. NDT: Nondestructive Testing

F. PJP: Partial Joint Penetration

G. PQR: Procedure Qualification Record

H. PT: Liquid Penetrant Testing

I. RT: Radiographic Testing

J. UT: Ultrasonic Testing

K. VT: Visual Inspection/Testing

L. WPQ: Welder/Welding Operator Performance Qualification Record

M. WPS: Welding Procedure Specification

1.3 REFERENCES

A. ASME:
   1. BPVC.V – Nondestructive Examination.
   2. BPVC.IX – Welding and Brazing Qualifications.

B. ASNT:
   1. SNT TC 1A – Personnel Qualification and Certification in Nondestructive Testing.

C. ASTM International:
   1. A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

D. AWS:
   1. A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.
   2. A3.0 – Standard Welding Terms and Definitions.
   3. D1.8 – Structural Welding Code – Seismic Supplement.
   4. D1.2 – Structural Welding Code – Aluminum.
   5. D1.3 – Structural Welding Code – Sheet Steel.

6. D1.4 – Structural Welding Code – Reinforcing Steel.
7. D1.6 – Structural Welding Code – Stainless Steel.
8. QC1 – Standard for AWS Certification of Welding Inspectors.

1.4 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Action Submittals:
   1. Shop Drawings:
      a. Shop and field WPSs and PQRs.
      b. NDT procedure specifications prepared in accordance with ASME BPVC.V.
      c. Welding Data (Shop and Field): Submit welding data together with Shop Drawings as a complete package.
         1) Show on Shop Drawings, or on a weld map, complete information regarding base metal specification designation, location, type, size, and extent of welds with reference called out for WPS and NDE numbers in tails of combined welding and NDE symbols as indicated in AWS A2.4.
         2) Clearly distinguish between shop and field welds.
         3) Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal. Provide complete joint welding details showing bevels, groove angles, and root openings for welds.
         4) Welding and NDE Symbols: In accordance with AWS A2.4.
         5) Welding Terms and Definitions: In accordance with AWS A3.0.

C. Informational Submittals:
   1. WPQs
   2. CWI credentials
   3. Testing agency personnel credentials
   4. CWI visual inspection (VT) reports
   5. Welding Documentation: Submit on forms in referenced welding codes.

1.5 QUALIFICATIONS

A. Contractor's Welding Inspector:
   1. Contractor's CWI acts for, and on behalf of, the Contractor for all inspection and quality matters within the scope of the Contract Documents.
   2. Contractor is required to provide a welding inspector to oversee welding operations and be responsible for visual inspection and necessary correction of all deficiencies in materials and workmanship required to meet referenced welding codes.
   3. This type of Quality requirements Inspection is NOT classified as Special Inspection.

B. Verification Inspector:
   1. CWI who acts on behalf of the Owner.
   2. This type of independent inspection and testing is the prerogative of the Owner, who may perform this function, or waive independent verification inspection if it is NOT required by the building official and building code.

C. Special Inspection:
   1. Nondestructive examination exclusive of VT.
   2. Special inspection includes NDE such as MT, PT, UT, RT, and Verification Inspection. Special Inspection personnel report to and are retained by the Owner or the Engineer on behalf of the Owner.
   3. See Section 01 40 00 – Quality Requirements for additional requirements.

D. WPSs:
   1. In accordance with AWS D1.1 for shop or field welding or ASME BPVC.IX (Forms QW 482 and QW 483) for shop welding only.

E. WPQs:
   1. In accordance with AWS D1.1 or ASME BPVC.IX (Form QW 484).

F. CWI:
   1. Certified in accordance with AWS QC1, and having prior experience with specified welding codes. Alternate welding inspector qualifications require prior approval by Engineer.

G. Testing Agency:
   1. Personnel performing tests shall be NDT Level II certified in accordance with ASNT SNT TC 1A.

1.6 SEQUENCING AND SCHEDULING

A. Unless otherwise specified, Submittals required in this section shall be submitted and approved prior to commencement of welding operations.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 SOURCE QUALITY REQUIREMENTS

A. CWI shall be present whenever shop welding is performed. CWI shall perform inspection at suitable intervals, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1 or referenced welding code:
   1. Verifying conformance of specified job material and proper storage.
   2. Monitoring conformance with approved WPS.
   3. Monitoring conformance of WPQ.
   4. Inspecting weld joint fit-up and performing in-process inspection.
   5. Providing 100% visual inspection of welds.
   6. Coordinating with nondestructive testing personnel and reviewing NDE test results.
   7. Maintaining records and preparing reports documenting that results of CWI VT and subsequent NDE testing comply with the Work and referenced welding codes.

PART 3 - EXECUTION

3.1 NONDESTRUCTIVE WELD TESTING REQUIREMENTS

A. Quality requirements Inspection:
   1. All Welds: 100% VT by Contractor’s CWI
   2. Acceptance Criteria:
      a. Per applicable referenced welding codes.

B. Nondestructive Testing Requirements:
   1. NDT frequency shall be as required by referenced welding codes.

C. NDT Procedures and Acceptance Criteria:
   1. Per applicable referenced welding codes.

3.2 FIELD QUALITY REQUIREMENTS

A. CWI shall be present whenever field welding is performed. CWI shall perform inspection, at suitable intervals, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in applicable referenced welding codes and as follows:
   1. Verify conformance of specified job material and proper storage.
   2. Monitor conformance with approved WPS.
   3. Monitor conformance of WPQ.
   4. Inspect welding joint fit-up and perform in-process inspection.
   5. Provide 100% visual inspection of all welds in accordance with Subparagraph Quality requirements Inspection.
   6. Supervise nondestructive testing personnel and evaluating test results.
   7. Maintain records and prepare report confirming results of inspection and testing comply with the Work.

3.3 WELD DEFECT REPAIR

A. Repair and retest rejectable weld defects until sound weld metal has been deposited in accordance with appropriate welding codes.

END OF SECTION

SECTION 05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aluminum framing
   2. Aluminum ladders
   3. Steel bollards
   4. Metal floor plate and associated supports

B. Products furnished, but NOT installed, under this Section include:
   1. Anchor bolts, steel pipe sleeves, and wedge-type inserts specified to be cast into concrete

C. Related Sections:
   1. Section 03 30 00 – Cast-In-Place Concrete
   2. Section 03 60 00 – Grout
   3. Section 05 05 19 - Post-Installed Anchors
   4. Section 07 92 00 – Joint Sealants
   5. Section 09 90 00 – Painting and Protective Coatings
   6. Section 40 05 07 - Hangers and Supports for Process Piping
   7. 40 23 39 - Process Piping

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design of Ladders:
   1. Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.
   2. Design Live Loads:
      a. Side rail loads: Ladder rails shall be designed to withstand a minimum of two (2) 300-pound loads plus 30% impact concentrated between any two consecutive attachments.
      b. Rung loads: Ladder rungs shall be designed to withstand a minimum live load of 300 lbs. plus 30% impact.
   3. Ladder Deflection:
      a. Limit rung deflection to span divided by 360.

B. Delegated Design of Aluminum Floor Plate
   1. Design of the floor plate, including all supports, connections and integral members shall be for the actual dead load plus a live load consisting of:
      a. The uniform live load of the adjacent floor or a uniform live load of 100 lbf/ft2, whichever load produces the greater effect for each component analyzed.
      b. Design shall use the loading and pattern loading for multiple spans which produces the greatest loading, stresses, and deflection with the floor plate system.
   2. Floor plates shall be analyzed for the load effects of FRP piping attachments as part of the odor control system. See Drawings for loading requirements and locations of fittings.
   3. The maximum total load deflection shall be limited to the span divided by 360 (L/360), NOT to exceed 0.25 in. between supporting members.

C. Thermal Movements:
   1. Provide exterior metal fabrications 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 calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

2. Temperature Change (Range):
   a. 120°F, ambient
   b. 180°F, material surfaces

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. Paint products
   2. Grout
   3. Fall Protection (ladder)
   4. Metal Floor Plate and support

C. Shop Drawings:
   1. Show fabrication and installation details for metal framing and fabrications.
   2. Include plans, elevations, sections, and details of metal framing and fabrications and associated connections. Show anchorage and accessory items.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.
   5. For installed products specified to comply with design loads, include structural analysis data signed and sealed by the qualified professional Engineer responsible for their preparation.

D. Samples for Verification:
   1. For each type and finish of extruded nosing and tread.

E. Mill Certificates:
   1. Signed by Manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

F. Welding Certificates.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
   1. A qualified installer who regularly erects structural steel or aluminum framing with scope and complexity like that of this project.

B. Fabricator Qualifications:
   1. A qualified fabricator who regularly fabricates stainless steel with scope and complexity like that of this project.
   2. A qualified fabricator who regularly fabricates aluminum with scope and complexity like that of this project.

C. Licensed Professional:
   1. Engineers responsible for delegated design items shall have at least 5 years of experience in the analysis and design of similar systems.
   2. Engineer shall hold professional license in the project state

D. Welding:
   1. Qualify Procedures and Personnel:

a. AWS D1.2 – Structural Welding Code – Aluminum
b. AWS D1.3 – Structural Welding Code – Sheet Steel
c. AWS D1.6 – Structural Welding Code – Stainless Steel

1.5 PROJECT CONDITIONS

A. Field Measurements:
1. Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and specify measurements on Shop Drawings.
2. Established Dimensions: Where field measurements can NOT be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
3. Provide allowance for trimming and fitting at site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep framing members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect framing members and packaged materials from erosion and deterioration.
1. Store fasteners in a protected place. Relubricate bolts and nuts that become dry.
2. DO NOT store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
3. DO NOT clean and use rusty bolts.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

C. Coordinate fabrication and installation of aluminum framing with the delegated design of pipe restraints attached to supporting structures, per Section 40 05 07 - Hangers and Supports for Process Piping.

D. Coordinate location and fabrication of integral fittings for FRP piping with the supplier of pipe system. See Section 40 23 39 - Process Piping and Drawings.

1.8 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are NOT limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, manufacturers specified.

2.2 METALS, GENERAL

A. Metal Surfaces, General:
1. Provide materials with smooth, flat surfaces, unless otherwise specified.
2. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars:
1. ASTM A36 (Provide Grade 50 where Noted).

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars:
1. ASTM A666, Type 316.

C. Stainless-Steel Bars and Shapes:
1. ASTM A276, Type 316.

D. Steel Tubing:
1. ASTM A500, cold-formed steel tubing.

E. Steel Pipe:
1. ASTM A53, standard weight (Schedule 40), unless another weight is specified or required by structural loads.

F. Cast Iron:
1. ASTM A48, Class 30, unless another class is specified or required by structural loads.

2.4 NONFERROUS METALS

A. Aluminum Plate and Sheet:
1. ASTM B209, Alloy 6061-T6.

B. Aluminum Extrusions:
1. ASTM B221, Alloy 6061-T6.

C. Aluminum-Alloy Rolled Tread Plate:
1. ASTM B632, Alloy 6061-T6.

D. Aluminum Castings:
1. ASTM B26, Alloy 443.0-F.

2.5 FASTENERS

A. General:
1. Unless otherwise specified, provide Type, 316 stainless-steel fasteners
2. Provide stainless-steel fasteners for fastening aluminum.
3. Select fasteners for type, grade, and class required.

B. Stainless-Steel Bolts and Nuts:
   1. Regular hexagon-head annealed stainless-steel bolts, nuts and, where specified, flat washers; ASTM F593, AISI Type 316, Condition CW for bolts and ASTM F594 for AISI Type 316, Condition CW nuts.
   2. All threads on stainless steel rods/bolts shall be protected with antiseize lubricant suitable for submerged stainless bolts and complying with Federal Specification MIL-A-907E.

C. Machine Screws:
   1. ASME B 18.6.3.

D. Plain Washers:
   1. Round, ASME B 18.22.1.

E. Lock Washers:
   1. Helical, spring type, ASME B 18.21.1.

F. Cast-in-Place Stainless Steel Anchors in Concrete:
   1. Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing as specified in ASTM E488, conducted by a qualified independent testing agency.
   2. Heavy hexagon-head annealed stainless-steel bolts, nuts and, where specified, flat washers. ASTM F593, AISI Type 316, Condition CW for bolts and ASTM F594 for AISI Type 316, Condition CW nuts.
   3. Where plate washers are indicated on Drawings, plate washers shall be type AISI Type 316, w/ surface of aluminum base plate protected with Mylar isolators or other protective system, as approved by the Engineer.

G. Post-Installed Anchors:
   1. See Section 05 05 19 - Post-Installed Anchors.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes:
   1. Select as specified in AWS specifications for metal alloy welded.

B. Shop Primers:
   1. Provide primers that comply with Division 9 – Finishes.

C. Universal Shop Primer:
   1. Fast-curing, lead-free and chromate-free, universal modified-alkyd primer complying with MPI#79.
   2. Use primer with a VOC content of 420 g/L (3.5 lbs/gal.), or less when calculated as specified in 40 CFR 59, Subpart D (EPA Method 24).
   3. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Zinc-Rich Primer:
   1. See SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
   2. Use primer with a VOC content of 420 g/L (3.5 lbs/gal.), or less when calculated as specified in 40 CFR 59, Subpart D (EPA Method 24).

   3. Available Manufacturers and Products:
      a. Benjamin Moore & Co.
         Epoxy Zinc-Rich Primer CM18119
      b. Carboline Company
         Carbozinc 621

c. ICI Devoe Coatings
Catha-Coat 313
d. International Coatings Limited
Interzinc 315 Epoxy Zinc-Rich Primer
e. PPG Architectural Finishes, Inc.
Aquapon Zinc-Rich Primer 97-670
f. Sherwin-Williams Company (The)
Corothane I GalvaPac Zinc Primer
g. Tnemec Company, Inc.
Tneme-Zinc 90-97

E. Galvanizing Repair Paint:
1. High-zinc-dust-content paint for re-galvanizing welds in steel, as specified in SSPC-Paint 20.

F. Stainless Steel Cleaner:
1. As specified in ASTM A380 Ferroxyl Test for Free Iron.
2. Available Products and Manufacturers:
a. Bradford Derustit Corp.
Derustit SS-3 Wondergel
b. Or Approved Equal.

G. Bituminous Paint:
1. Cold-applied asphalt emulsion as specified in ASTM D1187.

H. Non-Shrink, Nonmetallic Grout:
1. Factory-packaged, nonstaining, noncorrosive, nongaseous grout as specified in ASTM C1107.
2. Provide grout specifically recommended by Manufacturer for interior and exterior applications and as specified in Section 03 60 00 - Grout.

I. Concrete Materials and Properties:
1. See Section 03 30 00 – Cast-In-Place Concrete

2.7 FABRICATION, GENERAL

A. Shop Assembly:
1. Preassemble items in the shop to greatest extent possible.
2. Disassemble units only as necessary for shipping and handling limitations.
3. Use connections that maintain structural value of joined pieces.
4. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately.

C. Remove burrs and ease edges to a radius of approximately 1/32 in, unless otherwise specified.

D. Remove sharp or rough areas on exposed surfaces.

E. Form bent-metal comers to smallest radius possible without causing grain separation or otherwise impairing work.

F. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

G. Weld comers and seams continuously as specified:

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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise specified. Locate joints where least conspicuous.

I. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

J. Cut, reinforce, drill, and tap metal fabrications as specified to receive finish hardware, screws, and similar items.

K. Provide for anchorage of type specified; coordinate with supporting structure, and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
1. Where units are indicated to be cast into concrete, equip with integrally welded steel strap anchors, 1/8 in. by 1 1/2 in, with a minimum 6 in. embedment and 2 in. hook, NOT less than 8 in. from ends and corners of units and 24 in. o.c., unless otherwise specified.

2.8 METAL LADDERS

A. General:
1. See the more stringent requirements of OSHA and ANSI A14.3, unless otherwise specified.
2. Space side rails 16 in. clear apart, unless otherwise specified.
3. Support each ladder at top and bottom and NOT more than 60 in. o.c, with welded or bolted brackets, made from same metal as ladder.
4. All ladders including ladders less than 20 ft in height shall be equipped with an integral fall protection system.

B. Extension (Popup):
1. Every ladder that does NOT have an exterior hand hold shall be equipped with a popup extension designed by the ladder manufacturer.
2. Popup extension shall be of the same material and finish as the ladder with telescoping tubular section that locks automatically when fully extended.
3. Upward and downward movement shall be controlled by stainless steel spring balancing mechanisms.
4. Units shall be completely assembled with fasteners for securing to the ladder rungs as specified in the manufacturer’s recommendations.

C. Fall Prevention System (Ladder):
1. All ladders, including ladders less than 20 ft in height, shall be equipped with an integral fall prevention system. The fall prevention system at each ladder shall include a permanent metal carrier rung/rail, carrier rung/rail extension as required, sliding sleeve arresting unit, ladder rung clamps, full body harness, dismount section and all other components as necessary for complete installation and system to comply with OSHA and ANSI A14.3 standards and requirements.
2. The fall prevention system manufacturer shall design each fall prevention system, coordinate with the ladder manufacturer, and submit the fall prevention system design and detailed plans to the Engineer for approval.
3. The carrier rung/rail shall be Type 316 stainless steel or aluminum-alloy 6105-T5.

4. Carrier rung/rail extensions shall be provided for safe ladder access and egress. The total carrier rung/rail length shall be as designed by the fall prevention system manufacturer.
    a. Available Manufacturers:
        1) Sellstorm Manufacturing
        2) North Safety Products, Ltd.
        3) Or Approved Equal.

D. Stainless Steel Ladders:
1. Side rails: Continuous, 1/2 in. by 2 1/2 in. steel flat bars, with eased edges
2. Rungs: 3/4 in. steel bars
3. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
4. Rung spacing shall NOT exceed 12 in. on center.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
7. Available Products:
    a. IKG Industries, a Harsco company; Mebac
    b. W. S. Molnar Company; SlipNOT

E. Aluminum Ladders:
1. Side rails: Continuous extruded-aluminum channels or tubes, NOT less than 2 1/2 in. deep, 3/4 in. wide, and 1/8 in. thick
2. Rungs: Extruded-aluminum tubes, NOT less than 3/4 in. deep and NOT less than 1/8 in. thick, with ribbed tread surfaces
3. Fit rungs in centerline of side rails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets
4. Rung spacing shall NOT exceed 12 in. on center

2.9 ALUMINUM PLANK

A. Acceptable Manufacturers:
1. Ohio Gratings Inc.
2. McNichols Co.
3. Amico, a Gibraltar Industries Co.
4. Harsco Industrial IKG
5. Or approved equal.

B. Materials:
1. Plank and banding are Aluminum type 6061-T6, ASTM B221.
2. Description:
    a. Unpunched, Aluminum Heavy Duty Plank Grating: 6 in. wide extruded aluminum plank with support bars spaced 1.2 in. on center, fabricated with banding into panels of standard width to fill areas specified in the Drawings.
        1) Top Surface: Slip resistant
        2) Finish: Mill finished
        3) Plank Type: Unpunched
        4) Plank Depth: based on loading requirements and clear span.

2.10 METAL FLOOR PLATE

A. Also referenced as “Checkered”, "Diamond", or “Check” Plate, with raised lugs on one side and smooth surface on other side.

B. Fabricate from roller-aluminum-alloy 6061-T6, ASTM B632 plate of thickness specified below Raised lug pattern shall be on top and start at 45-degree angle to edge of plate or tread.

C. Design and provide stainless steel or aluminum angle and/or aluminum beam supports, as specified, or as required and NOT specified.

D. Include stainless steel or aluminum angle stiffeners and fixed and removable sections, as specified or required.

E. Provide flush stainless-steel bar drop handles for lifting removable sections one at each end of each section.

F. Floor plate, including all support members, reinforcement ribs, stiffeners, edge members, supports and all structural requirements shall be designed by a Professional Engineer licensed in the State of the Work and provided by the manufacturer/fabricator of the floor plate.

G. Floor plate shall be fabricated with integral fitting for attachment to FRP pipe above. See drawings for schematic detail and additional load criteria.

H. The maximum fiber stress shall NOT exceed that which is allowed by the Aluminum Association.

I. Contractor shall submit sealed shop drawings complete with details and calculations to the Engineer for review prior to fabrication. Submittal data shall be complete with detail and calculations to determine all components of the floor plate system, including plate, reinforcing ribs, supports, rib pattern, connections, and others as necessary.

J. All ends and openings shall be banded.

K. Provide 1/4 in. neoprene gaskets for all sealed or odor control floor plate coverings as/where specified.

L. The weight of a floor plate section shall NOT exceed 80 lbs.

M. Aluminum surfaces in contact with concrete, grout, or dissimilar metals shall be protected with a coat of bituminous paint, Mylar isolators or other protective system, as approved by the Engineer.

N. Where indicated on drawings, hatches replacing existing shall re-use existing mounting hardware to concrete the greatest extent permitted by applied design loading. Contractor shall field verify existing condition prior to plate fabrication.

O. Available Manufacturers
   1. Thompson Fabricating, LLC;
      Tarrant, AL
   2. Or Approved Equal.

2.11 METAL BOLLARDS

A. Fabricate metal bollards from steel shapes as specified.

2.12 ABRASIVE METAL NOSINGS AND TREADS

A. Cast-Metal Units:

1. Cast aluminum, with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
2. Manufacturers:
    a. American Safety Tread Co., Inc.
    b. Baleo Inc.
    c. Barry Pattern & Foundry Co., Inc.
    d. Granite State Casting Co.
    e. Safe-T-Metal Co.
    f. Wooster Products Inc.
3. Nosing: Cross-hatched units, 4 in. wide with 1/4 in. lip, for casting into concrete steps.
4. Nosing: Cross-hatched units, 1 1/2 in. by 1 1/2 in, for casting into concrete curbs.
5. Treads: Cross-hatched units, full depth of tread with 3/4 in. by 3/4 in. nosing, for application over bent plate treads or existing stairs.

