THE CITY OF ALEXANDER CITY, ALABAMA
SPECIFICATIONS - CONTRACTUAL DOCUMENTS
MULTI AGENCY WASTEWATER SOLUTION – PROJECT "B"
HIGHWAY 128 SEWER FORCE MAIN
BID #24-03
(SRF PROJECT CS010329-05)

PREPARED BY
MUNICIPAL CONSULTANTS, INC.
200 CENTURY PARK SOUTH, SUITE 212
BIRMINGHAM, ALABAMA

OCTOBER 2023

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GENERAL

ADVERTISEMENT FOR BIDS

Sealed proposals for the construction of **Multi Agency Wastewater Solution – Project "B" Highway 128 Sewer Force Main Bid #24-03 (SRF Project CS010329-05)** will be received by The City of Alexander City, Alabama (Owner) at the Alexander City Public Works Briefing Room, 281 James D. Nabors Drive, Alexander City, Alabama 35010 until **2:00 PM,** the prevailing time, on **November 17, 2023**, or by mailing to 281 James D. Nabors Drive, Alexander City, Alabama 35010 at which time and place they will be publicly opened and read. The bid is comprised of the following principal items and approximate quantities:

10,000 ± LF of 6" Force Main
Pump Station Construction
Sitework and Grading
Miscellaneous Appurtenances and Work

Plans and Specifications may be inspected at the Alexander City Water Services Department and Municipal Consultants, Inc. in Birmingham, Alabama and they may be obtained from the office of Municipal Consultants, Inc., 200 Century Park South, Suite 212, Birmingham, Alabama 35226, upon payment of **$125.00**. Cost of plans and specifications are non-refundable. Plans and specifications may also be downloaded from the City of Alexander City at [www.alexandercityal.gov/rfps].

All Bidders must be responsible, meeting the criteria and requirements set forth in the specification documents. Prequalification of Bidders is not required.

This project is considered a "Public Works" project and is governed by competitive bid laws as contained in Title 39 of the Alabama Code. Bidders, subcontractors, suppliers, and Bond Agents should be familiar with this code. This project is also governed by SRF Requirements.

The Owner reserves the right to reject any or all proposals and to waive technicalities. No Bidder may withdraw his bid within sixty days from the date set for receiving of the same. There will be a non-mandatory Pre-Bid Meeting for this project in the Public Works Briefing Room, 281 James D. Nabors Drive, Alexander City, Alabama 35010 at **10:00 AM** on **November 8, 2023**.

This project is governed by the applicable bid laws and practices of the State of Alabama.

MUNICIPAL CONSULTANTS, INC.
Consulting Engineers
200 Century Park South
Suite 212
Birmingham, AL 35226

By: Curtis "Woody" Baird
Title Mayor

BID DOCUMENTS

GENERAL INFORMATION FOR BIDDERS

BIDS will be received by the City of Alexander City, Alabama (herein called the "OWNER"), at the Alexander City Public Works Briefing Room, 281 James D. Nabors Drive, Alexander City, Alabama 35010 until **2:00 PM**, the prevailing time, on **November 17, 2023**, and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to the City of Alexander City, Alabama at 281 James D. Nabors Drive, Alexander City, Alabama 35010. Each sealed envelope containing a BID must be plainly marked on the outside as BID for **Multi Agency Wastewater Solution – Project "B" Highway 128 Sewer Force Main Bid #24-03 (SRF Project CS010329-05)** and the envelope should bear on the outside the name of the BIDDER, his address, his license number if applicable and the name of the Project for which the BID is submitted. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the OWNER at **281 James D. Nabors Drive, Alexander City, Alabama 35010.**

All BIDS must be made on the required BID form with the entire bound documents intact. All blank spaces for BID prices must be filled in, in ink, or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required. A copy of the BIDDER'S State Contractor's License for the state in which the work will be performed must be attached to the BID DOCUMENTS.

The OWNER may waive any informalities or minor defects or reject any or all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within 60 days after the actual date of the opening thereof or after the Notice of Award is transmitted to the BIDDER, provided the Award is made within the 60 days herein described. Should there be reasons why the Contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the OWNER and the BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID Schedule by examination of the site and a review of the Drawings and Specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of WORK or of the nature of the WORK to be done.

The OWNER shall provide to BIDDERS prior to BIDDING, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person shall not affect the risks or obligations assumed by the CONTRACTOR or relieve him from fulfilling any of the conditions of the Contract.