B. Extruded Units:
1. Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
2. Available Manufacturers:
    a. ACL Industries, Inc.
    b. American Safety Tread Co., Inc.
    c. Amstep Products
    d. Armstrong Products, Inc.
    e. Baleo Inc.
    f. Granite State Casting Co.
    g. Wooster Products Inc.
3. Provide ribbed units, with abrasive filler strips projecting 1/16 in. above aluminum extrusion.
4. Provide solid-abrasive-type units without ribs.
5. Nosing: Square-back units, 3 in. wide, for casting into concrete steps.
6. Nosing: Beveled-back units, 3 in. wide with 1 3/8 in. lip, for surface mounting on existing stairs.
7. Nosing: Two-piece units, 3 in. wide, with sub channel for casting into concrete steps.
8. Treads: Beveled-back units, full depth of tread with 1 3/8 in. lip, for application over existing stairs.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with Manufacturer.

D. Drill for mechanical anchors and countersink. Locate NOT more than 4 in. from ends and NOT more than 12 in. o.c., evenly spaced between ends, unless otherwise specified. Provide closer spacing if recommended by Manufacturer.
1. Provide two rows of holes for units more than 5 in. wide, with two holes aligned at ends and intermediate holes staggered.

E. Apply bituminous paint, Mylar isolators or other protective system as approved by the Engineer to concealed bottoms, sides, and edges of cast-metal units set into concrete.

2.13 FINISHES, GENERAL

A. See NAAMM “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.14 STAINLESS–STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Satin Finish:
   1. No.4

D. Dull Satin Finish:
   1. No.6

E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

F. Passivate Complete Fabrications prior to shipping to site with Stainless Steel Cleaner.

G. Passivate field welded assemblies after welding with Stainless Steel Cleaner.

2.15 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish:
   1. AA-M10 (Mechanical Finish: as fabricated, unspecified)

C. Class 1, Clear Anodic Finish:
   1. AA-M12C22A41 (Mechanical Finish: non-specular as fabricated
   2. Chemical Finish: etched, medium matte
   3. Anodic Coating: Architectural Class 1, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedment, with framing erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep framing secure, plumb, and in alignment against temporary construction loads. Remove temporary supports when permanent framing and connections are in place, unless otherwise indicated.

3.3 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement:
   1. Perform cutting, drilling, and fitting required for installing metal fabrications.

2. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are NOT to be left as exposed joints but CANNOT be shop welded because of shipping size limitations. DO NOT weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding:
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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction:
1. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
2. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or similar construction.

F. Protection:
1. Coat concealed surfaces of aluminum that will encounter grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.4 INSTALLING BEARING AND BASE PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces.

B. Clean bottom surface of plates.

C. Set bearing and leveling plates on wedges, shims, or leveling nuts.

D. After bearing members have been positioned and plumbed, tighten anchor bolts.

E. DO NOT remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
1. Use non-shrink grout, nonmetallic, in concealed locations where NOT exposed to moisture; use non shrink, nonmetallic grout in exposed locations, unless otherwise specified.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 INSTALLING METAL BOLLARDS

A. Anchor bollards in concrete as specified.

B. Anchor bollards in place with concrete footings.

C. Center and align bollards in holes 3 in. above bottom of excavation.

D. Place concrete and vibrate or tamp for consolidation.

E. Support and brace bollards in position until concrete has cured.

F. Fill bollards solidly with concrete, mounding top surface to shed water.
   1. DO NOT fill removable bollards with concrete.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting as specified in SSPC-PA 1 for touching up shop-painted surfaces.
   2. Apply by brush or spray to provide a minimum 2.0 mil dry film thickness.

B. Touchup Painting:
   1. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 90 00 – Painting and Protective Coatings.

C. Galvanized Surfaces:
   1. Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

SECTION 05 52 13 – PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Aluminum pipe railings

B. Related Sections:
   1. Section 05 50 00 – Metal Fabrications
   2. Section 09 90 00 – Painting and Protective Coatings

1.2 PERFORMANCE REQUIREMENTS

A. General:
   1. In engineering railings to withstand structural loads specified, determine allowable design working stresses of railing materials based on:
      a. For aluminum, the lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.

B. Structural Performance:
   1. Provide railings capable of withstanding the effects of gravity loads and the loads and stresses within limits and conditions specified.
   2. Handrails:
      a. Uniform load of 50 lbf/ft applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need NOT be assumed to act concurrently.
   3. Top Rails of Guards:
      a. Uniform load of 50 lbf/ft (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need NOT be assumed to act concurrently.
   4. Infill of Guards:
      a. Concentrated load of 200 lbf (0.89 kN) applied horizontally on an area of 1 ft^2.
      b. Uniform load of 25 lbf/ft^2 applied horizontally.
      c. Infill load and other loads need NOT be assumed to act concurrently.

C. Thermal Movements:
   1. Provide exterior railings that allow for thermal movements resulting from the maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   2. Base the engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   3. Temperature Change (Range):
      a. 120°F, ambient
      b. 180°F, material surfaces

D. Control of Corrosion:
   1. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Grout, anchoring cement, and paint products.

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

D. Samples for Initial Selection:
   1. For products involving selection of color, texture, or design.

E. Samples for Verification:
   1. Sections of each distinctly different linear railing member, 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 finishing and connecting members at intersections.

F. Mill Certificates:
   1. Signed by Manufacturers of stainless-steel products certifying that products furnished comply with requirements.

G. Welding certificates.

H. Qualification Data:
   1. For testing agency.

I. Product Test Reports:
   1. Based on evaluation of comprehensive tests performed by a qualified testing agency, as specified in ASTM E894 and ASTM E935.

1.4 QUALITY ASSURANCE

A. Source Limitations:
   1. Obtain each type of railing through one source from a single Manufacturer.

B. Welding:
   1. AWS D1.1 – "Structural Welding Code – Steel."
   2. AWS D1.2 – "Structural Welding Code – Aluminum."
   3. AWS D1.6 – "Structural Welding Code – Stainless Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements:
   1. Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements CANNOT be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
   3. Provide allowance for trimming and fitting at site.

1.6 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings.
   1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
   2. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. DO NOT support railings temporarily by any means that DO NOT satisfy structural performance requirements.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers are subject to requirements. Choose ONE of the manufacturers listed.

B. Available Manufacturers:
   1. Thompson Fabricating LLC,
      Tarrant, AL
   2. Approved equal.

2.2 METALS, GENERAL

A. Metal Surfaces, General:
   1. Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors:
   1. Cast or formed metal of same type of material and finish as supported rails, unless otherwise specified.

2.3 ALUMINUM

A. Aluminum, General:
   1. Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish specified, and with NOT less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Structural Pipe and Round Tubing:
   1. ASTM B429, Alloy 6063-T6.
   2. Provide Standard Weight (Schedule 40) pipe, unless otherwise specified.

C. Drawn Seamless Tubing:
   1. ASTM B210, Alloy 6063-T832.

D. Plate and Sheet:
   1. ASTM B209, Alloy 6061-T6.

E. Die and Hand Forgings:
   1. ASTM B247, Alloy 6061-T6.

F. Castings:
   1. ASTM B26, Alloy A356.0-T6.

2.4 RAIL AND POSTS

A. Nominal 1 1/2 in. diameter.

B. Rails:
   1. 1.900 in. outside diameter by 0.145 in. wall thickness. Schedule 40.

C. Posts:
   1. 1.900 in. outside diameter by 0.200 in. wall thickness. Schedule 80.

2.5 FITTINGS

A. Top Mount Base:
   1. Cast Aluminum
   2. For holes in base for concrete anchors
   3. For narrow walls or curbs, furnish two holes in base for concrete anchors with required edge distance.
   4. Manufacture and Products:
      a. Thompson Fabricating LLC
         Part No. TBF-3.4
      b. Thompson Fabricating LLC
         Part No. TBF-3.2 for narrow walls and curbs.

B. Handrail and Post Fittings:
   1. Extruded, machined bar stock, permanent mold casting, or die castings of sufficient strength to meet load requirements.
   2. Fittings shall match color of pipe in handrails.
   3. Sand cast parts NOT permitted.

C. Side Mounted Handrail Bracket:
   1. Extruded aluminum, Alloy 6063-T6 with four holes for bolts or concrete anchors.
   2. Manufacturer and Product: Thompson Fabricating LLC; Part TSM-1.50

D. Handrail Connections to Metal Stairway Stringers:
   1. Extruded aluminum bracket, Alloy 6060-T6
   2. Brackets and bolts 1/2 in. diameter Type 304 or 316 stainless steel bolts.
   3. Offset adjustable stir fitting of cast Al-mag, Part No. ASF

E. Handrail Connections to Metal Beams:
   1. Extruded aluminum bracket, Alloy 6060-T6
   2. Bracket bolts 1/2 in. diameter Type 304 stainless steel bolts.
   3. Manufacturer and Products: Thompson Fabricating LLC; Part Nos. SMB-2 or SMB-3. Use part no. TSM-1.50 if bracket is attached to flat side of a channel.

F. Handrail Wall Brackets:
   1. Cast Al-mag aluminum bracket, Par No. AWF adjustable wall fitting, with provision for three 3/8 in. Type 304 stainless steel bolts or concrete anchors.
   2. Manufacturer and Product: Thompson Fabricating LLC; Part No. AWF.

G. Miscellaneous Rail to Post Fitting:
   1. Cast Aluminum Tee Fitting: Part Nos. TF-1 and TX-1
   2. Cast Aluminum Ell Fitting: Part Nos. TE-1, TE-2, and TE-3

3. Aluminum Splice Lock: Part No. SL-1
4. Aluminum Expansion Joint Splice: Part No. CF-2
5. Manufacturer: Thompson Fabricating LLC

H. Handrail Gate:
1. Furnish 6063-T6, 6105-T5, or 6061-T6 extruded aluminum
2. Manufacturer: Thompson Fabricating LLC

I. Toeboards and Accessories:
1. Molded or extruded 6063 or 60621 aluminum
2. Manufacturer:
a. Thompson Fabricating LLC

J. Casting for Handrails:
1. Cast Al-mag with sufficient strength to meet load and test requirements. Anodizable grade finish with excellent resistance to corrosion when subject to exposure of sodium chloride solution intermittent spray and emersion.

K. Concrete Embedded Metal Anchorage:
1. As specified in Section 05 50 00 – Metal Fabrications.

2.6 FASTENERS

A. General:
1. Provide:
a. As specified in Section 05 50 00 – Metal Fabrications.
b. Aluminum Railings: Type 304 or 316 stainless-steel fasteners.

B. Locknuts, Washers, and Screws:
1. Elastic Locknuts, Steel Flat Washers, RHMS Rounded Head Machine Screws; Type A 304 or A 316 stainless steel.
2. Flat Washers: Molded Nylon
3. Manufacturer:
a. Mc-Master-Carr Supply Co.

C. Concrete Anchors:
1. Stainless steel Type 304 or 316. Use ICBO approved service load allowable values for size, length, embedment, spacing, and edge distance to match required loads shown in calculations.

D. Epoxy Anchors Heavy Duty 1/2 in. diameter, for exterior use only.

2.7 FABRICATION

A. General:
1. Fabricate railings to comply with requirements specified for design, dimensions, member sizes and spacing, details, finish, and anchorage, but NOT less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 in. unless otherwise specified. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that shall be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as specified to receive finish hardware, screws, and similar items.

G. Nonwelded Connections:
   1. Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   2. Fabricate splice joints for field connection using an epoxy structural adhesive if this is Manufacturer's standard splicing method.

H. Close exposed ends of railing members with prefabricated end fittings.

I. Provide wall returns at ends of wall-mounted handrails, unless otherwise specified. Close ends of returns unless clearance between end of rail and wall is 1/4 in. or less.

J. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

K. For railing posts set in concrete, provide steel sleeves NOT less than 6 in. long with inside dimensions NOT less than 1/2 in. greater than outside dimensions of post, with steel plate forming bottom closure.

L. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to NOT more than 1/40 of post height. Provide socket covers designed and fabricated to resist being dislodged.
   1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations specified.
   2. Fabricate from same metal as railings.

M. Toeboards:
   1. Where specified, provide toe boards at railings around openings and at edge of open-sided floors and platforms.
   2. Fabricate to dimensions and details specified.
   3. Dimension between bottom of toeboard and walking surface NOT to exceed 1/4 in.

2.8 FINISHES, GENERAL

A. See NAAMM – "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work:
   1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within 1/2 of the range of approved Samples.

2. Noticeable variations in the same piece are NOT acceptable.
3. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.9 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
1. Handrail Pipe and Posts: As specified in AA 45, designation AA-M32-C22-A41.
2. Cast Fittings and Toeboards: As specified in AA 45, designation AA-M10-C22-A41.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if NOT already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints and as specified in Manufacturers written instructions.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
1. DO NOT weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 in. in 3 ft.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members DO NOT exceed 1/4 in. in 12 ft.

C. Corrosion Protection:
1. Prevent galvanic action and other forms of corrosion caused from direct contact with concrete and dissimilar metals by coating metal surfaces as specified in manufacturers' recommendations and Section 09 90 00 – Painting and Protective Coatings.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction:
1. Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

F. Mount handrails only on completed walls. DO NOT support handrails temporarily by means NOT satisfying structural performance requirements.

3.3 RAILING CONNECTIONS

A. Set rails horizontal or parallel to slope of steps. Install posts and rails in the same plane. Remove projects or irregularities and provide smooth surface for sliding hand continuously

along top rail. Use offset rail for use on stairs and platforms if post is attached to web of stringers or structural platform supports.

B. Expansion Joints:
   1. Install expansion joints at locations specified but NOT farther apart than required to accommodate thermal movement, maximum interval of 54 ft on center and at structural joints. Provide slip-joint internal sleeve extending 2 in. beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 in. of post.

3.4 ANCHORING POSTS

A. Where specified, use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves fill annular space between the post and sleeve with non-shrink, nonmetallic grout, or anchoring cement mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes NOT less than 5 in. deep and 3/4 in. larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout, or anchoring cement, mixed and placed to comply with anchoring material per Manufacturer's written instructions.

C. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8 in. buildup, sloped away from post.

D. Where specified, anchor posts with fittings engineered for anchoring posts to concrete.

E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members:
   1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.

F. Install removable railing sections, where specified, in slip-fit metal sockets cast in concrete.

G. Anchor bolts shall be stainless steel.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide brackets with 1 1/2 in. clearance from inside face of handrail and finished wall surface.
   1. Use type of bracket with predrilled hole for exposed bolt anchorage.

B. Locate brackets as specified or, if NOT specified, at spacing required to support structural loads.

C. Secure wall brackets to building construction:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.

3.7 ADJUSTING AND CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing Manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that CANNOT be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION

SECTION 05 53 00 – METAL GRATINGS AND PLANK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Metal gratings and aluminum plank

B. Related Sections:
   1. Section 05 50 00 – Metal Fabrications
   2. Section 05 51 00 – Metal Stairs
   3. Section 09 90 00 – Painting and Protective Coatings

1.2 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings:
   1. Include plans, elevations, sections, details, supports and attachment to other work.
   2. Grating and Plank: Show dimensions, weight, and location of connections to adjacent grating, supports, and other Work.
   3. Grating and Plank Supports: Show dimensions, size, location, and anchorage to supporting structure.
   4. Catalog information and catalog cuts.
   5. Manufacturer's specifications, to include coatings.

C. Quality requirements Submittals:
   1. Special handling and storage requirements.
   2. Installation instructions.
   3. Factory test reports.
   4. Manufacturer's Certification of Compliance for specified products.
   5. Written Test Report that swaged crossbars, if used on grating, meet the requirements of the specified test and additional requirements of these Specifications.

1.3 REFERENCES

A. AASHTO:
   1. Standard Specifications for Highway Bridges, latest edition.

B. ASTM International:
   1. A36 – Standard Specification for Structural Steel.
   2. A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware (R 1987).
   4. A193 – Standard Specification for Alloy-Steel and Stainless-Steel Bolting Materials for High-Temperature Service.
   5. A194 – Standard Specification for Carbon and Alloy-Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
   6. A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   7. A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

8. A1011-17 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High-Strength.
9. B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
10. F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

C. NAAMM (National Association of Architectural Metal Manufacturers):
1. ANSI MBG 531 – Metal Bar Grating Manual.
2. ANSI MBG 532 – Heavy-Duty Metal Bar Grating Manual.

1.4 PREPARATION FOR SHIPMENT

A. Factory assemble items to ensure proper fit before shipping to job site.

B. Package and clearly tag parts and assemblies that are of necessity shipped unassembled and protect the materials from damage and facilitate identification and final assembly in the field.

1.5 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 FOOT TRAFFIC GRATING

A. Size:
1. As specified in Drawings.

B. Type:
1. A-19-4, unless otherwise specified.

C. Weight:
1. No section shall weigh more than 150 lbs.

D. Material:
1. Aluminum Bar Type Grating:
a. Swage locked aluminum I-bar grating, as manufactured by:
1) Thompson Fabricating, LLC, Tarrant, AL
2) Ohio Gratings, Inc., Canton, OR
3) Or Approved Equal.
2. Galvanized Steel Bar Type Grating:
a. Press-locked, deep rectangular crossbar design, as manufactured by:
1) IKG/Borden, Clark, NJ; Type B or Type F.

2.2 LIGHT VEHICULAR TRAFFIC GRATING

A. Size:
1. As specified in Drawings.

B. Type:
1. W-15-4, unless otherwise specified.

C. Weight:
   1. No section shall weigh more than 150 lbs.

D. Material:
   1. Aluminum Bar Type Grating:
      a. Press-locked deep rectangular crossbar design as manufactured by:
         1) IKG/Borden, Clark, NJ, IKG/Borden; Type B or Type F.
   2. Galvanized Steel Bar Type Grading:
      a. After Fabrication: ASTM A123, zinc coating.
      b. Heavy-weld type HWF or type HWB or press-locked, rectangular crossbar design as manufactured by:
         1) IKG/Borden,
            Clark, NJ
            IKG/Borden, Type FJ or BJ.

2.3 HEAVY VEHICULAR TRAFFIC GRATING

A. Size:
   1. As specified on the Drawings.

B. Type:
   1. High Load Capacity (HLC), unless specified otherwise.

C. Material:
   1. Galvanized Steel Bar Type:
      a. After Fabrication: ASTM A123, zinc coating.
      b. Heavy-weld type HWF or type HWB or press-locked, rectangular crossbar design as manufactured by:
         1) IKG/Borden, Clark, NJ; IKG/Borden, Type FJ or BJ.

2.4 ALUMINUM PLANK

A. Manufacturers (Subject to Requirements):
   1. Ohio Gratings Inc.
   2. Grating Pacific, Inc.
   3. Harsco Industrial IKG
   4. McNichols Co.
   5. Or Approved Equal.

B. Materials:
   1. Planks and banding are Aluminum-Alloy 6063-T6, ASTM B221.
   2. Description:
      a. Heavy-Duty, Extruded Aluminum Plank.
      b. All ends to be banded.
   3. Type(s):
      a. As specified in Drawings.
      b. Include:
         1) Interlocking and Unpunched
         2) Unpunched
         3) Diagonally punched with approximately 8% openings
   4. Top Surface:
      a. Manufacturer’s standard slip-resistant finish.
   5. Finish:
      a. Mill Finish.
   6. Fabrication and Tolerances:
      a. As specified in NAAM Metal Bar Grating Manual.

7. Depth:
    a. As specified in Drawings.
8. Loading:
    a. As specified in Drawings.
9. Weight:
    a. No section shall weigh more than 150 lbs.

2.5 ACCESSORIES

A. Anchor Bolts and Nuts:
1. Carbon Steel: ASTM A307 or A36.
2. Stainless Steel: ASTM A193 and ASTM A194, Type 316.
3. Galvanized Steel Bolts and Nuts: ASTM A153, zinc coating for ASTM A307 or A36.

B. Flat Washers (Unhardened):
1. ASTM F844; use ASTM A153 for zinc coating.

C. Removable Fastener Clips and Bolts:
1. Removable from above grating walkway surface
2. Material: To match Plank or Grating material
3. Type(s):
    a. Saddle clips
    b. Z clips
    c. Plank clips
    d. Plank lugs
    e. Countersunk land

2.6 FABRICATION

A. General:
1. Exposed Surfaces: Smooth finish and sharp, well-defined lines
2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in a neat, substantial manner.
3. Conceal fastenings where practical.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Weld Connections: NOT permitted on grating except at banding bars.

B. Sizing:
1. Field measure areas to receive grating, verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.
2. Section Length: Sufficient to prevent falling down through clear opening when oriented in the span direction when one end is touching either the concrete or the vertical leg of grating support.
3. Minimum Bearing: ANSI/NAAMM MBG 531.
4. Metal Crossbar Spacing: 4 in. maximum, unless otherwise shown or specified.
5. Crossbars: Flush with top of main bar and extend downward a minimum of 50% of the main bar depth.
    a. Swaged Crossbars:
        1) Within 1/4 in. of top of grating with 1/2 in. minimum vertical dimension after swaging, and minimum before swaging dimension of 5/16 in^2.
        2) Crossbar Dimension After Swaging: Minimum 1/8 in. wider than the opening at minimum of two comers at each side of each square opening in main bar.
        3) Crossbars may be a special extruded shape so that after swaging the top shall be flat, 3/16 in. wide and shall be flush with the top surface of the bearing bars for a minimum of 5/8 in. at center between bearing bars.

4) Flush crossbar meeting all the above except that after swaging shall overlap one comer by a minimum of 1/8 in. A sample of one bearing bar and one crossbar shall be tested by holding the bearing bar and pulling on the crossbar. The crossbar to bearing bar shall sustain a minimum of 300 lbs. without pullout of the bearing bar.
5) Tightly fit main bars and crossbars allowing no differential movement.

6. DO NOT use weld type crossbars.
7. Banding: All ends to be banded with same material as grating or plank; ANSI/NAAMM MBG 531 and ANSI/NAAMM MBG 532.
8. Furnish stainless steel Type 316 threaded anchor studs, as fasteners for grating or plank attachment to metal supports either NOT embedded or partially embedded in concrete.

C. Supports:
1. Seat angles and beams where shown:
a. Material: To match grating or plank
b. Extruded aluminum frame with slot for recessed grating clips
2. Coordinate dimensions and fabrication with grating or plank to be supported.
3. Welded Frames with Anchors: Continuously welded

D. Slip-Resistant Surface:
1. Approved Manufacturers:
a. Rectangular Aluminum Bar Grating:
1) IKG/Borden
Clark, NJ
EZ Weldslip-Resistant Coating.
2) Seidelhuber Metal Products, Inc.
Hayward, CA
Safety Grit Nonslip System.
3) Ohio Gratings, Inc.
Canton, OH
“Slip-Not” Safety Surface manufactured by W.S. Molnar Co., Detroit, MI.
b. I-Bar grating aluminum with a striated antiskid walking surface produced during the extrusion process:
1) IKG/Borden
Clark, NJ.
2) Seidelhuber Metal Products, Inc.
Hayward, CA.
3) Klemp Corp.
Chicago, IL.

E. Aluminum:
1. ASTM B221 extruded shapes.
2. Fabricate as specified in Manufacturer’s recommendations.
3. Grind smooth sheared edges exposed in the finished work.
4. Swage crossbars, if used, with equipment strong enough to deform crossbars.
5. Eliminate any loose crossbar intersections on swaged grating.

PART 3 - EXECUTION

3.1 PREPARATION

A. Electrolytic Protection:
1. Aluminum in contact with dissimilar metals, other than stainless steel, or in contact with masonry, grout, or concrete shall be coated with a bituminous coating as specified in Section 09 90 00 – Painting and Protective Coatings.
2. Allow paint to dry before installation of the material.

3.2 INSTALLATION

A. Install supports such that grating or plank sections have a solid bearing on both ends, and that rocking or wobbling movement does NOT occur under designed traffic loading.

B. Install plumb or level as applicable.

C. Install welded frames with anchors to straight plane without offsets.

D. Anchor grating or plank securely to supports using minimum of four fastener clips and bolts per grating or plank section.

E. Use stainless steel anchors and accessories with aluminum gratings.

F. Completed installation shall be rigid and neat in appearance.

G. Wherever grating or plank is pierced by pipes, ducts, and structural members, cut openings neatly and accurately to size and weld a rectangular band bar of the same height and material as bearing bars.

H. Cutouts for circular openings are to be 2 in. larger in diameter than the obstruction. Cutouts for all piping 4 in. or less shall be made in the field.

I. All rectangular cutouts are to be made to the next bearing bar beyond the penetration with a clearance NOT to exceed bearing bar spacing.

J. Commercially Manufactured Products:
   1. Install as specified in Manufacturer's recommendations.
   2. Secure grating or plank to support members with fasteners.
   3. Fasteners: Field locate and install.
   4. Permit each grating section or plank style grating assembly to be easily removed and replaced.

K. Protect all painted surfaces during installation.

L. Should coating become marred, prepare, and touch up surface as specified in paint Manufacturer's instructions.

END OF SECTION

DIVISION 6

WOOD AND PLASTICS

SECTION 06 80 17 – FIBERGLASS REINFORCED PLASTIC FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Fiberglass reinforced plastic fabrications:
      a. Headworks covers
      b. Framing Members for Hatches and Duct Supports

B. Furnish all labor, materials, equipment and incidentals governed by this section necessary to install the FRP products as specified herein.

C. Related Sections:
   1. Section 02 41 00 - Demolition.
   2. Section 05 05 19 - Post-Installed Anchors.

1.2 REFERENCES

A. ASTM International:
   1. D635 - "Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position"
   2. E-84 - "Standard Test Method for Surface Burning Characteristics of Building Materials"

B. ISO:
   1. 9001 - "Quality Management Systems - Requirements".

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data
   1. FRP Manufacturer's data showing materials of construction, dimensions, and loading capacity.
   2. Manufacturer's catalog information, descriptive literature, specifications, and identification of materials of construction.

C. Shop Drawings:
   1. Detailed structural drawings showing the equipment fabrications and interface with other items. Include dimensions, size, and details of anchorage and of connections to other work, and weights of associated equipment.
   2. Submit certified test reports of manufactured laminates, as specified herein.
   3. Detailed Calculations for compliance with Design Criteria signed and sealed by Professional Engineer in the State of Alabama for all fabricated/ modified covers, new support framing, and existing fabrications and support framing affected by the new framing conditions.

D. Quality Requirements Submittals:
   1. Manufacturer's Certificate of Compliance: Commercial products, including painting/coating systems.
   2. Special shipping, storage and protection, and handling instructions.
   3. Test procedures.
   4. Test results, reports, and certifications.
   5. Manufacturer's Certificate of Proper Installation.

6. Operation and maintenance manual.

E. Contract Closeout Submittals:
1. Service records for maintenance performed during construction.

1.4 DESIGN CRITERIA

A. The design of FRP covers, support framing, and existing FRP fabrications affected by the new framing conditions, including connections, shall be in accordance with governing building codes and standards as applicable.

B. Design live loads shall comply with the following:
1. 100 psf uniformly distributed across panel surface. Pattern loading applied to continuous elements shall be considered.
2. 1000 lb concentrated to any 12"x12" area on panel surface.

C. Design unfactored (1.0xWL) wind uplift pressure shall be 140 psf uniformly distributed across panel surface.

D. FRP panels shall not deflect more than 1/4" under unfactored live loading.

E. FRP panels weakened by penetrations, cuts, etc. shall be stiffened or reinforced as necessary to restore their capacity to withstand the specified loading and deflection limits. See Drawings for penetration locations, dimensions, and schematic details.

F. Design planks in accordance with industry-standard material codes.

G. Panels shall be fabricated entirely of FRP members. Every panel to beam connection shall be chemical resistant and will NOT weaken or corrode. A mechanical and replaceable Santoprene or Neoprene seal shall isolate the cover perimeter from the concrete wall. No foam tape or caulk shall be allowed.

1.5 QUALITY ASSURANCE

A. The material covered by these specifications shall be furnished by an ISO 9001 certified manufacturer of proven ability who is regularly engaged in the manufacture, fabrication and installation of FRP systems.

B. Substitution of any component or modification of system shall be made only when approved by the EOR.

C. Fabricator Qualifications: Firm experienced in successfully producing FRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.

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

1.6 DELIVERY, STORAGE, AND HANDLING

A. All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.

B. All materials and equipment necessary for the fabrication and installation of pultruded panels and appurtenances shall be stored before, during, and after shipment in a manner to prevent

cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which exhibits one or more of the above conditions shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.

C. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.

D. Identify and match-mark all materials, items and fabrications for installation and field assembly.

1.7 OPERATION AND MAINTENANCE DATA

A. O&M Manuals:
   1. Content, format, and schedule for providing as specified in Section 01 77 00 – Closeout Procedures.

B. Maintenance Summary Forms:
   1. As specified in Section 01 77 00 – Closeout Procedures.

1.8 WARRANTY

A. Provide warranty for a period of 12 months after the final acceptance of the equipment by the Owner and Engineer. The warranty shall stipulate that the equipment furnished is suitable for the purpose intended and free from defects of material and workmanship for the duration of the warranty. In the event the equipment fails to perform as specified, the Manufacturer shall promptly repair or replace the defective equipment without additional cost to the Owner.

B. Spare parts identified within this specification shall NOT be used to address warranty repairs.

C. See Section 01 78 36 – Warranties and Bonds for additional requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. All FRP fabrications and accessories shall be shipped from the manufacturer, palletized and banded with exposed edges protected to prevent damage in shipment.

B. Each piece shall be clearly marked showing the manufacturer's applicable drawing number.

2.2 FRP PANELS, FRAMING, AND OTHER FABRICATIONS

A. Materials
   1. The panel dimensions and their attachments to supporting structure shall be verified in the field to be compatible with the existing panels to be reinstalled, including panel interlock, if applicable.
   2. The FRP panels shall be manufactured by the pultrusion process. The glass fiber reinforcement for the panels shall be a core of continuous glass strand rovings wrapped with continuous strand glass mat. A synthetic surface veil shall be the outermost layer covering the exterior surfaces.
   3. Fiberglass panels shall be made from a fire retardant (select premium polyester or vinyl ester) resin system that meets the flame spread rating of 25 or less in accordance with ASTM E-84, flammability characteristics of UL 94 V-0 and meets the self-extinguishing requirements of ASTM D635. UV inhibitors are added to the resin.
   4. Color shall match existing panels.

B. Design
1. The top surface of all panels shall have a non-skid grit.
2. Panel plan dimensions and thicknesses shall comply with drawings and this specification section.
3. Configuration and location of modified panel dimensions and notches for openings and penetrations shall be verified in field prior to fabrication.
4. Design shall provide for expansion and contraction due to climatic change without damage to FRP panels under the following ambient conditions:
   a. Winter Conditions (0F)
   b. Summer Conditions (110F)
5. The cover and accessories shall be resistant to corrosive atmosphere such as hydrogen sulfide gas and corrosive condensate containing sulfuric acid.
6. Panels shall be anchored for uplift in accordance with the Design Criteria listed in this Specification Section.
7. Existing FRP framing and panel layout shall be documented by the contractor prior to removal for partial reconstruction of the Headworks in accordance with Section 02 41 00-Demolition. Documentation shall include dimensions for span, spacing, cross sections, and connections. New construction shall be compatible with existing fabrications to be reinstalled.

2.3 EXISTING CONSTRUCTION

A. Design
1. Existing structural elements and their connections with demand-to-capacity ratios increased by more than 5 percent from the Work shall be identified and analyzed for the new loading conditions per ASCE 7-16 Appendix 11B.
2. Affected elements that do not meet the loading requirements of the Design Criteria shall be supplemented or reinforced by new construction to meet the loading requirements. Design of such construction shall be performed by the Professional Engineer responsible for the design of delegated FRP Fabrications.

2.4 HARDWARE

A. Materials
1. All fasteners shall be 316 stainless steel.
2. All connecting elements, such as plates and clip angles, shall be type 316 stainless steel or FRP, as required for connection design.

B. Design
1. Design of FRP framing connections to supporting members and anchorage to concrete structure for the loads required by the Design Criteria and on the Drawings shall be performed by the Professional Engineer responsible for the design of delegated FRP Fabrications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages, diagrams, templates, instructions and directions for installation of anchorages that are to be post-installed into existing concrete walls.

B. Coordinate delivery of all listed items to project site.

3.2 INSTALLATION, GENERAL

A. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as determined by the Professional Engineer responsible for the design of delegated FRP fabrications.

B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; measured from established lines and levels.

C. Install products where indicated on the Drawings and as specified in manufacturer's printed instructions.

3.3 ALL FRP INSTALLATION

A. If required, all field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer.

B. Install items specified as indicated and in accordance with manufacturer’s instructions.

3.4 EXAMINATION

A. Make sure the installation of product conditions are as specified in Section 01 60 00 – Product Requirements.

3.5 MANUFACTURERS SERVICES

A. Manufacturer’s representative shall complete a Certification of Proper Installation and provide copies to the Owner, Engineer, Contractor, and Manufacturing Facility.

END OF SECTION

DIVISION 7

THERMAL AND MOISTURE PROTECTION

SECTION 07 92 00 – JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Silicone joint sealants
   2. Urethane joint sealants
   3. Preformed joint sealants

1.2 SUBMITTALS

A. Product Data:
   1. For each joint-sealant product specified.

B. Samples for Initial Selection:
   1. Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification:
   1. For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2 in. wide joints formed between two 6 in. long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule:
   1. Joint-sealant application, joint location, and designation
   2. Joint-sealant manufacturer and product name
   3. Joint-sealant formulation
   4. Joint-sealant color

E. Qualification Data:
   1. For qualified Installer and testing agency.

F. Product Certificates:
   1. For each kind of joint sealant and accessory, from manufacturer.

G. Product Test Reports:
   1. Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

H. Preconstruction Compatibility and Adhesion Test Reports:
   1. From sealant manufacturer, specifying:
      a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
      b. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

I. Warranties:
   1. Sample of special warranties.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing:

1. Submit to joint-sealant manufacturers, for testing specified below, samples of materials that shall contact or affect joint sealants.
2. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
3. Submit NOT fewer than three pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
6. Testing shall NOT be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, NOT older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
1. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations:
1. Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing:
1. Test joint sealants using a qualified testing agency.
a. Testing Agency Qualifications: An independent testing agency qualified as specified in ASTM C1021 to conduct the testing.
b. Test as specified in SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Preinstallation Conference:
1. Conduct conference at Project Site.

1.5 PROJECT CONDITIONS

A. DO NOT proceed with installation of joint sealants under:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40°F;
2. When joint substrates are wet;
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications specified;
4. Where contaminants capable of interfering with adhesion have NOT yet been removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty:
1. Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that DO NOT comply with performance and other requirements specified in this section within specified warranty period.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty:

1. Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that DO NOT comply with performance and other requirements specified in this section within specified warranty period.
2. Warranty Period: Two years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from:
1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

D. See Section 01 78 36 – Warranties and Bonds for additional information.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

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

B. Liquid-Applied Joint Sealants:
1. See ASTM C920 and other requirements specified for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
2. Suitability for Immersion in Liquids: Where sealants are indicated for Use I for joints that shall be continuously immersed in liquids, provide products that have undergone testing as specified in ASTM C1247. Liquid used for testing sealants is deionized water, unless otherwise specified.

C. Colors of Exposed Joint Sealants:
1. As specified by manufacturer's designations.

2.2 SILICONE JOINT SEALANTS

A. One-Part Silicones: ASTM C920, Type S, Grade NS, Class 25
1. 795 Silicone Structural Glazing, Glazing, and Weatherproofing Sealant, by Dow Corning (colors only)
2. Construction 1200 Sealant, General Electric Company
3. 999-A, Dow Corning
4. 864 Architectural Silicone, by Pecora Corporation (colors only)

2.3 URETHANE JOINT SEALANTS

A. Two-Part Urethane: Self-Leveling, ASTM C920, Type M, Grade P, Class 25
1. Chem-Calk CC-550, by Bostik
2. Vulkem 245, by Mameco
3. Vulkem 255, Wide-Joint, by Mameco
4. NR-200 Urexpan, by Pecora Corporation
5. Sikaflex-2c NS/SL, by Sika Corporation

B. Two-Part Urethane: Non-Sag, ASTM C920, Type M, Grade NS, Class 25
   1. Chem-Calk 500, by Bostik
   2. Vulkem 227, by Mameco.
   3. Dynatrol II, by Pecora Corporation.
   4. Sikaflex-2c NS/SL, by Sika Corporation.
   5. Sonolastic NP 2, by Sonneborn Building Products, ChemRex Inc.

C. One-Part Urethane: Self-Leveling, ASTM C920, Type S, Grade P, Class 25.
   1. Vulkem 45, by Mameco
   2. Urexpan NR-201, by Pecora Corporation
   3. Sonolastic SL1, by Sonneborn Building Products, ChemRex Inc.
   4. Sikaflex 1C-SL by Sika

D. One-Part Urethane: Non-Sag, ASTM C920, Type S, Grade NS, Class 25
   1. Chem-Calk 900, by Bostik
   2. Vulkem 116, by Mameco
   3. Sonolastic NP I, by Sonneborn Building Products, ChemRex Inc.
   4. Sikaflex 1A by Sika

2.4 PREFORMED JOINT SEALANTS

A. Preformed Silicone Joint Sealants:
   1. Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths specified, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
   2. Available Manufacturers (Subject to requirements, Choose ONE):
      a. Dow Corning Corporation; 123 Silicone Seal
      b. GE Advanced Materials – Silicones; UltraSpan US1100
      c. Pecora Corporation; Sil-Span

2.5 JOINT SEALANT BACKING

A. General:
   1. Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings:
   1. ASTM C1330, Type C (closed-cell material with a surface skin) OR Type O (open-cell material), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2.6 MISCELLANEOUS MATERIALS

A. Primer:
   1. Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces:
   1. Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints:
   1. Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
   2. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   3. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
   4. Porous joint substrates include:
      a. Concrete
      b. Masonry
      c. Exterior insulation and finish systems
   5. Remove laitance and form-release agents from concrete.
   6. Clean nonporous joint substrate surfaces with chemical cleaners or other means that DO NOT stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   7. Nonporous joint substrates include:
      a. Metal

B. Joint Priming:
   1. Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; DO NOT allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General:
   1. See joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard:
   1. Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. DO NOT leave gaps between ends of sealant backings.
   2. DO NOT stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are NOT used between sealants and backs of joints.

E. Sealant Installation:
1. Use proven techniques where backings are installed.
2. Place sealants so they directly contact and fully wet joint substrates.
3. Completely fill recesses in each joint configuration.
4. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-Sag Sealants:
1. Immediately after sealant application and before skinning or curing begins, tool sealants as specified in subparagraphs below to form smooth, uniform beads of configuration specified; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
2. Remove excess sealant from surfaces adjacent to joints.
3. Use tooling agents that are approved in writing by sealant manufacturer and that DO NOT discolor sealants or adjacent surfaces.
4. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise specified.
5. Provide flush joint profile where specified per Figure 8B in ASTM C1193.
6. Provide recessed joint configuration of recess depth and at locations specified per Figure 8C in ASTM C1193.

G. Installation of Preformed Silicone-Sealant System:
1. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of NOT less than 3/8 in. Hold edge of sealant bead 1/4 in. inside masking tape.
2. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
3. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

3.4 FIELD QUALITY REQUIREMENTS

A. Field-Adhesion Testing:
1. Field test joint-sealant adhesion to joint substrates.
2. Extent of Testing:
   a. Test completed and cured sealant joints.
   b. Perform 10 tests for the first 1,000 ft of joint length for each kind of sealant and joint substrate.
   c. Perform 1 test for each 1,000 ft of joint length thereafter or 1 test per each floor per elevation.
3. Test Method:
   a. Test joint sealants as specified in Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
   b. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

4. Inspect tested joints and report on:
    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results:
1. Sealants NOT evidencing adhesive failure from testing or noncompliance with other specified requirements shall be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with specified requirements.

3.5 CLEANING

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

3.6 PROTECTION

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

END OF SECTION

DIVISION 9

FINISHES

SECTION 09 90 00 – PAINTING AND PROTECTIVE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Surface preparation and field application of paints, and other coatings.

B. Related Sections:
   1. Section 05 50 00 – Metal Fabrications
   2. Section 09 96 00 – High Performance Coatings
   3. Section 22 05 53 – Mechanical Identification
   4. Section 26 05 53 – Identification for Electrical Systems

1.2 DEFINITIONS

A. See ASTM D16 for definitions of terms used in this Section.

1.3 REFERENCES

A. ASTM International:
   1. D16 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.
   2. D4442 – Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
   3. E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

B. MPI (Master Painters Institute):
   1. Approved Products List.
   2. Architectural Painting Manual.

1.4 PREINSTALLATION MEETINGS

A. Convene minimum one week prior to commencing Work of this Section.

1.5 SEQUENCING

A. Do not apply finish coats until paintable sealant is applied.

B. Back prime wood trim before installation of trim.

1.6 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. Submit manufacturer data on finishing products, special coatings.
   2. Include MPI – Approved Products Lists with proposed products highlighted.

C. Samples:
   1. Submit two paper chip samples, 10 in. by 10 in. in size, illustrating range of colors and textures available for each surface finishing product as scheduled.

2. Painted Samples:
    a. Submit two painted samples, illustrating selected colors and textures for each selected color and system with specified coats cascaded.
    b. Submit on tempered hardboard 2, 10 in. by 10 in. in size.

D. Manufacturer's Certificate:
1. Certify that products meet or exceed specified requirements.

E. Manufacturer Instructions:
1. Submit special surface preparation procedures, substrate conditions requiring special attention.

F. Field Quality-Control Submittals:
1. Indicate results of Contractor-furnished tests and inspections.

G. Qualifications Statements:
1. Submit qualifications for manufacturer and applicator.
2. Submit manufacturer's approval of applicator.

H. Closeout Submittals:
1. Section 01 77 00 – Closeout Procedures: Requirements for submittals.
2. Operation and Maintenance Data: Submit information on cleaning, touchup, and repair of painted and coated surfaces.

I. Maintenance Material Submittals:
1. Section 01 77 00 – Closeout Procedures: Requirements for maintenance materials.
2. Extra Stock Materials:
    a. Furnish [1] gal. of each color, type, and surface texture as provided for Project.
    b. Label each container with manufacturer's label, color, type, texture, room number, and site location.
    c. Store where directed by Owner.

1.7 QUALITY ASSURANCE

A. MPI Standards:
1. See indicated MPI standards.
2. Products: Listed in MPI – Approved Products List.

B. Surface Burning Characteristics:
1. Fire-Retardant Finishes: Maximum 25/450 flame-spread/smoke-developed index when tested as specified in ASTM E84.

C. Perform Work as specified in ASTM standards.

1.8 QUALIFICATIONS

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

B. Applicator:
1. Company specializing in performing Work of this Section with minimum three years of documented experience and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Container Labeling:
   1. Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Inspection:
   1. Accept materials on Site in manufacturer's sealed and labeled containers.
   2. Inspect for damage and to verify acceptability.

D. Store materials in ventilated area and otherwise as specified in manufacturer instructions.

E. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection as specified in manufacturer instructions.

1.10 AMBIENT CONDITIONS

A. Section 01 50 00 – Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Storage Conditions:
   1. Minimum Ambient Temperature: 45°F
   2. Maximum Ambient Temperature: 90°F

C. Application Conditions:
   1. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint manufacturer.
   2. Do not apply exterior coatings during rain or snow, when relative humidity is outside humidity ranges, or when moisture content of surfaces exceeds those required by paint manufacturer.
   3. Minimum Application Temperatures for Latex Paints: 45°F for interiors and 50°F for exteriors, unless otherwise indicated by manufacturer instructions.
   4. Minimum Application Temperature for Varnish and Finishes: 65°F for interiors and exteriors, unless otherwise indicated by manufacturer instructions.
   5. Lighting Level: 80 fc measured mid-height at substrate surface.