Each BID must be accompanied by a BID BOND payable to the OWNER in the amount described in the General Specifications. As soon as the BID prices have been compared, the OWNER will return the BONDS of all except the three lowest responsible BIDDERS. When

the Agreement is executed, the BONDS of the two remaining unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until the payment BOND and performance BOND have been executed and approved, after which it will be returned. A cashier's check may be used in lieu of a BID BOND as described in the General Specifications.

A performance BOND and a payment BOND, each in the amount of 100 percent of the CONTRACT PRICE, with a corporate surety approved by the OWNER, will be required for the faithful performance of the Contract and as provided in the General Specifications.

Attorneys-in-fact who sign BID BONDS or payment BONDS and performance BONDS must file with each BOND a certified and effective dated copy of their power of attorney.

The party to whom the Contract is awarded will be required to execute the Agreement and obtain the performance BOND and payment BOND within fifteen (15) calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The NOTICE OF AWARD shall be accompanied by the necessary Agreement and BOND forms. In case of failure of the BIDDER to execute the Agreement, the OWNER may at his option consider the BIDDER in default, in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER within fifteen (15) days of receipt of acceptable performance BOND, payment BOND and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement within such period, the BIDDER may by WRITTEN NOTICE withdraw his signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within a reasonable time frame of the execution of the Agreement by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within a reasonable time frame or within the period mutually agreed upon, the CONTRACTOR may terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as he deems necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the WORK contemplated therein.

A conditional or qualified BID will not be accepted. The OWNER reserves the right to reject any BID that is submitted by a BIDDER that is determined by the OWNER to not be a responsible BIDDER or whose BID proposal is not responsive. In determining whether a BIDDER or BID is responsible and/or responsive, the OWNER reserves the right to also request and consider the following factors in Section III.2 of the General Specifications and/or the Special Provisions (if applicable).

Award will be made in concurrence with the Special Provisions "Award of Contract", the General Specifications, and any Supplemental General Conditions.

All applicable laws, ordinances, and the rules and regulations of all authorities having

jurisdiction over construction of the PROJECT shall apply to the Contract throughout.

Each BIDDER is responsible for thoroughly inspecting the site and for reading and being thoroughly familiar with all the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to do any of the foregoing shall in no way whatsoever relieve any BIDDER from any obligation in respect to his BID.

Further, the BIDDER agrees to abide by the requirements under Executive Order No. 11246, as amended, including specifically the provision of the equal opportunity clause set forth in these Specifications if included herein.

The low BIDDER shall supply the names and addresses of major material SUPPLIERS and SUBCONTRACTORS when requested to do so by the OWNER in addition to those required in the Bid Documents. Either the act of not providing the names required with the submittal of the Bid Documents or the act of not providing such additional names that may be requested after Bids are received, will be grounds for the OWNER to disqualify the BIDDER for not being responsive.

This project is considered a "Public Works" project and is governed by competitive bid laws as contained in Title 39 (1997) of the Alabama Code. Bidders, subcontractors, suppliers, and Bond Agents should be familiar with this code.

A non-mandatory Pre-Bid conference for prospective BIDDERS will be held in the Public Works Briefing Room, 281 James D. Nabors Drive, Alexander City, Alabama 35010 at **10:00 AM** on **November 8, 2023.** It shall be the responsibility of the bidders to have a thorough understanding of the plans, specifications, and other contract documents and to include all costs in their bids for fully complying with all requirements.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____

_____ as Principal, and _____ as Surety, are hereby held and firmly bound unto **The City of Alexander City, Alabama** as OWNER in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns. Signed, this _____ day of _____, 20_____. The Condition of the above obligation is such that whereas the Principal has submitted to the Owner a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the

Multi Agency Wastewater Solution – Project "B"

Highway 128 Sewer Force Main Bid #24-03 (SRF Project CS010329-05) .

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void. Otherwise, the same shall remain in force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the amount that is allowed by Alabama Code, Title 39 (1997) for Public Works projects.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____ (L.S.)
Principal

_____
Surety

By: _____

IMPORTANT - Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the Project is located.

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INSURANCE REQUIREMENTS CERTIFICATION

The Contractor selected for the Project will be required to provide insurance in full accordance with all the requirements of the Specifications. See the sections pertaining to insurance in the Special Provisions and in the General Specifications. Bidders shall ensure that if awarded the Project, the insurance provided will be in full accordance with all these requirements. This includes the exact endorsements and coverages as listed. No exceptions will be allowed.