1.11 WARRANTY

A. Furnish five-year manufacturer's warranty for paint and coatings.

B. See Section 01 78 36 – Warranties and Bonds for additional requirements.

PART 2 - PRODUCTS

2.1 PAINTS AND COATINGS

A. Manufacturers:
   1. Sherwin Williams (specified)
   2. Or Approved Equal.

B. Substitutional Manufacturers:
   1. As specified in Section 01 60 00 – Product Requirements.
   2. Furnish materials as specified in ASTM standards.

C. Materials:
   1. Coatings:
      a. Ready mixed, except field-catalyzed coatings.
      b. Capable of drying or curing free of streaks or sags.
   2. Patching Materials: Latex filler
   3. Fastener Head Cover Materials: Latex filler
   4. Accessories:
      a. Grade: Commercial
      b. Linseed oil
      c. Shellac
      d. Turpentine
      e. Paint thinners
      f. Other materials not specifically indicated but required to achieve specified finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 77 00 – Closeout Procedures: Requirements for application examination.

B. Verify that surfaces and or substrate conditions are ready to receive Work as recommended by product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of Work, and report conditions capable of affecting proper application to Engineer.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Moisture Content:
   1. Measure moisture content of surfaces using electronic moisture meter.
   2. Do not apply finishes unless moisture content of surfaces is below following maximums:
      a. Gypsum Wallboard: 12%
      b. Masonry, Concrete, and Concrete Unit Masonry: 12%
      c. Interior Wood: 15%, measured as specified in ASTM D4442
      d. Exterior Wood: 15%, measured as specified in ASTM D4442
      e. Concrete Floors: 8%

3.2 PREPARATION

A. Section 01 77 00 – Closeout Procedures: Requirements for application preparation.

B. Prepare coatings as follows:
   1. To soft paste consistency, capable of being readily and uniformly dispersed to homogeneous coating.
   2. For smooth flow and brushing properties.

C. Surface Appurtenances:
   1. Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Defects:
   1. Correct defects and clean surfaces capable of affecting Work of this Section.

E. Marks:
   1. Seal marks that may bleed through surface finishes with shellac.

F. Impervious Surfaces:
   1. Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach.
   2. Rinse with clean water and allow surface to dry.

G. Aluminum Surfaces Scheduled for Paint Finish:
   1. Remove surface contamination by steam or high-pressure water.
   2. Remove oxidation with acid etch and solvent washing.
   3. Apply etching primer immediately following cleaning.

H. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish:
   1. Remove foreign particles to permit adhesion of finishing materials.
   2. Apply latex-based sealer or primer.

I. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

J. Concrete Floors:
   1. Remove contamination, acid etch, and rinse floors with clear water.
   2. Verify that required acid-alkali balance is achieved.
   3. Allow to dry.

K. Gypsum Board Surfaces:
   1. Fill minor defects with filler compound.
   2. Spot-prime defects after repair.

L. Galvanized Surfaces:
   1. Remove surface contamination and oils, and wash with solvent.
   2. Apply coat of etching primer.

M. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish:
   1. Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter.
   2. Remove oil and grease with solution of trisodium phosphate, rinse well, and allow to dry.
   3. Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water and allow to dry.

N. Uncoated Steel and Iron Surfaces:
   1. Remove grease, mill scale, weld splatter, dirt, and rust.
   2. If heavy coatings of scale are evident, remove by hand wire brushing or by sandblasting.
   3. Clean by washing with solvent.
   4. Apply treatment of phosphoric acid solution, ensuring that weld joints, bolts, and nuts are similarly cleaned.
   5. Spot-prime paint after repairs.

O. Shop-Primed Steel Surfaces:
   1. Sand and scrape to remove loose primer and rust.
   2. Feather edges to make touchup patches inconspicuous.
   3. Clean surfaces with solvent.
   4. Prime metal items, including shop-primed items.

P. Interior Wood Items Scheduled to Receive Paint Finish:
   1. Wipe off dust and grit prior to priming.
   2. Seal knots, pitch streaks, and sappy sections with sealer.
   3. Fill nail holes and cracks after primer has dried.
   4. Sand between coats.

Q. Interior Wood Items Scheduled to Receive Transparent Finish:
   1. Wipe off dust and grit prior to sealing.
   2. Seal knots, pitch streaks, and sappy sections with sealer.
   3. Fill nail holes and cracks after sealer has dried.
   4. Sand lightly between coats.

R. Exterior Wood Scheduled to Receive Paint Finish:
   1. Remove dust, grit, and foreign matter.
   2. Seal knots, pitch streaks, and sappy sections.
   3. Fill nail holes with tinted exterior paintable calking compound after prime coat has been applied.

S. Exterior Wood Scheduled to Receive Transparent Finish:
   1. Remove dust, grit, and foreign matter.
   2. Seal knots, pitch streaks, and sappy sections with sealer.
   3. Fill nail holes with tinted exterior calking compound after sealer has been applied.

T. Glued-Laminated Beams:
   1. Prior to finishing, wash surfaces with solvent, and remove grease and dirt.

U. Metal Doors Scheduled for Painting:
   1. Prime metal door at top and bottom edge surfaces.

V. Existing Work:
   1. Extend existing paint and coatings installations using materials and methods compatible with existing installations and as specified.

3.3 APPLICATION

A. See MPI – Architectural Painting Manual.

B. DO NOT apply finishes to surfaces that are not dry.

C. Apply each coat to uniform appearance.

D. Apply each coat of paint slightly darker than preceding coat, unless specified otherwise.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Cleaning:
   1. Vacuum surfaces to remove loose particles.
   2. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Fillers:
   1. If clear finishes are required, tint fillers to match wood.
   2. Work fillers into grain before set, and wipe excess from surface.

H. Concealed Surfaces:
   1. Prime concealed surfaces of interior and exterior woodwork with primer paint.

2. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.

I. Finishing Mechanical and Electrical Equipment:
1. Schedule of Color-Coding and Identification Banding of Equipment, Ductwork, Piping, and Conduit, as specified in:
   a. Section 22 05 53 – Mechanical Identification.
   b. Section 26 05 53 – Identification for Electrical Systems.
2. Paint shop-primed equipment.
3. Paint shop-finished items installed in interior areas.
4. Remove unfinished louvers, covers, and access panels on mechanical and electrical components, and paint separately.
5. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where these items are shop finished.
6. Paint interior surfaces of air ducts visible through grilles and louvers with one coat of flat black paint to visible surfaces.
7. Paint dampers exposed behind louvers, grilles, to match face panels.
8. Paint exposed conduit and electrical equipment installed in finished areas.
9. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
10. Color-Coding:
    a. Color-code equipment, piping, conduit, and exposed duct work as specified in indicated requirements.
    b. Color band and identify with flow arrows, names, and numbering.
11. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings that were removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. Section 01 77 00 – Closeout Procedures: Requirements for testing, adjusting, and balancing.

B. Inspecting and Testing:
1. See MPI – Architectural Painting Manual.

3.5 CLEANING

A. Section 01 77 00 – Closeout Procedures: Requirements for cleaning.

B. Collect waste material that may constitute fire hazards, place in closed metal containers, and remove daily from Site.

3.6 PAINTING SCHEDULE

A. Shop-Primed Items for Site Finishing:
1. Section 05 50 00 – Metal Fabrications:
   a. Exposed surfaces of lintels, elevator pit ladders.
   b. Alkyd System MPI EXT 5.1D:
      1) Shop Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79.
      2) Intermediate Coat: Matching topcoat.
      3) Topcoat: Alkyd, exterior, semigloss (MPI Gloss Level 5), MPI #94.
      4) Topcoat: Alkyd, exterior, gloss (MPI Gloss Level 6), MPI #9.
      5) Water-Based Light Industrial Coating System MPI EXT 5.1C:
      6) Shop Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79.
      7) Intermediate Coat: Matching topcoat.

8) Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5), MPI #163.
9) Topcoat: Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6), MPI #164.

B. Exterior Surfaces:
1. Wood – Painted (Opaque):
a. Latex System MPI EXT 6.3L:
1) Prime Coat: Primer, latex for exterior wood, MPI #6.
2) Intermediate Coat: Matching topcoat.
3) Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.
4) Topcoat: Latex, exterior semigloss (MPI Gloss Level 5), MPI #11.
b. Latex System, Alkyd Primer MPI EXT 6.3A:
1) Prime Coat: Primer, alkyd for exterior wood, MPI #5.
2) Intermediate Coat: Matching topcoat.
3) Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.
4) Topcoat: Latex, exterior semigloss (MPI Gloss Level 5), MPI #11.
c. Alkyd System MPI EXT 6.3B:
1) Prime Coat: Primer, alkyd for exterior wood[, MPI #5.
2) Intermediate Coat: Matching topcoat.
3) Topcoat: Alkyd, exterior, semigloss (MPI Gloss Level 5), MPI #94.
4) Topcoat: Alkyd, exterior, gloss (MPI Gloss Level 6), MPI #9.
2. Wood – Transparent:
a. Solid-Color, Water-Based Stain System MPI EXT 6.3K.
1) Prime Coat: Primer, alkyd for exterior wood, MPI #5
2) Intermediate Coat: Matching topcoat.
3) Topcoat: Stain, exterior, water based, solid hide, MPI #16.
b. Semitransparent Stain System MPI EXT 6.3D:
1) Prime Coat: Matching topcoat.
2) Topcoat: Stain, exterior, solvent based, semitransparent, MPI #13
3. Glued-Laminated Wood, Wood Timber Members:
a. One coat of stain, sealer.
b. Two coats of varnish , gloss, or semigloss.
4. Pavement Markings: Two coats of paint, yellow or white.
5. Concrete, Concrete Block:
a. One coat of block primer.
b. Two coats of latex.
6. Gypsum Board Soffits:
a. One coat of primer sealer latex.
b. Two coats of latex.
7. Steel – Unprimed:
a. Water-Based Light Industrial Coating System MPI EXT 5.1M:
1) Prime Coat: Primer, rust-inhibitive, water based MPI #107.
2) Intermediate Coat: Matching topcoat.
3) Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5), MPI #163.
4) Topcoat: Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6), MPI #164.
b. Water-Based Light Industrial Coating System MPI EXT 5.1C:
1) Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79
2) Intermediate Coat: Matching topcoat.
3) Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5), MPI #163.
4) Topcoat: Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6), MPI #164.
c. Alkyd System MPI EXT 5.1D:

1) Prime Coat: Primer, alkyd, anticorrosive, for metal, MPI #79.
2) Intermediate Coat: Matching topcoat.
3) Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5), MPI #163;
4) Topcoat: Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6), MPI #164.

8. Steel – Shop Primed:
   a. Touch up with zinc chromate primer.
   b. Two coats of alkyd enamel, semigloss.
9. Steel – Galvanized:
   a. One coat galvanize primer.
   b. Two coats of alkyd enamel, semigloss.
10. Aluminum – Mill Finish:
    a. One coat etching primer.
    b. Two coats of alkyd enamel, gloss.
11. Copper:
    a. One coat etching primer.
    b. Two coats of alkyd enamel, gloss.

C. Interior Surfaces:
1. Wood – Painted:
   a. One coat of latex prime sealer.
   b. Two coats latex enamel, eggshell.
2. Wood – Transparent:
   a. Semitransparent Stain System MPI INT 6.4C:
      1) Prime Coat: Paste wood filler/stain.
      2) Intermediate and Topcoat: Polyurethane varnish, MPI #56 or #57 as required.
3. Concrete:
   a. Latex System MPI INT 3.1A, MPI INT 3.1E:
      1) Prime Coat: Primer, alkali resistant, water based, MPI #3.
      2) Prime Coat: Matching topcoat.
      3) Intermediate Coat: Matching topcoat.
      4) Topcoat: Latex, interior, flat, (MPI Gloss Level 1), MPI #53.
      5) Topcoat: Latex, interior, semigloss, (MPI Gloss Level 5), MPI #54.
   b. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:
      1) Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
      2) Intermediate Coat: Matching topcoat.
      3) Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.
      4) Topcoat: Latex, interior, institutional low odor/VOC, semigloss (MPI Gloss Level 5), MPI #147.
   c. Alkyd System MPI INT 3.1D:
      1) Prime Coat: Primer, alkali resistant, water based, MPI #3.
      2) Intermediate Coat: Matching topcoat.
      3) Topcoat: Alkyd, interior, flat (MPI Gloss Level 1), MPI #49.
      4) Topcoat: Alkyd, interior, semigloss (MPI Gloss Level 5), MPI #47.
4. Concrete Block:
   a. Latex System MPI INT 4.2A:
      1) Block Filler: Block filler, latex, interior/exterior, MPI #4.
      2) Intermediate Coat: Matching topcoat.
      3) Topcoat: Latex, interior, flat, (MPI Gloss Level 1), MPI #53.
      4) Topcoat: Latex, interior, semigloss, (MPI Gloss Level 5), MPI #54.
   b. Institutional Low-Odor/VOC Latex System MPI INT 4.2E:
      1) Block Filler: Block filler, latex, interior/exterior, MPI #4.
      2) Intermediate Coat: Matching topcoat.

3) Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 1), MPI #143.
4) Topcoat: Latex, interior, institutional low odor/VOC, semigloss (MPI Gloss Level 5), MPI #147.

c. Alkyd System MPI INT 4.2C:
1) Block Filler: Block filler, latex, interior/exterior, MPI #4.
2) Intermediate Coat: Matching topcoat.
3) Topcoat: Alkyd, interior, flat (MPI Gloss Level 1), MPI #49.
4) Topcoat: Alkyd, interior, semigloss (MPI Gloss Level 5), MPI #47.

5. Steel – Unprimed:
a. One coat of alkyd primer.
b. Two coats of alkyd enamel, semigloss.

6. Steel – Primed:
a. Touch up with alkyd primer.
b. Two coats of alkyd enamel, semigloss.

7. Steel – Galvanized:
a. One coat galvanize primer.
b. Two coats of alkyd enamel, semigloss.

8. Aluminum – Mill Finish:
a. One coat etching primer.
b. Two coats of alkyd enamel, gloss.

9. Concrete Floors:
a. One coat of catalyzed epoxy primer.
b. Two coats of catalyzed epoxy enamel, gloss.

10. Gypsum Board Walls:
a. One coat of alkyd.
b. Two coats of latex enamel, eggshell.

11. Gypsum Board Ceilings:
a. One coat of alkyd primer sealer.
b. Two coats latex enamel, eggshell.

12. Fire-Retardant Finish:
a. Fire-Retardant Coating, Pigmented, Solvent-Based System MPI INT 9.2H:
1) Prime Coat and Intermediate Coat: As recommended by topcoat manufacturer.
2) Topcoat: Fire-retardant coating, alkyd, interior, flat MPI #63.

b. Fire-Retardant Coating, Pigmented, Water-Based System MPI INT 9.2J:
1) Prime Coat and Intermediate Coat: As recommended by topcoat manufacturer.
2) Topcoat: Fire-retardant coating, latex, interior, flat MPI #64.
3) Topcoat: Fire-retardant topcoat, latex, interior MPI #67.

13. Insulated Coverings – Canvas and Cotton:
a. One coat of alkyd primer sealer.
b. Two coats of alkyd enamel, eggshell.

D. Colors:
1. As indicated on drawings.

END OF SECTION

SECTION 09 96 00 – HIGH–PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. High-performance coatings and special preparation for surfaces of piping and process equipment, and other surfaces in contact with process water and wastewater.

B. Related Sections:
   1. Section 09 90 00 – Painting and Coating.

1.2 REFERENCES

A. Federal Specification Unit:
   1. FS A-A-3054 – Paint, Heat Resisting (204°C).
   2. FS AA-3120A – Paint: For Swimming Pools.
   3. FS TT-C-555B – Coating, Textured (for Interior and Exterior Masonry Surfaces).
   4. FS TT-P-28H – Paint, Aluminum, Heat Resisting.

B. Master Painters Institute:
   1. MPI – Approved Products List.
   2. MPI – Architectural Painting Manual.

C. SSPC (The Society for Protective Coatings):
   1. SSPC – Painting Manual, Volume 2: Systems and Specifications.
   2. SSPC-Paint 16 – Coal Tar Epoxy-Polyamide Black (or Dark Red).
   3. SSPC-SP 2 – Hand Tool Cleaning.
   4. SSPC-SP 3 – Power Tool Cleaning.
   5. SSPC-SP 5 – White Metal Blast Cleaning.
   6. SSPC-SP 6 – Commercial Blast Cleaning.
   7. SSPC-SP 7 – Brush-Off Blast Cleaning.
   8. SSPC-SP 10 – Near-White Metal Blast Cleaning.
   9. SSPC-SP 11 – Power Tool Cleaning to Bare Metal.
   10. SSPC-SP 13 – Concrete Surface Preparation.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Shop Drawings:
   1. Schedule of proposed coating materials.
   2. Schedule of surfaces to be coated with each coating material.

C. Product Data:
   1. Submit manufacturer information indicating coating materials, performance ratings and description of physical properties of coatings including solids content and ingredient analysis, VOC content, temperature resistance, typical exposures and limitations, and manufacturer's standard color chips:
   2. Data Sheets:
      a. For each paint system, furnish a Paint System Data Sheet (PSDS), the Manufacturer’s Technical Data Sheets, and paint colors available (where applicable) for each product used in the paint system. The PSDS form is appended to the end of this section.

b. Submit required information on a system-by-system basis.
c. Furnish copies of paint system submittals to the coating applicator.
d. Indiscriminate submittal of Manufacturer's literature only is not acceptable.
e. Regulatory requirements – Submit data concerning:
1) Volatile organic compound limitations.
2) Coatings containing lead compounds and PCBs.
3) Abrasives and abrasive blast cleaning techniques, and disposal.
4) NSF certification of coatings for use in potable water supply systems.

3. Include MPI – Approved Products Lists with proposed products highlighted.

D. Samples:
1. Submit two square drawdowns or brushouts of topcoat finish samples 8 in. by 8 in. in size, illustrating colors for selection. Identify each sample as to finish, formula, color name and number and sheen name and gloss units.

E. Manufacturer's Certificate:
1. Certify that products meet or exceed specified requirements.

F. Manufacturer Instructions:
1. Submit special procedures, perimeter conditions requiring special attention.
2. Include:
a. Special requirements for transportation and storage.
b. Mixing instructions.
c. Shelf life.
d. Pot life of material.
e. Precautions for applications free of defects.
f. Surface preparation.
g. Method of application.
h. Recommended number of coats.
i. Recommended dry film thickness (DFT) of each coat.
j. Recommended total dry film thickness (DFT).
k. Drying time of each coat, including prime coat.
l. Required prime coat.
m. Compatible and noncompatible prime coats.
n. Recommended thinners, when recommended.
o. Limits of ambient conditions during and after application.
p. Time allowed between coats (minimum and maximum).
q. Required protection from sun, wind, and other conditions.
r. Touchup requirements and limitations.
s. Minimum adhesion of each system submitted as specified in ASTM D 4541.

G. Qualifications Statements:
1. Submit qualifications for manufacturer and applicator.
2. Submit manufacturer's approval of applicator.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 – Closeout Procedures: Requirements for submittals.

B. Operation and Maintenance Data:
1. Submit maintenance and cleaning requirements for coatings, repair, and patching techniques.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 77 00 – Closeout Procedures: Requirements for maintenance materials.

B. Extra Stock Materials:
   1. Furnish 5 gal. of each color of each type of coating specified, for Owner's maintenance use.
   2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.6 QUALITY ASSURANCE

A. MPI Standards:
   1. Comply with indicated MPI standards.
   2. Products: Listed in MPI – Approved Products List.

B. Quality Assurance Submittals:
   1. Quality Assurance plan.
   2. Qualifications of coating applicator including List of Similar Projects and List of References substantiating experience.
   3. Factory Applied Coatings: Manufacturer’s certification stating factory applied coating system meets or exceeds requirements specified.
   4. If the Manufacturer of finish coating differs from that of shop primer, provide both Manufacturers’ written confirmation that materials are compatible.
   5. Manufacturer’s written instructions and special details for applying each type of paint.
   6. Manufacturers’ Certification of Proper Installation.

C. Certifications:
   1. All paints and coatings to be used on this project comply with current federal, state, and local VOC regulations.

D. Compatibility of coatings:
   1. Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.

E. Services of coating manufacturer’s representative:
   1. Arrange for coating manufacturer’s representative to attend preinstallation conferences. Make periodic visits to the project site to provide consultation and inspection services during surface preparation and application of coatings, and to make visits to coating plants to observe and approve surface preparation procedures and coating application of items to be “shop primed and coated”.

1.7 QUALIFICATIONS

A. Manufacturer:
   1. Company specializing in manufacturing products specified in this Section with minimum five years' experience.

B. Applicator Qualifications:
   1. Company specializing in performing Work of this Section with minimum five years of experience applying specified type or types of coatings under conditions similar to those of the Work and approved by manufacturer.
   2. Provide qualifications of applicator and references listing 5 similar projects completed in the past 2 years.
   3. Manufacturer approved applicator when manufacturer has approved applicator program.

4. Approved and licensed by polymorphic polyester resin manufacturer to apply polymorphic polyester resin coating system.
5. Approved and licensed by elastomeric polyurethane (100% solids) manufacturer to apply 100% solids elastomeric polyurethane system.
6. Applicator of offsite application of coal tar epoxy shall have successfully applied coal tar epoxy on similar surfaces in material, size, and complexity as on the Project.

C. Regulatory requirements:
1. Comply with governing agencies regulations by using coatings that do not exceed permissible volatile organic compound limits and do not contain lead:
   a. Do not use coal tar epoxy in contact with drinking water or exposed to ultraviolet radiation.
   b. Perform surface preparation and painting as specified in recommendations of:
      1) Paint Manufacturer's instructions.
      2) SSPC-PA Guide No. 3, Guide to Safety in Paint Applications.
      3) Federal, state, and local agencies having jurisdiction.

1.8 MOCKUPS

A. Prior to start of surface preparation, furnish a 4 in. by 4 in. steel panel for each grade of sandblast specified in this section, prepared to specified requirements.

B. Provide panel representative of the steel used; prevent deterioration of surface quality.

C. Upon approval of Engineer, panel to be reference source for inspection.

D. Unless otherwise specified, before painting work is started, prepare minimum 8 in. by 10 in. samples with type of paint and application specified on similar substrate to which paint is to be applied.

E. Furnish additional samples as required until colors, finishes, and textures are approved.

F. Approved samples to be the quality standard for final finishes.

G. Field samples:
1. Prepare and coat a minimum 100 ft^2 area between corners or limits such as control or construction joints of each system.
2. Approved field sample may be part of Work.
3. Obtain approval before painting other surfaces.

H. Section 01 40 00 – Quality Requirements: Requirements for mockup.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver new unopened containers.

B. Do not deliver materials aged more than 12 months from manufacturing date.

C. Section 01 60 00 – Product Requirements: Requirements for transporting, handling, storing, and protecting products.

D. Container Labeling:
1. Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

E. Inspection:
   1. Accept materials on Site in manufacturer's sealed and labeled containers.
   2. Inspect for damage and to verify acceptability.

F. Store materials in ventilated area and as specified in manufacturer instructions.

G. Remove unspecified and unapproved paints from Project site immediately.

H. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection as specified in manufacturer instructions.
   3. Take precautions to prevent fire and spontaneous combustion.

I. Shipping:
   1. Where precoated items are to be shipped to the site, protect coating from damage. Batten coated items to prevent abrasion.
   2. Use nonmetallic or padded slings and straps in handling.

1.10 AMBIENT CONDITIONS

A. Section 01 50 00 – Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Minimum Conditions:
   1. Do not install materials when temperature is below 55°F or above 90°F.

C. Subsequent Conditions:
   1. Maintain above temperature range, 24 hours before, during, and 72 hours after installation of coating.

D. Provide lighting level of 80 fc, measured mid-height at substrate surface.

E. Restrict traffic from area where coating is being applied or is curing.

1.11 WARRANTY

A. Section 01 77 00 – Closeout Procedures: Requirements for warranties.

B. Furnish Manufacturer’s extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of work specified in this Specification section found defective during a period of 5 years after the date of Substantial Completion.

C. Contractor and paint Manufacturer shall jointly and severally furnish guarantee.

D. Include coverage for bond to substrate, and degradation of chemical resistance.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN CRITERIA

A. Coating materials shall be especially adapted for use in water and wastewater treatment plants.

B. Coating materials used in contact with potable water supply systems shall be certified to NSF 61.

2.2 HIGH–PERFORMANCE COATINGS

A. Manufacturers:
1. High Performance Coatings Manufacturers (Choose ONE):
   a. Carboline: Carboline, St. Louis, MO.
   b. Ceilcote: International Protective Coatings, Berea, OH.
   c. Dampney: The Dampney Company, Everett, MA.
   d. Devoe: International Protective Coatings, Louisville, KY.
   e. Dudick: Dudick, Inc., Streetsboro, OH.
   f. GET: Global Eco Technologies, Pittsburg, CA.
   g. Henkel: Henkel North America, Madison Heights MI.
   h. IET: Integrated Environmental Technologies, Santa Barbara, CA.
   i. Induron Protective Coatings, Birmingham, AL.
   j. PPG Amercoat: PPG Protective & Marine Coatings, Brea, CA.
   k. Raven Lining Systems, Broken Arrow, OK.
   l. Rustoluem : Rustoleum Corp., Sommerset, NJ.
   m. Sanchem: Sanchem, Chicago, IL.
   n. Sauereisen: Sauereisen, Pittsburgh, PA
   o. Superior: Superior Environmental Products, Inc., Addison, TX.
   p. S-W: Sherwin-Williams Co., Cleveland, OH.
   q. Tnemec: Tnemec Co., Kansas City, MO.
   r. Wasser: Wasser High Tech Coatings, Kent, WA.
   s. ZRC: ZRC Worldwide Innovative Zinc Technologies, Marshfield, MA.
   t. Or Approved Equal.
2. Preparation And Pretreatment Materials:
   a. Metal pretreatment (Choose ONE):
      1) Henkel: Galvaprep 5.
      2) International: AWLGrip Alumiprep 33.
      3) Or Approved Equal.
   b. Surface cleaner and degreaser (Choose ONE):
      1) Carboline Surface Cleaner No.3.
      2) Devoe: Devprep 88.
      3) S-W: Clean and Etch.
      4) Or Approved Equal.
3. Coating Materials:
   a. Alkali resistant bitumastic (Choose ONE):
      1) Carboline: Bitumastic No. 50.
      2) Sherwin Williams: Targuard.
      3) Wasser: MC-Tar.
      4) Or Approved Equal.
   b. Wax coating:
      1) Sanchem: No-Ox-Id A special.
      2) Or Approved Equal.
   c. High solids epoxy (self-priming) not less than 72% solids by volume (Choose ONE):
      1) Carboline: Carboguard 891.
      2) Devoe: Bar Rust 233H.
      3) Induron: PE-70.
      4) PPG Amercoat: Amerlock 2.
      5) S-W: Duraplate 235
      6) Tnemec: HS Epoxy Series N140.
      7) Or Approved Equal.
   d. Aliphatic or aliphatic-acrylic polyurethane (Choose ONE):

1) Carboline: Carbothane 134 VOC.
2) Devoe: Devthane 379.
3) PPG Amercoat: Amershield VOC.
4) S-W: High Solids Polyurethane [CA].
5) Tnemec: Endura-Shield II Series 1075 (U).
6) Or Approved Equal.

e. H2S Resistant Epoxy: Multi-component aggregate-filled epoxy system specifically designed for exposure to municipal wastewater. (Choose ONE System):
1) Tnemec:
a) Cementitious Mortar: Mortarclad Series N218 (As required).
b) Epoxy Mortar: PermaShield H2S Series G434 (Min. 1/8-inch).
c) Coating: Perma-Glaze Series G435 (Min. 20 mils).
2) Sherwin Williams
a) Cementitious Mortar: AW Cook Micro-silica mortar (As required).
b) Primer: RR&C Concrete Epoxy Primer (Min. 5 mils).
c) Coating: Duraplate 6100 (Min. 200 mils).
3) PPG
a) Cementitious Mortar: AW Cook Micro-silica mortar (As required).
b) Primer: RAVEN 175 (Min. 5 mils).
c) Coating: RAVEN 405 (Min. 150 mils).
4) Or Approved Equal.

f. High temperature coating 150–350°F (Choose ONE):
1) Carboline: Thermaline 4900.
2) Dampney: Thermalox 245 Silicone – Zinc Dust.
3) PPG Amercoat: Amerlock 2/400 GFK.
4) Or Approved Equal.

g. High temperature coating 400–1,000°F (dry) (Choose ONE):
1) Carboline: Thermaline 4700.
2) Dampney: Thermolox 230C Series Silicone.
3) Devoe: HT-12, High Heat Silicone.
4) Or Approved Equal.

h. High temperature coating up to 1,400°F:
1) Dampney: Thermalox 240 Silicone Ceramix.
2) Or Approved Equal.

i. Asphalt varnish: AWWA C 500.

j. Protective coal tar:
1) Not Acceptable.

k. Coal tar epoxy:
1) Not Acceptable.

l. Coal tar:
1) Where coal tar, coal tar epoxy, or coal tar mastic are specified or indicated on the Drawings, use coal tar epoxy substitute in their place. Coal tar shall not be allowed.

m. Coal Tar Epoxy Substitute Manufacturer:
1) Tnemec: Series 431.
2) Or Approved Equal.

n. Vinyl ester: Glass mat reinforced, total system 125 mils DFT. (Choose ONE):
1) Carboline: Semstone 870.
2) Ceilcote: 6640 Ceilcrete.
3) Dudick: Protecto-Flex 800.
4) Tnemec: Chembloc Series 239SC.
5) Or Approved Equal.

o. Elastomeric polyurethane, 100% solids, ASTM D16, Type V, (Urethane P):
1) GET: Endura-Flex EF-1988.
2) Or Approved Equal.

p. Anti-slip floor coatings:

1) PPG: SFT675.

q. Concrete floor coatings (Choose ONE):
   1) Carboline: Semstone 140SL.
   2) Devoe: Devran 124.
   3) Dudick: Polymer Alloy 1000.
   4) Tnemec: Tneme-Glaze Series 282.
   5) Or Approved Equal.

r. Waterborne acrylic emulsion (Choose ONE):
   1) S-W: DTM Acrylic B66W1.
   2) Tnemec: Tneme-Cryl Series 6.
   3) Or Approved Equal.

s. Galvanizing Zinc Compound:
   1) ZRC: Cold Galvanizing Compound.
   2) Other Approved Equal.

2.3 COATING SYSTEMS

A. Coatings:
   1. Description:
      a. Complete multicoat systems formulated and recommended by manufacturer for intended applications and in indicated thicknesses.
      b. Specified number of coats does not include primer or filler coat.
   2. Lead content: None.
   3. Chromium Content as Zinc Chromate or Strontium Chromate: None.
   4. Maximum VOC Content: As required by applicable regulations.
   5. Colors: As selected from manufacturer's standard colors or indicated on Drawings.

B. System 1 Submerged Metals – Potable Water – High-Solids Epoxy Coating:
   1. Description: High-solids, two-component epoxy.
   2. Exposure: Moderate.
   3. Surface Prep: Abrasive Blast, or Centrifugal Wheel Blast (SP 5).
   4. Number of Coats: One.
   5. Finish: Low gloss.
   6. Minimum Solids Content: 78% by volume.
   7. Minimum Dry Film Thickness Per Coat: 6 mils.
   8. Primer: High Solids Epoxy (Self Priming).

C. System 2 Submerged Metals – Domestic Sewage – High-Solids Epoxy Coating:
   1. Description: High-solids, two-component.
   2. Exposure: Severe.
   3. Surface Prep: Abrasive Blast, or Centrifugal Wheel Blast (SP 5).
   4. Number of Coats: Two.
   5. Finish: Low gloss.
   6. Minimum Solids Content: 100% by volume.
   7. Minimum Dry Film Thickness Per Coat: 30 mils.
   8. Primer: High Solids Epoxy – As recommended by painting system manufacturer.

D. System 3: Exposed Metal – Highly Corrosive – Epoxy/Polyurethane Coating or Novolac Epoxy:
   1. Description: High-solids, two-component epoxy intermediate coat and solvent-based, two-component, pigmented polyurethane top coat.
   2. Exposure: Severe.
   3. Surface Prep: Abrasive Blast (SP 10).
   4. Number of Coats: Two.
   5. Finish: Semi-Gloss.
   6. Minimum Epoxy Solids Content: 78% by volume.
   7. Minimum Polyurethane Solids Content: 69% by volume.

8. Minimum Dry Film Thickness Per Coat: 4 mils.
9. Primer: As recommended by painting system manufacturer.

E. System 4: Exposed Metal – Mildly Corrosive – Polyurethane Coating:
1. Description: Solvent-based, two-component, pigmented polyurethane.
2. Exposure: Moderate.
3. Surface Prep: Abrasive Blast (SP 10).
4. Number of Coats: One.
5. Finish: Semi-Gloss.
6. Minimum Solids Content: 69% by volume.
7. Minimum Dry Film Thickness Per Coat: 3 mils.
8. Primer: As recommended by painting system manufacturer.

F. System 5: Buried Metal – General:
1. Standard Conditions
   a. Description:
      1) Standard Hot Coal-Tar Enamel, or
      2) Coal-Tar Epoxy Substitute, or
      3) Tape Coat System.
   b. Exposure: Moderate.
   c. Surface Prep: Abrasive Blast (SP 10).
   d. Number of Coats and Minimum Dry Film Thickness Per Coat:
      1) Standard Hot Coal-Tar Enamel: Conform to AWWA C203
      2) Coal-Tar Epoxy Substitute: Conform to AWWA C210
      3) Tape Coat System: Conform to AWWA C214
   e. Primer: As recommended by painting system manufacturer.
2. For Acidic Soil, Brackish Water, High Bacteria
   a. Description:
      1) Coal-Tar Epoxy Substitute, Double Felt
   b. Exposure: Moderate.
   c. Surface Prep: Abrasive Blast (SP 10).
   d. Number of Coats and Minimum Dry Film Thickness Per Coat:
      1) AWWA C203, App. A, Sec. Al.5
   e. Primer: As recommended by painting system manufacturer.
3. For Highly Abrasive Soil, Brackish Water
   a. Description:
      1) Coal-Tar Epoxy Substitute, Fibrous Glass, or
      2) Tape Coat System.
   b. Exposure: Moderate.
   c. Surface Prep: Abrasive Blast (SP 10).
   d. Number of Coats and Minimum Dry Film Thickness Per Coat:
      1) Coal-Tar Epoxy Substitute, Fibrous Glass: AWWA C203, App. A, Sec. A1.5
      2) Tape Coat System: AWWA C214 with Double Outer Wrap
   e. Primer: As recommended by painting system manufacturer.

G. System 6: Moderate-Heat-Resistant Coating for Ferrous Metal (150°–400°F):
1. Description: Solvent-based, pigmented enamel, formulated for service up to 400°F.
2. Exposure: Moderate.
3. Surface Prep: Abrasive Blast (SP 10).
4. Number of Coats: One.
5. Minimum Dry Film Thickness Per Coat: 2 mils.
6. Primer: As recommended by painting system manufacturer.

H. System 7: High-Heat-Resistant Coating for Ferrous Metal (400°–1,000°F):
1. Description: Solvent-based, silicone type, aluminum coating, formulated for service up to 1,000°F.

2. Exposure: Severe.
3. Surface Prep: Abrasive Blast (SP 10).
4. Number of Coats: Two.
5. Minimum Solids Content: 46% by volume.
6. Minimum Dry Film Thickness Per Coat: 2 mils.
7. Primer: As recommended by painting system manufacturer.

I. System 8: High-Heat-Resistant Coating for Ferrous Metal (1,000°–1,400°F):
1. Description: Silicon ceramic matrix and thermally stable pigments., formulated for service up to 1,400°F.
2. Exposure: Severe.
3. Surface Prep: Abrasive Blast (SP 10).
4. Number of Coats: Two.
5. Minimum Dry Film Thickness Per Coat: 1.5 mils.
6. Primer: As recommended by painting system manufacturer.

J. System 10: Galvanized Metal Conditioning – Wash Primer:
1. Description: Wash Primer or Coating Manufacturer's Recommendation.
2. Exposure: Severe.
3. Surface Prep: Solvent Clean (SP 1), followed by Hand Tool (SP 2), or Power Tool (SP 3).
4. Number of Coats: One minimum, additional coats as required by exposure.
5. Minimum Dry Film Thickness Per Coat: 0.4 mils.

K. System 11: Galvanized Metal Conditioning – Zinc Primer:
1. Description: Organic Zinc Rich or Coating Manufacturer's Recommendation.
2. Exposure: Severe.
3. Surface Prep: Solvent Clean (SP 1), followed by Hand Tool (SP 2), Power Tool (SP 3), or Brushoff Blast (SP 7).
4. Number of Coats: One minimum, additional coats as required by exposure.
5. Minimum Dry Film Thickness Per Coat: 3 mils.

L. System 12: Skid-Resistant Walkway Surface Coatings:
1. Description: Aggregated High Solids Epoxy for use on steel, wood, aluminum, brick, block, fiberglass, or concrete.
2. Exposure: Moderate.
3. Surface Prep: Brushoff Blast (SP 7) or Plastic Surface Preparation.
4. Number of Coats: One.
5. Minimum Solids Content: 100% by volume.
6. Minimum Dry Film Thickness Per Coat: 30 mils.
7. Primer: High Solids Epoxy – As recommended by painting system manufacturer.
8. Aggregate Size: GL-400, grit size 20.

M. System 13: Sliding Metal:
1. Description: Wax coating.
2. Surface Prep: Solvent Clean (SP 1), followed by Hand Tool (SP 2), Power Tool (SP 3), or Brushoff Blast (SP 7).
3. Number of Coats: One.
4. Minimum Dry Film Thickness Per Coat: 30 mils.

N. System 14: Exposed PVC – Epoxy/Polyurethane Coating:
1. Description: High-solids, two-component epoxy primer and solvent-based, two-component, pigmented polyurethane top coat.
2. Exposure: Severe.
3. Surface Prep: Brushoff Blast (SP 7) or Plastic Surface Preparation.
4. Number of Coats: Two.
5. Finish: Semi-Gloss.

6. Minimum Epoxy Solids Content: 78% by volume.
7. Minimum Polyurethane Solids Content: 69% by volume.
8. Minimum Dry Film Thickness Per Coat: 2 mils.

O. System 15: Aluminum and Dissimilar Metal Insulation:
1. Description: Alkali Resistant Bitumastic or Coal-Tar Epoxy Substitute.
2. Surface Prep: Solvent Clean (SP 1).
3. Number of Coats: One.
4. Minimum Dry Film Thickness Per Coat: 18 mils.

P. System 16: Existing Concrete/CMU Repair:
1. Description: High-solids, two-component epoxy, with filler.
2. Exposure: Moderate.
3. Surface Prep: SP 13.
4. Filler: Per Manufacturer's Recommendations, 10 MDFT.
5. Primer: High Solids Epoxy – As recommended by painting system manufacturer, 5 MDFT, min.
6. Number of Coats: One.
7. Finish: Low gloss.
8. Minimum Solids Content: 78% by volume.
9. Minimum Dry Film Thickness Per Coat: 6 mils.

Q. System 17: New Concrete/CMU Exterior-Epoxy/Polyurethane (as required by application schedule):
1. Description: High-solids, two-component epoxy intermediated coat and, Aliphatic Polyurethane, with filler.
2. Exposure: Moderate.
3. Surface Prep: SP 13.
4. Filler: Per Manufacturer's Recommendations, 10 MDFT.
5. Primer: As recommended by painting system manufacturer.
6. Number of Coats: One.
7. Minimum Epoxy Solids Content: 78% by volume.
8. Minimum Polyurethane Solids Content: 69% by volume.
9. Minimum Dry Film Thickness Per Coat: 4 mils.

R. System 18: Concrete/CMU Interior or Immersion Mildly Corrosive – Epoxy/Epoxy (as required by application schedule):
1. Description: High-solids, two-component epoxy intermediated coat and, -solids, two-component epoxy top coat.
2. Exposure: Moderate.
3. Surface Prep: SP 13.
4. Filler: Per Manufacturer's Recommendations, 10 MDFT.
5. Primer: As recommended by painting system manufacturer.
6. Number of Coats: Two.
7. Minimum Epoxy Solids Content: 78% by volume.
8. Minimum Dry Film Thickness Per Coat: 6 mils.

S. System 19: Concrete– Immersion Highly Corrosive – H2S Resistant Epoxy:
1. Description: H2S Resistant Epoxy.
2. Exposure: Severe.
3. Surface Prep: SP 13.
4. Filler: As specified in Section 2.2.
5. Primer: As specified in Section 2.2.
6. Number of Coats: Two.
7. Minimum Dry Film Thickness: As specified in Section 2.2 or recommended by coating system manufacturer.

T. System 20: Epoxy Concrete Floor Coating – Moderate Corrosive Areas:
   1. Description: A highly chemical-resistant and solvent-resistant colored novolac glaze.
   2. Exposure: Moderate.
   3. Number of Coats: Two.
   4. Finish: Gloss.
   5. Minimum Solids Content: 100% by volume.
   6. Minimum Dry Film Thickness Per Coat: 6 mils.
   7. Primer: As recommended by painting system manufacturer.

U. System 21: Epoxy Concrete Floor and Secondary Containment Coating – Highly Corrosive Areas:
   1. Description: Epoxy Mortar and Fiberglass intermediate coat with a highly chemical-resistant and solvent-resistant colored novolac glaze top coat.
   2. Exposure: Severe.
   3. Primer: High Solids Epoxy, 6 mils.
   4. Intermediate Coat: Novolac Epoxy Mortar, 70 mils.
   5. Top Coat: Novolac Epoxy, 6 mils.
   6. Finish: Gloss.
   7. Minimum Solids Content: 100% by volume.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 77 00 – Closeout Procedures: Requirements for application examination.

B. Substrates:
   1. Verify that substrate surfaces are ready to receive Work of this Section as indicated by coating manufacturer.
   2. Obtain and follow manufacturer instructions for examination and testing of substrates.
   3. Cementitious Substrates: Do not begin application until substrate has cured minimum 28 days and measured moisture content is not greater than 16%.

C. Masonry:
   1. Verify that masonry joints are struck flush.

D. Wood:
   1. Do not begin application if substrate has moisture content greater than 12%.

3.2 GENERAL PROTECTION

A. Protect adjacent surfaces from coatings and damage. Repair damage resulting from inadequate or unsuitable protection:

B. Protect adjacent surfaces not to be coated from spatter and droppings with drop cloths and other coverings:

C. Mask off surfaces of items not to be coated or remove items from area.

D. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being coated and in particular, surfaces within storage and preparation area.

E. Place cotton waste, cloths, and material which may constitute fire hazard in closed metal containers and remove daily from site.

F. Remove electrical plates, surface hardware, fittings, and fastenings, prior to application of coating operations. Carefully store, clean, and replace on completion of coating in each area. Do not use solvent or degreasers to clean hardware that may remove permanent lacquer finish.

3.3 PREPARATION

A. Section 01 70 00 – Execution Requirements: Requirements for application preparation.

B. Clean surfaces of loose foreign matter.

C. Remove substances that would bleed through finished coatings; if removal is not possible, seal surface with shellac.

D. Remove finish hardware, fixture covers, and accessories and store.

E. Prepare surfaces as specified in coating manufacturer's instructions, unless more stringent requirements are specified in this Section.