The Bidder hereby certifies that he has provided all insurance requirements to his insurance provider for their careful review and pricing, and has verified that if his bid is accepted, all the insurance required by the Specifications, including the exact endorsements and coverages, will be provided. The Contractor also certifies that if the Contractor's current insurance provider will not provide the insurance required by the Specifications, then the Bidder has located another insurance provider for the Project that will issue insurance for the Project in full accordance with all requirements of the Specifications.

Finally, the Contractor certifies that he has included all costs necessary in his Bid to provide all insurance in full accordance with all the Specifications.

Contractor _____

By _____

Date _____

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LIST OF MATERIAL SUPPLIERS AND EQUIPMENT MANUFACTURERS

Contractors submitting a proposal are required to fully complete the following list of Material Suppliers and Equipment Manufacturers for their Base Bid. If this information is not clearly and properly provided, this will be grounds for the Owner to disqualify the Bidder for not being responsive. When a single Material Supplier or Equipment Manufacturer is listed as the "Base", the Contractor shall furnish that Material Supplier and/or Equipment Manufacturer. When two or more Material Suppliers and/or Equipment Manufacturers are listed as the "Base", the Contractor must circle the Material Supplier or Equipment Manufacturer that will be furnished. When an item is blank, the Contractor shall write in the Material Supplier or Equipment Manufacturer to be furnished under the "Base" proposal. In every case, only one Material Supplier or Equipment Manufacturer shall be circled or listed for each material or equipment item. Unless a substitute is accepted as outlined below, the Contractor shall furnish and install the product of the Material Supplier or Equipment Manufacturer as he indicates herein.

Where the List of Material Suppliers and Equipment Manufacturers provides for substitute material suppliers and/or equipment manufacturers, the Bidder may, but is not required to, write in or circle a substitute material supplier or equipment manufacturer. The Contractor shall fulfill the requirements of these Specifications and particularly Special Provisions II and III. The bidder shall write in the amount of price reduction for the use of each such substitute indicated. In every case, only one substitute Material Supplier or Equipment Manufacturer shall be written in or circled for each material or equipment item. When a substitute Material Supplier or Equipment Manufacturer is offered by the Contractor and accepted by the Owner, the Contractor shall furnish and install the product of that Material Supplier or Equipment Manufacturer.

The award of the Contract will be based on the base Material Supplier(s) and/or Equipment Manufacturer(s) listed unless there are provisions for Alternate Deducts of Base Bid in Special Provisions, Section III and the Bid Schedule Items of Work. No substitute equipment or material shall be accepted unless it is approved by the Owner. The Contractor shall furnish and install the base materials or equipment he has indicated for any or all of the substitutes rejected.

If the information required above is not clearly and properly provided, this will be grounds for rejecting that bidder. Failure to furnish and install the indicated base or indicated and approved substitute material and equipment from the suppliers and manufacturers shall constitute default of the Contract.

LIST OF MATERIAL SUPPLIERS AND EQUIPMENT MANUFACTURERS

The base Material Supplier or Equipment Manufacturer is listed in bold directly to the right of the type of material or equipment.

	Material or Equipment	Name of Supplier or Manufacturer
1.	**Bulk Chemical Storage Tank**	**Base:** _____
2.	_____	**Base:** _____

The Bidder further certifies that if his bid is accepted, the base Material Suppliers and Equipment Manufacturers he has indicated herein will be awarded contracts for supply of their products unless deductive substitutes are provided as specified herein and approved by the Owner. The Bidder further certifies that deductive substitute Material Suppliers and Equipment Manufacturers he has properly indicated that are approved by the Owner will be awarded contracts for supply of their products.

Contractor _____

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LIST OF SUBCONTRACTORS

Contractors submitting a proposal are required to list in the spaces provided the name of each of the subcontractors they will use if awarded the Contract. No substitutions will be allowed without approval of the Owner. The Bidder shall list the names of major subcontractors. If all the information is not provided with the bid, this will be grounds for the Owner to disqualify the Bidder for not being responsive.

ITEM OF WORK	SUBCONTRACTOR NAMES
Electrical	_____

Note: If the Contractor will not use a subcontractor for an Item of Work, he shall write "None" in the blank for the Subcontractor for that Item of Work.