F. Protect surfaces listed from abrasive blasting by masking, or other means:
1. Threaded portions of valve and gate stems, grease fittings, and identification plates.
2. Machined surfaces for sliding contact.
3. Surfaces to be assembled against gaskets.
4. Surfaces of shafting on which sprockets are to fit.
5. Surfaces of shafting on which bearings are to fit.
6. Machined surfaces of bronze trim, including those slide gates.
7. Cadmium-plated items, except cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment requiring abrasive blasting.
8. Galvanized items, unless scheduled to be coated.

G. Protect installed equipment, mechanical drives, and adjacent coated equipment from abrasive blasting to prevent damage caused by entering sand or dust.

H. Existing Painted and Sealed Surfaces:
1. Remove loose, flaking, and peeling paint, and feather edge and sand smooth edges of chipped paint.
2. Cleaning of previously coated surfaces:
    a. Utilize cleaning agent to remove soluble salts such as chlorides and sulfates from concrete and metal surfaces:
        1) Cleaning agent: Biodegradable nonflammable and containing no volatile organic compounds.
        2) Manufacturer:
            a) Chlor-Rid International, Inc.
            b) Or Approved Equal.
    b. Or Steam clean and degrease surfaces to be coated to remove oils and grease.
    c. Cleaning of surfaces utilizing the decontamination cleaning agent may be accomplished in conjunction with abrasive blast cleaning, steam cleaning, high-pressure washing, or hand washing as approved by the coating manufacturer's representative and the Engineer.
    d. Test cleaned surfaces as specified in the cleaning agent manufacturer's instructions to ensure all soluble salts have been removed. Additional cleaning shall be carried out as necessary.
    e. Final surface preparation prior to application of new coating system shall be made as specified in coating manufacturer's printed instructions.

I. Concrete:

1. Allow new concrete to cure for minimum of 28 days before coating.
2. Clean concrete surfaces of dust, mortar, fins, loose concrete particles, form release materials, oil, and grease. Fill voids so that surface is smooth. Etch or brush off-blast clean as specified in SSPC SP-7 to provide surface profile equal to 40-grit – 60-grit sandpaper, or as recommended by coating manufacturer. All concrete surfaces shall be vacuumed clean prior to coating application.

J. Galvanized Surfaces:
1. Degrease or solvent clean (SSPC SP-1) to remove oily residue.
2. Power tool or hand tool clean or whip abrasive blast.
3. Test surface for contaminants using copper sulfate solution.
4. Apply metal pretreatment within 24 hours before coating galvanized surfaces that cannot be thoroughly abraded physically, such as bolts, nuts, or preformed channels.

K. Ferrous Metal:
1. Solvent clean.
2. Remove loose rust, loose mill scale, and other foreign substances.
3. Hand Tools: Comply with SSPC-SP 2.
4. Power Tools: Comply with SSPC-SP 3.
5. Blasting: Comply with SSPC-SP 7.
6. Surfaces to Be Finished as Indicated in Coating Schedules
    a. Remove tight rust to bare metal.
    b. Hand Tools: Comply with SSPC-SP 2.
    c. Power Tools: Comply with SSPC-SP 3.
    d. Blasting: Comply with SSPC-SP 10.
    e. Protect from corrosion until coated.

L. Ductile iron pipe and fittings to be lined or coated:
1. Abrasive blast clean as specified in NAPF 500-03.

M. Sherardized, aluminum, copper, and bronze surfaces:
1. Prepare as specified in coating manufacturer's instructions.

N. Shop primed metal:
1. Certify that primers applied to metal surfaces in the shop are compatible with coatings to be applied over such primers in the field.
2. Remove shop primer from metal to be submerged by abrasive blasting as specified in SSPC SP-10, unless greater degree of surface preparation is required by coating manufacturer’s representative.
3. Correct abraded, scratched, or otherwise damaged areas of prime coat by sanding or abrasive blasting to bare metal as specified in SSPC SP-2, SP-3, or SP-6, as directed by the Engineer.
4. When entire shop priming fails or has weathered excessively (more than 25% of the item), or when recommended by coating manufacturer’s representative, abrasive blast shop prime coat to remove entire coat and prepare surface as specified in SSPC SP-10.
5. When incorrect prime coat is applied, remove incorrect prime coat by abrasive blasting as specified in SSPC SP-10.
6. When prime coat not authorized by Engineer is applied, remove unauthorized prime coat by abrasive blasting as specified in SSPC SP-10.
7. Shop applied bituminous paint or asphalt varnish: Abrasive blast clean shop applied bituminous paint or asphalt varnish from surfaces scheduled to receive non-bituminous coatings.

O. Cadmium-plated, zinc-plated, or sherardized fasteners:
1. Abrasive blast in same manner as unprotected metal when used in assembly of equipment designated for abrasive blasting.

2. Abrasive blast components to be attached to surfaces which cannot be abrasive blasted before components are attached.
3. Grind sharp edges to approximately 1/16 in. radius before abrasive blast cleaning.
4. Remove and grind smooth all excessive weld material and weld spatter before blast cleaning as specified in NACE SP0178.

P. PVC and FRP Surfaces:
1. Prepare surfaces to be coated by light sanding (de-gloss) and wipe-down with clean cloths, or by solvent cleaning.

Q. Mechanical And Electrical Equipment Preparation:
1. Identify equipment, ducting, piping, and conduit as specified in:
   a. Section 22 05 53 – Mechanical Identification
   b. Section 26 05 53 – Identification for Electrical Systems
2. Remove grilles, covers, and access panels for mechanical and electrical system from location and coat separately.
3. Prepare and finish coat-primed equipment with color selected by the Engineer.
4. Prepare and prime and coat insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are covered with prefinished coating.
5. Replace identification markings on mechanical or electrical equipment when coated over or spattered.
6. Prepare and coat interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with 1 coat of flat black paint, to limit of sight line.
7. Prepare and coat dampers exposed immediately behind louvers, grilles, convector, and baseboard cabinets to match face panels.
8. Prepare and coat exposed conduit and electrical equipment occurring in finished areas with color and texture to match adjacent surfaces.
9. Prepare and coat both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
10. Color code equipment, piping, conduit, and exposed ductwork and apply color banding and identification, such as flow arrows, naming and numbering, as specified in Contract Documents.

3.4 APPLICATION

A. General
1. Apply primer to each surface, unless specifically not required by coating manufacturer.
2. Apply coatings as specified in manufacturer's instructions.
3. Coat metal unless specified otherwise:
4. Aboveground piping to be coated shall be empty of contents during application of coatings.
5. Verify metal surface preparation immediately before applying coating as specified in SSPC SP COM.
6. Allow surfaces to dry, except where coating manufacturer requires surface wetting before coating.
7. Wash coat and prime sherardized, aluminum, copper, and bronze surfaces, or prime with manufacturer's recommended special primer.
8. Prime shop primed metal surfaces. Spot prime exposed metal of shop primed surfaces before applying primer over entire surface.
9. Multiple coats:
10. Apply minimum number of specified coats.
11. Apply additional coats when necessary to achieve specified thicknesses.
12. Apply coats to thicknesses specified, especially at edges and corners.

13. When multiple coats of same material are specified, tint prime coat and intermediate coats with suitable pigment to distinguish each coat.
14. Lightly sand and dust surfaces to receive high gloss finishes, unless instructed otherwise by coating manufacturer.
15. Dust coatings between coats.
16. Coat surfaces without drops, overspray, dry spray, runs, ridges, waves, holidays, laps, or brush marks.
17. Remove spatter and droppings after completion of coating.
18. Apply coating by brush, roller, trowel, or spray, unless method of application is required by coating manufacturer's instructions or these Specifications.
19. Plural component application: Drums shall be premixed each day. All gauges shall be working order prior to the start of application. Ratio checks shall be completed prior to each application. A spray sample shall be sprayed on plastic sheeting to ensure set time is complete prior to each application. Hardness testing shall be performed after each application.
20. Spray application:
    a. Stripe coat edges, welds, nuts, bolts, difficult to reach areas by brush before beginning spray application, as necessary, to ensure specified coating thickness along edges.
    b. When using spray application, apply coating to thickness not greater than that recommended in coating manufacturer's instructions for spray application.
    c. Use airless spray method, unless air spray method is required by coating manufacturer's instruction or these Specifications.
    d. Conduct spray coating under controlled conditions. Protect adjacent construction and property from coating mist, fumes, or overspray.
21. Drying and recoating:
    a. Provide fans, heating devices, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
    b. For submerged service the Contractor shall provide a letter to the Engineer that the lining system is fully cured and ready to be placed into service.
    c. Limit drying time to that required by these Specifications or coating manufacturer's instructions.
    d. Do not allow excessive drying time or exposure which may impair bond between coats.
    e. Recoat epoxies within time limits recommended by coating manufacturer.
    f. When time limits are exceeded, abrasive blast clean and de-gloss clean prior to applying another coat.
    g. When limitation on time between abrasive blasting and coating cannot be met before attachment of components to surfaces which cannot be abrasive blasted, coat components before attachment.
    h. Ensure primer and intermediate coats of coating are unscarred and completely integral at time of application of each succeeding coat.
    i. Touch up suction spots between coats and apply additional coats where required to produce finished surface of solid, even color, free of defects.
    j. Leave no holidays.
    k. Sand and feather into a smooth transition and recoat and recoat scratched, contaminated, or otherwise damaged coating surfaces so damages are invisible to naked eye.
22. Concrete:
    a. Apply first coat (primer) only when surface temperature of concrete is decreasing in order to eliminate effects of off-gassing on coating.
    b. Prior to priming, patch with filler to produce smooth surface.
23. Wood:
    a. Prior to priming patch with filler to produce smooth, even surface. Wood Items to Receive Transparent Finish:

1) Remove dust and grit, sealing residue, seal knots, pitch streaks, and sappy sections as indicated by coating manufacturer.
2) Fill nail holes and cracks with matching tinted filler.

B. ALKALI RESISTANT BITUMASTIC
1. Preparation:
a. Prepare surfaces as specified in general preparation requirements.
2. Application:
a. Apply as specified in general application requirements.
b. Apply at least 2 coats, 8 mils–14 mils dry film thickness each.

C. WAX COATING
1. Preparation:
a. Prepare surfaces as specified in general preparation requirements.
2. Application:
a. Apply as specified in general application requirements.
b. Apply at least 1/32 in. thick coat with 2 in. or shorter bristle brush.
c. Thoroughly rub coating into metal surface with canvas covered wood block or canvas glove.

D. HIGH SOLIDS EPOXY SYSTEM
1. Preparation:
a. Prepare surfaces as specified in general preparation requirements.
b. Abrasive blast ferrous metal surfaces to be submerged at jobsite as specified in SSPC SP-5 prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces as specified in SSPC SP-10.
c. Abrasive blast non-submerged ferrous metal surfaces at jobsite as specified in SSPC SP-10, prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces as specified in SSPC SP 6.
d. Abrasive blast clean ductile iron surfaces at jobsite as specified in SSPC SP-7.
2. Application:
a. Apply coatings as specified in general application requirements.
b. Apply minimum 2-coat system with minimum total dry film thickness (DFT) of 12 mils.
c. Recoat or apply succeeding epoxy coats within time limits recommended by manufacturer. Prepare surfaces for recoating as specified in manufacturer's instructions.
d. Coat metal to be submerged before installation when necessary, to obtain acceptable finish, and to prevent damage to other surfaces.
e. Coat entire surface of support brackets, stem guides, pipe clips, fasteners, and other metal devices bolted to concrete.
f. Coat surface of items to be exposed and adjacent 1 in. to be concealed when embedded in concrete or masonry.

E. HIGH SOLIDS EPOXY AND POLYURETHANE COATING SYSTEM
1. Preparation:
a. Prepare surfaces as specified in general preparation requirements.
b. Prepare concrete surfaces as specified in general preparation requirements.
c. Touch up shop primed steel and miscellaneous iron.
d. Abrasive blast ferrous metal surfaces at jobsite prior to coating. Abrasive blast clean rust and discoloration from surfaces.
e. Degrease or solvent clean, whip abrasive blast, power tool, or hand tool clean galvanized metal surfaces.
f. Lightly sand (de-gloss) fiberglass and poly vinyl chloride (PVC) pipe to be coated and wipe clean with dry cloths, or solvent clean as specified in coating manufacturer's instructions.

g. Abrasive blast clean ductile iron surfaces.

2. Application:
   a. Apply coatings as specified in general application requirements.
   b. Apply 3 coat system consisting of:
      1) Primer: 4 mils–5 mils dry film thickness high solids epoxy.
      2) Intermediate coat: 4 mils–5 mils dry film thickness high solids epoxy.
      3) Topcoat: 2.5 mils–3.5 mils dry film thickness aliphatic or aliphatic-acrylic polyurethane topcoat.
   c. Recoat or apply succeeding epoxy coats within 30 days or within time limits recommended by manufacturer, whichever is shorter. Prepare surfaces for recoating as specified in manufacturer's instructions.

F. EPOXY NOVOLAC SYSTEM
1. Preparation:
   a. Prepare surfaces as specified in general preparation requirements.
   b. Prepare concrete to obtain clean, open pore with exposed aggregate as specified in manufacturer's instructions.
   c. Prepare ferrous metal surfaces as specified in SSPC SP-5, with coating manufacturer's recommended anchor pattern.
   d. Complete application of prime coat within 6 hours of abrasive blast cleaning. When cleaned surfaces rust or discolor, abrasive blast surfaces as specified in SSPC SP-5.
   e. When handling steel, wear gloves to prevent hand printing.
   f. Adjust pH of concrete to within 7 pH–11 pH before applying prime coat.
2. Application:
   a. Apply coatings as specified in general application requirements and as specified in manufacturer’s instructions.
   b. Continue to monitor dew point. Dew point shall remain 5 degrees above ambient temperature for a minimum of 8 hours after application of coating.

G. HIGH TEMPERATURE COATING
1. Preparation:
   a. Prepare surfaces as specified in general preparation requirements.
   b. Abrasive blast surface as specified in SSPC SP-10.
2. Application:
   a. Apply coatings as specified in general application requirements.
   b. Apply number of coats as specified in manufacturer's instructions.

H. ASPHALT VARNISH
1. Preparation:
   a. Prepare surfaces as specified in general preparation requirements.
2. Application:
   a. Apply coatings as specified in general application requirements.
   b. Apply minimum 2 coats.

I. VINYL ESTER
1. Preparation:
   a. Prepare surfaces as specified in coating manufacturer's recommendations and as directed and approved by coating manufacturer's representative.
2. Application:
   a. Apply prime coat, as required by coating manufacturer, base coat, glass mat, and topcoat to total dry film thickness of 125 mils minimum:
      1) Final topcoat on floors shall include nonskid surface, applied as specified in manufacturer's instructions.
   b. Perform high voltage holiday detection test as specified in SP0188-06, over 100% of coated surface areas to ensure pinhole free finished coating system.

c. All work shall be accomplished as specified in coating manufacturer's instructions and under direction of coating manufacturer's representative.

J. ELASTOMERIC POLYURETHANE (100% SOLIDS)
1. Preparation:
a. Prepare surfaces as specified in coating manufacturer's instructions and as directed and approved by coating manufacturer's representative.
2. Application:
a. Apply epoxy primer at DFT of 1 mils–2 mils, as specified in manufacturer's instructions.
b. Apply polyurethane coating at minimum total DFT:
1) Steel: 60 mils DFT.
2) Ductile iron and ductile iron pipe coating and lining: 30 mils DFT.
3) Concrete: 120 mils DFT.
4) Or as recommended by the coating manufacturer and accepted by Engineer.
3. For concrete application, provide saw cutting for coating terminations as specified in manufacturer's instructions:
4. For application to damaged concrete, refer to Division 03 concrete specifications.
5. Perform high voltage holiday detection test as specified in SP0188-06, over 100% of coated surface areas to ensure pinhole free finished coating system.

K. CONCRETE FLOOR COATINGS
1. Preparation:
a. Prepare surfaces as specified in general application requirements and as specified in coating manufacturer’s instructions.
2. Application:
a. Apply primer if required by coating manufacturer.
b. Apply 1 or more coats as recommended by coating manufacturer to receive a minimum total dry film thickness of 25 mils, color as selected by Owner.
3. Final topcoat shall include nonskid surface, applied as specified in coating manufacturer's instructions.

L. WATERBORNE ACRYLIC EMULSION
1. Preparation:
a. Remove all oil, grease, dirt, and other foreign material by Solvent Cleaning as specified in SSPC SP-1.
b. Lightly sand all surfaces and wipe thoroughly with clean cotton cloths before applying coating.
2. Application:
a. Apply 2 or more coats to obtain a minimum dry film thickness (DFT) of 5.0 mils.

3.5 FIELD QUALITY CONTROL

A. Section 01 75 00 – Startup Testing and Training: Requirements for testing, adjusting, and balancing.

B. Each coat will be inspected. Strip and remove defective coats, prepare surfaces and recoat. When approved, apply next coat.

C. Control and check dry film thicknesses and integrity of coatings.

D. Measure dry film thickness with calibrated thickness gauge.

E. Dry film thicknesses on ferrous-based substrates may be checked with Elcometer Type 1 Magnetic Pull-Off Gage or Positector 6000.

F. Verify coat integrity with low-voltage sponge or high-voltage spark holiday detector, as specified in SP0188 06. Allow Engineer to use detector for additional checking.

G. Check wet film thickness before coal tar epoxy coating cures on concrete or nonferrous metal substrates.

H. Arrange for services of coating manufacturer's field representative to provide periodic field consultation and inspection services to ensure proper surface preparation of facilities and items to be coated, and to ensure proper application and curing:
   1. Notify Engineer 24 hours in advance of each visit by coating manufacturer's representative.
   2. Provide Engineer with a written report by coating manufacturer's representative within 48 hours following each visit.

3.6 CLEANING

A. Section 01 77 00 – Closeout Procedures: Requirements for cleaning.

B. Collect waste material that may constitute fire hazard, place in closed metal containers, and remove daily from Site.

C. Clean surfaces immediately of overspray, splatter, and excess material.

D. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.7 PROTECTION

A. Section 01 77 00 – Closeout Procedures: Requirements for protecting finished Work.

B. Protect adjacent surfaces and materials not receiving coating from overspray.

C. Mask when necessary to provide adequate protection and repair damage.

3.8 SCHEDULE OF ITEMS NOT REQUIRING COATING

A. General: Unless specified otherwise, the items do not require coating:
   1. Items that have received final coat at factory and not listed to receive coating in field.
   2. Aluminum, brass, bronze, copper, plastic (except PVC pipe), rubber, stainless steel, chrome, Everdur, or lead.
   3. Buried or encased piping or conduit.
   4. Exterior concrete.
   5. Galvanized steel wall framing, galvanized roof decking, galvanized electrical conduits, galvanized pipe trays, galvanized cable trays, and other galvanized items:
      a. Areas on galvanized items or parts where galvanizing has been damaged during handling or construction shall be repaired:
         1) Clean damaged areas by SSPC SP-1, SP-2, SP-3, or SP-7 as required.
         2) Apply 2 coats of a Galvanizing Zinc Compound as specified in manufacturer’s instructions.
   6. Grease fittings.
   7. Fiberglass ducting or tanks in concealed locations.
   8. Steel to be encased in concrete or masonry.

3.9 SCHEDULE OF SURFACES TO BE COATED

A. See attached schedule for a list of items to be coated. Schedule may not list all items that require a coating – coat unlisted surfaces with same coating system as similar listed surfaces. Color coat all piping as specified in Section 40 23 39 – Process Piping.

END OF SECTION

SURFACES TO BE COATED	COATING SYSTEM	Field/Factory	NOTES
PVC Piping, PVC surfaces, and FRP without an integral UV resistant gel coating			
Exterior Exposed	14	Factory Primed/Field Finished	
Structural Steel and related metals			
Submerged in Domestic Sewage	2	Factory Primed/Field Finished	Clarifier Mechanism Center Column
Exposed – Highly Corrosive	3	Factory Primed/Field Finished	All Above-grade Exterior Locations
Buried	5	Factory Primed/Field Finished	
Aluminum Surfaces including Grating, Handrails, Checker Plate, Stairs, and related items			
Aluminum grating in contact with dissimilar metals (other than stainless steel), or in contact with masonry, grout, or concrete	11	Factory Primed/Field Finished	
Aluminum checker plate	12	Factory Primed/Field Finished	
Handrail Bases	15	Factory Primed/Field Finished	
Aluminum in contact with concrete	15	Factory Primed/Field Finished	
Platform Connections to Concrete	15	Factory Primed/Field Finished	
Mechanical Equipment			
Dampers	3	Factory Primed/Field Finished	
Concrete			

SURFACES TO BE COATED	COATING SYSTEM	Field/Factory	NOTES
Structures holding wastewater in primary treatment, biological treatment, or solids treatment processes:	19	Field Coated	Fac. 20: Headworks – Entire height of walls. Coating to extend minimum of 3 inches over top of walls. Fac. 25: Primary Clarifiers – Top 10'-0" of interior walls of discharge wells. Coating to extend minimum of 3 inches over top of walls.

DIVISION 22

PLUMBING

SECTION 22 05 29 – PROCESS SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Hangers and Supports for Mechanical System Piping and Equipment:
      a. Steel pipe hangers and supports.
      b. Trapeze pipe hangers.
      c. Metal framing systems.
      d. Thermal-hanger shield inserts.
      e. Fastener systems.
      f. Pipe positioning systems.
      g. Equipment supports.

B. Related Sections:
   1. Section 40 23 39 – Process Piping – General

1.2 DEFINITIONS

A. MSS:
   1. Manufacturers Standardization Society for the Valve and Fittings Industry, Inc.

B. Terminology:
   1. As specified in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. Steel pipe hangers and supports.
   2. Thermal-hanger shield inserts.
   3. Pipe positioning systems.

C. Shop Drawings:
   1. Show fabrication and installation details and include calculations:
      a. Trapeze pipe hangers. Include Product Data for components.
      b. Metal framing systems. Include Product Data for components.
      c. Equipment supports.
   2. Drawings of piping support system, locating each support, brace, hanger, guide, component, and anchor. Identify support, hanger, guide, and anchor type by catalog number and Shop Drawing detail number.
   3. Revisions to support systems resulting from changes in related piping system layout or addition of flexible joints.

D. Welding Certificates.

E. Contract Closeout Submittals:
   1. Maintenance information on piping support system.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment.

1.5 QUALITY ASSURANCE

A. Welding:
   1. Qualify procedures and personnel as specified in:
      a. AWS D1.1, "Structural Welding Code – Steel."
      b. AWS D1.2, "Structural Welding Code – Aluminum."
      c. AWS D1.3, "Structural Welding Code – Sheet Steel."
      d. AWS D1.4, "Structural Welding Code – Reinforcing Steel."
      e. ASME Boiler and Pressure Vessel Code: Section IX.

1.6 DESIGN REQUIREMENTS

A. General:
   1. Contractor shall be responsible for the design, size, and location of process piping support systems as specified in this section, the Drawings, and the Design Details. The design shall be provided by a company specifically specializing in the design of support systems. The pipe support system design company shall demonstrate that they have at least five years of experience in pipe support design and have successfully completed at least three designs in the previous year. The Contractor shall provide Certification of Compliance with these requirements.
   2. Seismic Load:
      a. Seismic loads as specified in the Structural General Notes Drawing.
   3. Piping smaller than 30 in.:
      a. Supports are shown only where specific types and locations are required; additional pipe supports may be required.
   4. Piping 30 in. and larger:
      a. Support systems have been designed for piping shown.
   5. Meet requirements of MSS SP 58, MSS SP 69, and MSS SP 89.

B. Pipe Support Systems:
   1. Support Load:
      a. Dead loads imposed by weight of pipes filled with water, except air and gas pipes, plus insulation and capable of supporting combined weight of supported systems, system contents, and test water.
   2. Safety Factor:
      a. Minimum of 5.
   3. Maximum Support Spacing and Minimum Rod Size:
      a. Steel or Ductile Iron Piping:

Pipe Size	Maximum Support/ Hanger Spacing	Minimum Rod Size Single Rod Hangers
1 in. & smaller	6 ft	1/4 in.
1 1/2 in. – 2 1/2 in.	8 ft	1/4 in.
3 in. – 4 in.	10 ft	3/8 in.

Pipe Size	Maximum Support/ Hanger Spacing	Minimum Rod Size Single Rod Hangers
6 in.	12 ft	3/8 in.
8 in.	12 ft	1/2 in.
10 in. – 12 in.	14 ft	5/8 in.
14 in.	16 ft	3/4 in.
16 in. – 18 in.	16 ft	7/8 in.
20 in.	18 ft	1 in.
24 in.	18 ft	1 1/4 in.
30 in. & larger	As shown on Drawings	As shown on Drawings

b. Copper Piping:
   1) Maximum Support Spacing: 2 ft less per size than listed for steel pipe, with 1 in. and smaller pipe supported every 5 ft.
   2) Minimum Hanger Rod Sizing: Same as listed for steel pipe.

c. Plastic and Fiberglass Piping:
   1) Maximum support spacing: As recommended by manufacturer for flow temperature in pipe.
   2) Minimum Hanger Rod Sizing: Same as listed for steel pipe.

d. Stainless Steel Piping:

SST Pipe Size	Maximum Support/ Hanger Spacing	Minimum Rod Size Single Rod Hangers
1 in. – 4 in.	8 ft	1/4 in.
6 in.	8 ft	3/8 in.
8 in. – 10 in.	10 ft	1/2 in.
12 in.	10 ft	1/2 in.
14 in. – 16 in.	12 ft	5/8 in.
18 in. – 20 in.	14 ft	3/4 in.
24 in.	14 ft	7/8 in.

C. Framing Support System:
   1. Beams:
      a. Size such that beam stress does NOT exceed 25,000 psi and maximum deflection does NOT exceed 1/240 of span.
   2. Column Members:
      a. Size as specified in Manufacturer's recommended method.
   3. Support Loads:
      a. Calculate using weight of pipes filled with water.
   4. Maximum Spans:
      a. Steel and Ductile Iron Pipe, 3 in. Diameter and Larger:
         1) 10 ft centers, unless otherwise specified.
      b. Other Pipelines and Special Situations:
         1) May require supplementary hangers and supports.
   5. Electrical Conduit Support:
      a. Include in design of framing support system.

D. Anchoring Devices:
   1. Design, size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor support, to withstand shear and pullout loads imposed by loading and spacing on each particular support.

E. Vertical Sway Bracing:
   1. 10 ft maximum centers, or as shown.

F. Existing Support Systems:
   1. Use existing supports systems to support new piping only if Contractor can show that they are adequate for additional load, or if they are strengthened to support the additional load.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. When specified items are NOT available, fabricate pipe supports of correct material and to general configuration specified by catalogs.

B. Special support and hanger details are shown for cases where standard catalog supports are inapplicable.

C. Materials:
   1. Wetted and Submerged: Stainless steel
   2. Atmospheric Exposed:
      a. Galvanized or painted steel as specified in Section 09 90 00 – Painting and Protective Coatings.
   3. Corrosive Areas: FRP

2.2 MANUFACTURERS

A. Subject to requirements, Manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, Manufacturers specified.

2.3 STEEL PIPE HANGERS AND SUPPORTS

A. Description:
   1. MSS SP-58, Types 1 – 58, factory-fabricated components. See Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:
   1. B-Line Systems, Inc.
      A division of Cooper Industries
   2. Empire Industries, Inc.
   3. ERICO/Michigan Hanger Co.
   4. Globe Pipe Hanger Products, Inc.
   5. Grinnell Corp.
   6. GS Metals Corp.
   7. National Pipe Hanger Corporation
   8. Other Approved Equal.

C. Galvanized, Metallic Coatings:
   1. Pre-galvanized or hot dipped.

D. Nonmetallic Coatings:
   1. Plastic coating, jacket, or liner.

E. Padded Hangers:
   1. Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.4 TRAPEZE PIPE HANGERS

A. Description:
   1. MSS SP-69, Type 59, shop-fabricated or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.5 METAL FRAMING SYSTEMS

A. Description:
   1. MFMA-3, shop-fabricated or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:
   1. B-Line Systems, Inc.
      A division of Cooper Industries
   2. Power-Strut Div.; Tyco International, Ltd.
   3. Thomas & Betts Corporation
   4. Tolco Inc.
   5. Unistrut Corp.; Tyco International, Ltd.
   6. Other Approved Equal.

C. Coatings:
   1. Manufacturer's standard finish, unless bare metal surfaces are specified.

D. Nonmetallic Coatings:
   1. Plastic coating, jacket, or liner.

2.6 THERMAL–HANGER SHIELD INSERTS

A. Description:
   1. 100 psig minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:
   1. Carpenter & Paterson, Inc.
   2. ERICO/Michigan Hanger Co.
   3. PHS Industries, Inc.
   4. Pipe Shields, Inc.
   5. Rilco Manufacturing Company, Inc.
   6. Value Engineered Products, Inc.
   7. Other Approved Equal.

C. Insulation-Insert Material for Cold Piping:
   1. Water-repellent treated, ASTM C533, Water-repellent treated, ASTM C533, Type I calcium silicate or ASTM C552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping:
   1. Water-repellent treated, ASTM C533, Type I calcium silicate or ASTM C552, Type II cellular glass.

E. Trapeze or Clamped Systems:
   1. Insert and shield shall cover entire circumference of pipe.

F. Clevis or Band Hangers:
   1. Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length:
   1. Extend 2 in. beyond sheet metal shield for piping operating below ambient air temperature.

2.7 FASTENER SYSTEMS

A. Powder-Actuated Fasteners:
   1. Threaded-steel stud, for use in hardened Portland cement concrete with pullout, tension, and shear capacities appropriate for supported loads and building materials where used.
   2. Manufacturers:
      a. Hilti, Inc.
      b. ITW Ramset/Red Head
      c. Masterset Fastening Systems, Inc.
      d. MKT Fastening, LLC.
      e. Powers Fasteners
      f. Other Approved Equal.

B. Mechanical-Expansion Anchors:
   1. Insert-wedge-type stainless steel, for use in hardened Portland cement concrete with pullout, tension, and shear capacities appropriate for supported loads and building materials where used.
   2. Manufacturers:
      a. B-Line Systems, Inc.
         A division of Cooper Industries
      b. Empire Industries, Inc.
      c. Hilti, Inc.
      d. ITW Ramset/Red Head
      e. MKT Fastening, LLC.
      f. Powers Fasteners
      g. Other Approved Equal.

2.8 PIPE POSITIONING SYSTEMS

A. Description:
   1. IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:
   1. C & S Mfg. Corp.
   2. HOLDRITE Corp.
      Hubbard Enterprises
   3. Samco Stamping, Inc.

2.9 EQUIPMENT SUPPORTS

A. Description:
   1. Welded, shop-fabricated or field-fabricated equipment support made from structural-steel shapes.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel:
   1. ASTM A36 steel plates, shapes, and bars; black and galvanized.

B. Grout:
   1. ASTM C1107, factory-mixed and factory-packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
   2. Properties:
      a. Nonstaining, noncorrosive, and nongaseous.
   3. Design Mix:
      a. 5,000 psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 GENERAL

A. Install support systems as specified in MSS SP 69, Pipe Hangers and Supports-Selection and Application and MSS SP 89, Pipe Hangers and Supports-Fabrication and Installation, unless specified otherwise.

B. Support piping connections to equipment by pipe support and NOT by the equipment.

C. Support large or heavy valves, fittings, and appurtenances independently of connected piping.

D. Support No Pipe From The Pipe Above It.

E. Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where specified.

F. DO NOT install pipe supports and hangers in equipment access areas or bridge crane runs.

G. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing.

H. Install lateral supports for seismic loads at all changes in direction.

I. Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.

J. Repair mounting surfaces to original condition after attachments are made.

3.2 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. See MSS SP-69 for pipe hanger selections and applications that are NOT specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that shall NOT have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Unless otherwise specified in piping system Sections, install:
   1. Horizontal-Piping Hangers and Supports:
      a. Adjustable, Steel Clevis Hangers (MSS Type 1):
         1) For suspension of uninsulated or insulated stationary pipes, NPS 1/2 – NPS 30.
      b. Yoke-Type Pipe Clamps (MSS Type 2):
         1) For suspension of 120°F–450°F pipes, NPS 4 to NPS 16, requiring up to 4 in. of insulation.
      c. Carbon-Steel or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3):
         1) For suspension of pipes, NPS 3/4 – NPS 24, requiring clamp flexibility and up to 4 in. of insulation.
      d. Steel Pipe Clamps (MSS Type 4):
         1) For suspension of cold and hot pipes, NPS 1/2 – NPS 24, if little or no insulation is required.
      e. Pipe Hangers (MSS Type 5):
         1) For suspension of pipes, NPS 1/2 – NPS 4, to allow off-center closure for hanger installation before pipe erection.
      f. Adjustable Swivel Split-Ring or Solid-Ring Hangers (MSS Type 6):
         1) For suspension of uninsulated stationary pipes, NPS 3/4 – NPS 8.
      g. Adjustable, Steel Band Hangers (MSS Type 7):
         1) For suspension of uninsulated stationary pipes, NPS 1/2 – NPS 8.
      h. Adjustable Band Hangers (MSS Type 9):
         1) For suspension of uninsulated stationary pipes, NPS 1/2 to NPS 8.
      i. Adjustable Swivel-Ring Band Hangers (MSS Type 10):
         1) For suspension of uninsulated stationary pipes, NPS 1/2 to NPS 2.
      j. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11):
         1) For suspension of uninsulated stationary pipes, NPS 3/8 – NPS 8.
      k. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12):
         1) For suspension of uninsulated stationary pipes, NPS 3/8 – NPS 3.
      l. U-Bolts (MSS Type 24):
         1) For support of heavy pipes, NPS 1/2 – NPS 30.
      m. Clips (MSS Type 26):
         1) For support of insulated pipes NOT subject to expansion or contraction.
      n. Pipe Saddle Supports (MSS Type 36):
         1) For support of pipes, NPS 4 – NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
      o. Pipe Stanchion Saddles (MSS Type 37):
         1) For support of pipes, NPS 4 – NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
      p. Adjustable Pipe Saddle Supports (MSS Type 38):
         1) For stanchion-type support for pipes, NPS 2 1/2 – NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
      q. Single Pipe Rolls (MSS Type 41):
         1) For suspension of pipes, NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

r. Adjustable Roller Hangers (MSS Type 43):
   1) For suspension of pipes, NPS 2 1/2 – NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
s. Complete Pipe Rolls (MSS Type 44):
   1) For support of pipes, NPS 2 – NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is NOT necessary.
t. Pipe Roll and Plate Units (MSS Type 45):
   1) For support of pipes, NPS 2 – NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is NOT necessary.
u. Adjustable Pipe Roll and Base Units (MSS Type 46):
   1) For support of pipes, NPS 2 – NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

2. Vertical-Piping Clamps:
   a. Extension Pipe or Riser Clamps (MSS Type 8):
      1) For support of pipe risers, NPS 3/4 – NPS 20.
   b. Carbon-Steel or Alloy-Steel Riser Clamps (MSS Type 42):
      1) For support of pipe risers, NPS 3/4 – NPS 20, if longer ends are required for riser clamps.
3. Hanger Rod Attachments:
   a. Steel Turnbuckles (MSS Type 13):
      1) For adjustment up to 6 in. for heavy loads.
   b. Steel Clevises (MSS Type 14):
      1) For 120°F–450°F piping installations.
   c. Swivel Turnbuckles (MSS Type 15):
      1) For use with MSS Type 11, split pipe rings.
   d. Malleable-Iron Sockets (MSS Type 16):
      1) For attaching hanger rods to various types of building attachments.
   e. Steel Weldless Eye Nuts (MSS Type 17):
      1) For 120°F–450°F piping installations.
4. Building Attachments:
   a. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   b. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
   c. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   d. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   e. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   f. C-Clamps (MSS Type 23): For structural shapes.
   g. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
   h. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
   i. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
   j. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
   k. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
   l. 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 specified loads:
      1) Light (MSS Type 31): 750 lbs.

2) Medium (MSS Type 32): 1500 lbs.
3) Heavy (MSS Type 33): 3000 lbs.

m. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

n. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

o. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

5. Saddles and Shields:
   a. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   b. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
   c. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
6. Spring Hangers and Supports:
   a. Restraint-Control Devices (MSS Type 47): Where specified to control piping movement.
   b. Spring Cushions (MSS Type 48): For light loads if vertical movement does NOT exceed 1 1/4 in.
   c. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
   d. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
   e. Variable-Spring Hangers (MSS Type 51): Preset to specified load and limit variability factor to 25% to absorb expansion and contraction of piping system from hanger.
   f. Variable-Spring Base Supports (MSS Type 52): Preset to specified load and limit variability factor to 25% to absorb expansion and contraction of piping system from base support.
   g. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to specified load and limit variability factor to 25% to absorb expansion and contraction of piping system from trapeze support.
   h. 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:
      1) Horizontal (MSS Type 54): Mounted horizontally.
      2) Vertical (MSS Type 55): Mounted vertically.
      3) Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

G. See MSS SP-69 for trapeze pipe hanger selections and applications that are NOT specified in piping system Sections.

H. See MFMA-102 for metal framing system selections and applications that are NOT specified in piping system Sections.

I. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

J. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.3 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation:
   1. See MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation:
   1. See MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
   2. 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.
   3. Field fabricate from ASTM A36, steel shapes selected for loads being supported. Weld steel as specified in AWS D1.1.

C. Fiberglass Pipe Hanger Installation:
   1. See applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation:
   1. Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

E. Thermal-Hanger Shield Installation:
   1. Install in pipe hanger or shield for insulated piping.

F. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 in. thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool Manufacturer. Install fasteners as specified in powder-actuated tool Manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners as specified in Manufacturer's written instructions.

G. Pipe Positioning System Installation:
   1. Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation:
   1. Fabricate from welded-structural-steel shapes.

J. 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.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2 1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution:
   1. Install hangers and supports so piping live and dead loads and stresses from movement shall NOT be transmitted to connected equipment.

N. Pipe Slopes:
   1. Install hangers and supports to provide specified pipe slopes and to make sure maximum pipe deflections are NOT exceeded as specified in ASME B31.1 (for power piping) and ASME B31.9 (for building services piping).

O. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. DO NOT exceed pipe stress limits as specified in ASME B31.1 for power piping and ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is specified. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180°.
      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:
      a. NPS 1/4 – NPS 3 1/2: 12 in. long and 0.048 in. thick.
      b. NPS 4: 12 in. long and 0.06 in. thick.
      c. NPS 5 – NPS 6: 18 in. long and 0.06 in. thick.
      d. NPS 8 – NPS 14: 24 in. long and 0.075 in. thick.
      e. NPS 16 – NPS 24: 24 in. long and 0.105 in. thick.
   5. Pipes NPS 8 and Larger: Include wood inserts.
   6. Insert Material: Length at least as long as protective shield.
   7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.4 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting:
   1. Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.5 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers 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:
   1. See AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
   2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   3. Obtain fusion without undercut or overlap.
   4. Remove welding flux immediately.
   5. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.6 ADJUSTING

A. Hanger Adjustments:
   1. Adjust hangers to distribute loads equally on attachments and to achieve specified slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1 1/2 in.

3.7 PAINTING

A. Paint exposed surfaces immediately after erecting hangers and supports as specified in Section 09 90 00 – Protective Painting and Coatings.

B. Galvanized Surfaces:
   1. Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint as specified in ASTM A780.

END OF SECTION

SECTION 22 05 53 – MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. The Work required for Mechanical Identification.
   2. Identification devices, including:
      a. Painted Identification Materials.
      b. Equipment Labels.
      c. Plastic Pipe Markers.
      d. Plastic Tape.
      e. Underground-Type Plastic Line Marker.
      f. Valve Tags.
      g. Valve Schedule Frames.
      h. Engraved Plastic-Laminate Signs.

1.2 REFERENCES

A. ANSI Standards:
   1. See ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.3 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. Submit Manufacturer's technical product data and installation instructions for each identification material and device required.

C. Schedules:
   1. Submit valve schedule for each piping system, typewritten and reproduced on 8 1/2 in. by 11 in. bond paper. Tabulate the valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shutoff and similar special uses, by special "flags", in margin of schedule.
   2. In addition to mounted copies, furnish extra copies for Maintenance Manuals as specified in Division 01.

D. Maintenance Data:
   1. Include product data and schedules in maintenance manuals; as specified in Division 01 – General Requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Firms regularly engaged in manufacture of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for NOT less than 5 years.

1.5 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: (Subject to Requirements):
   1. Allen Systems, Inc.
   2. Brady (W.H.) Co.
      Signmark Div.
   3. Industrial Safety Supply Co., Inc.
   4. Seton Name Plate Corp.
   5. Other Approved Equal.

2.2 MECHANICAL IDENTIFICATION MATERIALS

A. General:
   1. Provide Manufacturer's standard products of categories and types required for each application as referenced in other sections. Selection is Installer's option where more than a single type is specified for applications but provide single selection for each product category.

2.3 PAINTED IDENTIFICATION MATERIALS

A. Stencils:
   1. Standard fiberboard stencils, prepared for required applications with letter sizes as specified in ANSI A13.1 for piping and similar applications, but NOT less than 1 1/4 in. high letters for ductwork and NOT less than 3/4 in. high letters for access door signs and similar operational instructions.

B. Stencil Paint:
   1. Standard exterior type stenciling enamel; black, except as otherwise specified; either brushing grade or pressurized spray can form and grade.

C. Identification Paint:
   1. Standard identification enamel of colors specified or, if NOT otherwise specified for piping systems, as specified in ANSI A13.1 and/or Owner Selection for colors.

D. See Section 09 90 00 – Painting and Protective Coatings.

2.4 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   1. Material and Thickness:
      a. Stainless steel, 0.025 in. (0.64 mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Minimum Label Size:
      a. Length and width vary for required label content, but NOT less than 2 1/2 in. by 3/4 in. (64 mm by 19 mm).
   3. Minimum Letter Size:
      a. 1/4 in. (6.4 mm) for name of units if viewing distance is less than 24 in. (600 mm).
      b. 1/2 in. (13 mm) for viewing distances up to 72 in. (1,830 mm).
      c. Proportionately larger lettering for greater viewing distances.
      d. Include secondary lettering 2/3 – 3/4 the size of principal lettering.
   4. Fasteners:
      a. Stainless-steel rivets or self-tapping screws

5. Adhesive:
    a. Contact-type permanent adhesive, compatible with label and with substrate.

2.5 PLASTIC PIPE MARKERS

A. Snap-On Type:
1. Provide Manufacturer's standard preprinted, semi-rigid snap-on, color-coded pipe markers, as specified in ANSI A13.1.

B. Pressure-Sensitive Type:
1. Provide Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, as specified in ANSI A13.1.

C. Insulation:
1. Furnish 1 in. thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125°F (52°C) or greater. Cut length to extend 2 in. beyond each end of plastic pipe marker.
2. Small Pipes:
    a. For external diameters less than 6 in. (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the methods below:
        1) Snap-on application of pretensioned semi-rigid plastic pipe marker.
        2) Adhesive lap joint in pipe marker overlap.
        3) Laminated or bonded application of pipe marker to pipe (or insulation).
        4) Taped to pipe (or insulation) with color-coded plastic adhesive tape, NOT less than 3/4 in. wide; full circle at both ends of pipe marker, tape lapped 1 1/2 in.
3. Large Pipes:
    a. For external diameters of 6 in. and larger (including insulation if any), provide either full-band or strip-type pipe markers, but NOT narrower than 3 times letter height (and of required length), fastened by one of the methods below:
        1) Laminated or bonded application of pipe marker to pipe (or insulation).
        2) Taped to pipe (or insulation) with color-coded plastic adhesive tape, NOT less than 1 1/2 in. wide; full circle at both ends of pipe marker, tape lapped 3 in.
        3) Trapped-to-pipe (or insulation) application of semi-rigid type, with Manufacturer's standard stainless-steel bands.

D. Lettering:
1. Manufacturer's standard preprinted nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance with name as specified.
2. Arrows: Print each pipe marker with arrows specifying direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

2.6 PLASTIC TAPE

A. General:
1. Provide Manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, NOT less than 3 mils thick.

B. Width:
1. Provide 1 1/2 in. wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6 in, 2 1/2 in. wide tape for larger pipes.

C. Color:
1. See ANSI A13.1, except where another color selection is specified.

2.7 UNDERGROUND–TYPE PLASTIC LINE MARKERS

A. General:
1. Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; NOT less than 6 in. wide by 4 mils thick.
2. Provide tape with printing most accurately specifying type of service of buried pipe.

B. Provide multi-ply tape consisting of solid aluminum foil core between 2-layers of plastic tape.

2.8 VALVE TAGS

A. Brass Valve Tags:
1. Provide 19 GA polished brass valve tags, with a stamp-engraved piping system abbreviation in 1/4 in. high letters and sequenced valve numbers 1/2 in. high, and with 5/32 in. hole for fastener.
2. Provide 1 1/2 in. diameter tags, except as otherwise specified.
3. Provide size and shape as specified or scheduled for each piping system.
4. Fill tag engraving with black enamel.

B. Plastic Laminate Valve Tags:
1. Provide Manufacturer's standard 3/32 in. thick engraved plastic laminate valve tags, with piping system abbreviation in 1/4 in. high letters and sequenced valve numbers 1/2 in. high, and with 5/32 in. hole for fastener.
2. Provide 1 1/2 in^2 black tags with white lettering, except as otherwise specified.
3. Provide size, shape and color combination as specified or scheduled for each piping system.

C. Valve Tag Fasteners:
1. Provide Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

D. Access Panel Markers:
1. Provide Manufacturer's standard 1/16 in. thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve. Include 1/8" center hole to allow attachment.

2.9 VALVE SCHEDULE FRAMES

A. General:
1. For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

2.10 ENGRAVED PLASTIC–LAMINATE SIGNS

A. General:
1. Provide engraving stock melamine plastic laminate, as specified in FS L-P-387, in the sizes and thicknesses specified, engraved with engraver's standard letter style of the sizes and wording specified, black with white core (letter color) except as otherwise specified, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

B. Thickness:
   1. 1/16 in. for units up to 20in^2 or 8 in. length; 1/8 in. for larger units.

C. Fasteners:
   1. Self-tapping stainless-steel screws, except contact-type permanent adhesive where screws CANNOT or should NOT penetrate the substrate.

2.11 LETTERING AND GRAPHICS

A. General:
   1. Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified, or scheduled. Provide numbers, lettering and wording as specified, or, if NOT otherwise, as specified by manufacturers, or as required for proper identification and operation/maintenance of mechanical systems and equipment.

B. Multiple Systems:
   1. Where multiple systems of same generic name are shown and specified, provide identification which specifies individual system number as well as service (as examples; Boiler No. 3, Air Supply No. 1H, Standpipe F12).

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Coordination:
   1. Where identification is to be applied to surfaces which require insulation, painting or other covering or finish including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

3.2 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPING SYSTEM IDENTIFICATION

A. Install pipe markers of ONE of the types on each system specified to receive identification, and include arrows to show normal direction of flow:
   1. Stenciled markers, including color-coded background band or rectangle, and contrasting lettering of black or white. Extend color band or rectangle 2 in. beyond ends of lettering.
   2. Stenciled markers, with lettering color as specified in ANSI A13.1.
   3. Plastic pipe markers, with application system as specified under "Materials" in this section. Install on pipe insulation segment where required for hot uninsulated pipes.
   4. Stenciled markers, black or white for best contrast, wherever continuous color-coded painting of piping is provided.

5. Locate pipe markers and color bands wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior unconcealed locations.
    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
    c. Near locations where pipes pass through walls or floors/ceilings, or enter inaccessible enclosures.
    d. At access doors, manholes and similar access points which permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.
    f. Spaced intermediately at maximum spacing of 50 ft along each piping run, except reduce spacing to 25 ft in congested areas of piping and equipment.
    g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

3.5 UNDERGROUND PIPING IDENTIFICATION

A. General:
    1. During back-filling/top-soiling of each exterior underground piping system, install continuous underground-type plastic line marker, located directly over buried line at 6 in. to 8 in. below finished grade. Where multiple small lines are buried in common trench and DO NOT exceed overall width of 16 in., install single line marker. For tile fields and similar installations, mark only edge pipelines of field.

3.6 VALVE IDENTIFICATION

A. Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, plumbing fixture faucets, convenience and lawn-watering hose bibs, and shutoff valves at plumbing fixtures, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.

B. Mount valve schedule frames and schedules in machine rooms where specified, or if NOT otherwise, where specified by Contracting Officer.

C. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

3.7 ADJUSTING AND CLEANING

A. Adjusting:
    1. Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.

B. Cleaning:
    1. Clean face of identification devices, and glass frames of valve charts.

3.8 EXTRA STOCK

A. Furnish minimum of 5% extra stock of each mechanical identification material required, including additional numbered valve tags (NOT less than 3) for each piping system, additional piping system identification markers, and additional plastic laminate engraving blanks of assorted sizes.

B. Where stenciled markers are provided, clean and retain stencils after completion of stenciling and include used stencils in extra stock, along with required stock of stenciling paints and applicators.

END OF SECTION

DIVISION 23
HVAC

SECTION 23 07 13 – MECHANICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. The Work for Insulating:
      a. Domestic water piping
      b. Refrigerant piping

B. Related Sections:
   1. Section 40 41 13 – Heat Tracing

1.2 SUBMITTALS

A. Subject to the requirements of Section 01 33 00 – Submittal Procedures.

B. Product Data:
   1. For each type of product specified. Include thermal conductivity, water vapor permeance thickness, and jackets (both factory-applied and field-applied if any).

1.3 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics:
   1. For insulation and related materials, as determined by testing identical products as specified in ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   2. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   3. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging:
   1. Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 WARRANTY

A. See Section 01 78 36 – Warranties and Bonds for requirements.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. See requirements in "Piping Insulation Schedule."

B. Products shall NOT contain asbestos, lead, mercury, or mercury compounds.

C. Products that encounter stainless steel shall have a leachable chloride content of less than 50 ppm when tested as specified in ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable as specified in ASTM C795.

E. Foam insulation materials shall NOT use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation:
1. Mineral or glass fibers bonded with a thermosetting resin.
2. See ASTM C553, Type II and ASTM C1290.
3. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Mineral-Fiber Board Insulation:
1. Mineral or glass fibers bonded with a thermosetting resin.
2. See ASTM C612, Type IA or Type IB.
3. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Mineral-Fiber, Preformed Pipe Insulation:
1. Type I, 850°F (454°C) Materials: Mineral or glass fibers bonded with a thermosetting resin.
2. See ASTM C547, Type I, Grade A, with factory-applied ASJ.
3. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Rigid Pipe Insulation (Phenolic, Polyisocyanurate):
1. Minimum Type II, Grade I ((-70)–300°F). Phenolic (Type III, Grade I). Rigid foam insulation with closed cell structure.
2. See ASTM C591 and/or ASTM C1126.
3. Shall have 2% or less water absorption.
4. See ASTM E84 25/50 flame and smoke development.

J. Preformed Flexible Elastomeric Pipe Insulation:
1. Closed-cell, sponge-rubber or expanded-rubber materials.
2. See ASTM C534, Type I for tubular materials.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise specified.

B. Mineral-Fiber Adhesive:
   1. See MIL-A-3316C, Class 2, Grade A.

C. Flexible Elastomeric and Polyolefin Adhesive:
   1. See MIL-A-24179A, Type II, Class I.

D. ASJ Adhesive, and FSK Jacket Adhesive:
   1. See MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire-resistant and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: ((-40)–250°F ((-40) – 121°C)).
   4. Color: Aluminum.

2.4 FACTORY–APPLIED JACKETS

A. Insulation system schedules specify factory-applied jackets on various applications.

B. When factory-applied jackets are specified, see:
   1. ASJ for preformed mineral fiber pipe insulation: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; as specified in ASTM C1136, Type I.

2.5 FIELD–APPLIED JACKETS

A. Field-applied jackets shall as specified in ASTM C921, Type I, unless otherwise specified.

B. Metal Jacket:
   1. Aluminum Jacket:
      a. See ASTM B209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
      b. Aluminum finish.
      c. Factory-Fabricated Fitting Covers:
         1) Same material, finish, and thickness as jacket.
         2) Preformed 2-piece or gore, 45 degrees and 90 degrees, and short-radius and long-radius elbows.
         3) Tee covers.
         4) Flange and union covers.
         5) End caps.
         6) Beveled collars.
         7) Valve covers.
         8) Field fabricate fitting covers only if factory-fabricated fitting covers are NOT available.

2.6 TAPES

A. FSK Tape:
   1. Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; as specified in ASTM C1136.
   2. Width: 3 in. (75 mm).
   3. Thickness: 6.5 mils (0.16 mm).
   4. Adhesion: 90 oz F/in. (1.0 N/mm) in width.
   5. Elongation: 2%.
   6. Tensile Strength: 40 lbf/in. (7.2 N/mm) in width.

7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Insulation Pins and Hangers:
   1. Capacitor-Discharge-Weld Pins:
      a. Copper-coated or zinc-coated steel pin, fully annealed for capacitor-discharge welding, length to suit depth of insulation specified.
   2. Insulation-Retaining Washers:
      a. Self-locking washers formed from 0.016 in. (0.41 mm) thick, galvanized-steel aluminum or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but NOT less than 1 1/2 in. (38 mm) in diameter.
      b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples:
   1. Outward-clinching insulation staples, nominal 3/4 in. (19 mm) wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation:
   1. Clean and dry surfaces to receive insulation. Remove materials that shall adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of pipes and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that DO NOT corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is specified, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are specified, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3 in. (75 mm) wide strips of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 in. (100 mm) o.c.
   3. Overlap jacket longitudinal seams at least 1 1/2 in. (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 in. (50 mm) o.c.
      a. For below ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, as specified in insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are specified, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75% of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 in. (100 mm) beyond damaged areas. Adhere, staple, and seal patches such as butt joints.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise specified.
   2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
   3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt

each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by NOT less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by NOT less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by NOT less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services NOT specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations specified. Installation shall be:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 in. (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is specified in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC PIPE INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
   1. Install pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
   4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install mitered sections of pipe insulation.
   2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed valve covers manufactured of same material as pipe insulation when available.
   2. When preformed valve covers are NOT available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   3. Install insulation to flanges as specified for flange insulation application.
   4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL–FIBER PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are specified, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 in. (150 mm) o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, DO NOT staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 in. (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are NOT available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are NOT available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF RIGID–FOAM PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are specified, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 in. (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, DO NOT staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 in. (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are NOT available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are NOT available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD–APPLIED PIPE JACKET INSTALLATION

A. Where metal jackets are specified, install with 2 in. (50 mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with

weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 in. (300 mm) o.c. and at end joints.

3.9 FINISHES

A. Flexible Elastomeric Thermal Insulation:
1. After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. DO NOT field paint aluminum or stainless-steel jackets.

3.10 PIPE INSULATION SCHEDULE

A. Pipes Requiring Insulation:
1. Indoor, hot and cold domestic water piping used in office areas (above ceiling or exposed), serving sinks, lavatories, water closets, eyewashes or other general office fixtures shall be:
   a. Preformed mineral-fiber pipe insulation:
      1) Fluid temperature of 141°F–200°F and nominal pipe size of 1 1/4 in. or less shall be 1 in. thick.
      2) Fluid temperature of 141°F–200°F and nominal pipe size of 1 1/2 in. – 3 in. shall be 1 1/2 in. thick.
      3) Fluid temperature of 141°F–200°F and nominal pipe size of 4 in. – <6 in. shall be 2 in. thick.
      4) Fluid temperature of 81°F–140°F and nominal pipe size of 1 1/4 in. or less shall be 1 in. thick.
      5) Fluid temperature of 81°F–140°F and nominal pipe size of 1 1/2 in. – <6 in. shall be 1 1/2 in. thick.
      6) Fluid temperature of 40°F–80°F and nominal pipe size of 1 1/4 in. or less shall be 1/2 in. thick.
      7) Fluid temperature of 40°F–80°F and nominal pipe size of 1 1/2 in. – <6 in. shall be 1 in. thick.
   b. Exposed piping shall have field applied aluminum jacket.
2. Indoor, hot and cold domestic water and water used for process applications located in nonmechanically cooled spaces exposed or concealed shall be:
   a. Rigid-foam pipe insulation (Phenolic or Polyisocyanurate):
      1) Fluid temperature of 141°F–200°F and nominal pipe size of 1 1/4 in. or less shall be 1 in. thick.
      2) Fluid temperature of 141°F–200°F and nominal pipe size of 1 1/2 in. – 3 in. shall be 1 1/2 in. thick.
      3) Fluid temperature of 141°F–200°F and nominal pipe size of 4 in. – <6 in. shall be 2 in. thick.
      4) Fluid temperature of 81°F–140°F and nominal pipe size of 1 1/4 in. or less shall be 1 in. thick.
      5) Fluid temperature of 81°F–140°F and nominal pipe size of 1 1/2 in. – <6 in. shall be 1 1/2 in. thick.
      6) Fluid temperature of 40°F–80°F and nominal pipe size of 1 1/4 in. or less shall be 1/2 in. thick.
      7) Fluid temperature of 40°F–80°F and nominal pipe size of 1 1/2 in. – <6 in. shall be 1 in. thick.
   b. Exposed piping to have an aluminum jacket.
3. Outdoor, hot and cold domestic water and water used in process applications shall be:
   a. Rigid-foam pipe insulation (Phenolic or Polyisocyanurate):
      1) Fluid temperature of 141°F–200°F and nominal pipe size of 1 1/4 in. or less shall be 1 in. thick.

2) Fluid temperature of 141°F–200°F and nominal pipe size of 1 1/2 in. – 3 in. shall be 1 1/2 in. thick.
3) Fluid temperature of 141°F–200°F and nominal pipe size of 4 in. – <6 in. shall be 2 in. thick.
4) Fluid temperature of 81°F–140°F and nominal pipe size of 1 1/4 in. or less shall be 1 in. thick.
5) Fluid temperature of 81°F–140°F and nominal pipe size of 1 1/2 in. – <6 in. shall be 1 1/2 in. thick.
6) Fluid temperature of 40°F–80°F and nominal pipe size of 1 1/4 in. or less shall be 1/2 in. thick.
7) Fluid temperature of 40°F–80°F and nominal pipe size of 1 1/2 in. – <6 in. shall be 1 in. thick.

b. Field applied aluminum jacket.
c. See Drawings and Section 40 41 13 – Heat Tracing for heat tracing requirements.

4. Indoor, refrigerant suction piping air shall be:
   a. 1 1/2 in. preformed flexible elastomeric pipe insulation.
5. Outdoor, refrigerant suction piping air shall be:
   a. 1 1/2 in. preformed flexible elastomeric pipe insulation with field applied aluminum jacket.

B. Pipe insulation shall meet requirements of International Energy Code.

END OF SECTION

SECTION 23 33 00 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:
   1. Control dampers.
   2. Manual volume dampers.

1.2 SUBMITTALS

A. Subject to requirements of Section 01 33 00 – Submittal Procedures

B. Product Data: For each type of product.
   1. For each type of product specified.

C. Operation and Maintenance Data:
   1. For air duct accessories to include in operation and maintenance manuals

PART 2 - PRODUCTS

2.1 CONTROL DAMPERS

A. General Requirements:
   1. Unless otherwise indicated, use single round-blade configuration for two-position control.
   2. Factory or field assemble multiple damper sections to provide a single damper assembly of size required by the application.

B. Performance:
   1. AMCA Certification: Test and rate in accordance with AMCA 511.
   2. Leakage:
      a. Class IA: Leakage is not to exceed 3 cfm/sq. ft. against 1 inch wg differential static pressure.
      b. Class I: Leakage is not to exceed 4 cfm/sq. ft. against 1 inch wg differential static pressure.
      c. Class II: Leakage is not to exceed 10 cfm/sq. ft. against 1 inch wg differential static pressure.
      d. Class III: Leakage is not to exceed 40 cfm/sq. ft. against 1 inch wg differential static pressure.
   3. Pressure Drop: Up to 6 in. wg differential pressure when tested in accordance with AMCA 500-D, Figure 5.3.
   4. Velocity: Up to 4000 fpm.
   5. Temperature: Minus 40°F to plus 400°F.

C. Construction
   1. Linkage out of airstream.
   2. Suitable for horizontal or vertical airflow applications.
   3. Frames:
      a. Type: Flanged channel
      b. Frame Material: Stainless steel
      c. Frame Thickness: Between 10 gauge and 12-gauge thickness
      d. Flanges for attaching to walls and flangeless frames for installing in ducts.
   4. Blades:
      a. Blade Design: Round butterfly blade.

b. Blade Material: Stainless Steel.
c. Blade Thickness: Between 10 gauge and 12-gauge thickness

5. Blade Edging Seals:
   a. Replaceable Silicone Rubber.
   b. Blade Jamb Seal: Flexible stainless steel, compression type.
6. Blade Axles: 1/2-inch to 3/4 inch diameter; stainless steel.
7. Bearings: Stainless steel sleeve.
   a. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.

D. Fully Modulating Damper Actuator - Electric:
1. Electrical – 24VDC.
2. UL 60730-2-14 and UL 2043, plenum rated.
3. Actuator Type: Fully modulating.
   a. Sufficient motor torque to drive damper fully open and fully closed with adequate force to achieve required damper seal.
   b. Minimum 90-degree drive rotation.
4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:
   a. Temperature: Minus 40°F to plus 130°F.
   b. Humidity: 5 to 95% relative humidity noncondensing.
6. Environmental enclosure: NEMA 8 Explosion proof enclosure.
7. Actuator to be factory mounted and provided with a single-point wiring connection.
8. Actuator shall include Modbus TCP communication capability for integration with SCADA.

E. Two Position Damper Actuator – Electric:
1. Shall be supplied by odor-control vendor
2. UL 60730-2-14 and UL 2043, plenum rated
3. Actuator Type: Two Position
   a. Sufficient motor torque to drive damper fully open and fully closed with adequate force to achieve required damper seal.
   b. Minimum 90-degree drive rotation.
4. Clockwise or counterclockwise drive rotation as required for application.
5. Environmental Operating Range:
   a. Temperature: Minus 40°F to plus 130°F.
   b. Humidity: 5 to 95% relative humidity noncondensing.
6. Environmental enclosure: NEMA 8 Explosion proof enclosure
7. Actuator to be factory mounted and provided with a single-point wiring connection

F. Controllers, Electrical Devices, and Wiring:
1. Electrical Connection: Ethernet

2.2 MANUAL VOLUME DAMPERS

A. General Requirements:
1. Unless otherwise indicated, use parallel-blade configuration for equipment isolation service.
2. Factory or field assemble multiple damper sections to provide a single damper assembly of size required by the application.

B. Performance:
1. AMCA Certification: Test and rate in accordance with AMCA 511.
2. Leakage:
   a. Class IA: Leakage is not to exceed 3 cfm/sq. ft. against 1 inch wg differential static pressure.

b. Class I: Leakage is not to exceed 4 cfm/sq. ft. against 1 inch wg differential static pressure.
c. Class II: Leakage is not to exceed 10 cfm/sq. ft. against 1 inch wg differential static pressure.
d. Class III: Leakage is not to exceed 40 cfm/sq. ft. against 1 inch wg differential static pressure.

3. Pressure Drop: Up to 6 in. wg differential pressure when tested in accordance with AMCA 500-D, Figure 5.3.
4. Velocity: Up to 4000 fpm.
5. Temperature: Minus 40°F to plus 400°F.

C. Construction:
1. Linkage out of airstream.
2. Suitable for horizontal or vertical airflow applications.
3. Frames:
a. Type: Flanged channel.
b. Frame Material: Stainless steel
c. Frame Thickness: Between 10-gauge and 12-gauge thickness
d. Flanges for attaching to walls and flangeless frames for installing in ducts.
4. Blades:
a. Blade Design: Round butterfly blade.
b. Blade Material: Stainless Steel.
c. Blade Thickness: Between 10-gauge and 12-gauge thickness
5. Blade Edging Seals:
a. Replaceable Silicone Rubber.
6. Blade Jamb Seal: Flexible stainless steel, compression type.
7. Blade Axles: 1/2-inch to 3/4 inch diameter; stainless steel.
8. Bearings: Stainless steel sleeve.
a. Dampers mounted with vertical blades to have thrust bearings at each end of every blade.
9. Materials:
a. Stainless Steel Sheets: Comply with ASTM A480/A480M, Type 304.

PART 3 - EXECUTION

3.1 INSTALLATION OF AIR DUCT ACCESSORIES

A. Install duct accessories in accordance with applicable details in NAIMA AH116 for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use stainless steel accessories in fibrous-glass ducts.

C. Install manual and control dampers as shown on drawings.

D. Where multiple damper sections are necessary to achieve required dimensions, provide reinforcement to fully support damper assembly when fully closed at full-system-design static pressure.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan and damper inlets and outlets and elsewhere as indicated and as needed for testing and balancing.

G. Install duct test holes where required for testing and balancing purposes. See Section 44 31 83.

H. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that size and location of access doors are adequate to perform required operation.
   3. Inspect turning vanes for proper and secure installation, and verify that vanes do not move or rattle.

END OF SECTION