If the Bidder does not write in the name of a Subcontractor, he shall submit with his bid detailed evidence satisfactory to the Engineer that he has sufficient personnel experienced in that trade on his full time staff to perform that item of work on this project. Failure to submit such satisfactory evidence with the Bid, or the submission of inaccurate, misleading, or incorrect information, will be grounds for the Owner to disqualify the Bidder for not being responsive.

The Bidder certifies that if his bid is accepted, the above subcontracting firms or businesses will be awarded subcontracts for the above portions of the work.

Contractor _____

By _____

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BASIS OF PAYMENT

BASE BID

For unit price items, the quantities shown in the "Items of Work" reflect estimates. The actual quantities will be adjusted during construction to reflect the conditions encountered, or other changes, or Owner preferences. Inasmuch as the actual quantities may vary considerably from the quantities listed in the schedule or shown on the drawings, the bidders shall insert prices that represent his actual costs. The Contractor shall not be paid an amount higher than he bids.

The cost of all work required for the project shall be included in the "Items of Work" listed for the project.

The Contract Unit or Lump Sum Bid Amounts shall be payment in full for furnishing all resources (materials, labor, equipment, etc.) necessary to install and complete each portion of the project in complete accordance with the requirements of the Plans and Specification-Contractual Documents. The Contract Bid Amounts shall include the cost of completing all work described under each bid item description and all necessary incidental work not included or listed as a separate bid item. Incidental work may include, but not be limited to, all necessary excavation (earth or rock), backfilling (earth or stone), demolition, sheeting, shoring, piling, bracing, bypass pumping, dewatering, well pointing, clearing, grubbing, erosion control, locating all utilities and existing piping, repairing or replacing damaged facilities, restoration, grassing, disposal of excess materials, traffic/pedestrian control in accordance with the regulations of all authorities or agencies having jurisdiction over the work areas, permit compliance, and all other miscellaneous tasks necessary to fully complete the projects, etc. The quantities actually required may be significantly more or less than the quantities shown. **The Contractor will be paid for only the quantities actually and properly installed, and approved for payment. The Contractor shall be paid only the price he bids for each item regardless of the conditions encountered, the quantity actually required, or the unit price.**

ITEMS 1 AND 2 – PVC AND/OR HDPE PIPE

The Contract Unit Price Bid per lineal foot shall be payment in full for the furnishing of all labor, machinery, equipment, materials, and all incidentals necessary and required to install pipe. The Unit Price Bid shall include, but not be limited to: providing the Owner an acceptable pre-construction video of the entire project site (and any other areas which may be

affected by construction activities), earth and rock excavation, backfilling, backfilling with crushed stone for drives and paved areas or as required, backfilling with special subgrade material where rock or unstable subgrade material is encountered and removed or as required, the compaction of ditches, dress up, temporary asphalt patching, grassing, fencing, clearing and grubbing as required and allowed by the Plans and Specifications, grading work, removal of debris and excess material, replacing any property damaged, asphalt and concrete replacement and repair, paying all fees, furnishing bonds, concrete bracing, handling and repairing existing utilities and storm drains, providing all requirements of Department of Transportation including traffic and pedestrian control to the satisfaction of the City, State, County, or other agencies with jurisdiction over the work areas, the securing of releases from the Departments of Transportation and local authorities, the setting of alignment and grade stakes, rip-rap shown or inferred from the drawings, dewatering, sheeting and bracing, concrete thrust collars, NPDES Permitting, BMP installation and maintenance, flushing, disinfection, testing, and all other accessories and all incidentals necessary and required to complete the work to the satisfaction of the Owner and Engineer. Additional backfill including bedding required for trenches and rock removal shall be included in this item unless specifically covered by other pay items. All miscellaneous and incidental items required by the Plans and/or Specifications but not covered by other pay items shall be covered by this item. The Contractor shall install all facilities within right-of-way or adjacent easement and ensure any work and trees removed are within the right-of-way and/or easement. Note: for this project, Contractor shall have the option of providing 6" CL 200 PVC or 8" HDPE DR11. Contractor shall indicate his pipe selection on the list of material suppliers and equipment manufacturers. Pipe material shall not be changed after bid without approval of the Owner.

ITEM 3 – VALVES AND BOXES

The Contract Unit Price Bid per each shall be payment in full for the furnishing of all labor, machinery, equipment, materials, and all incidentals necessary and required to install valves with valve boxes. This item shall include, but not be limited to: valve, valve box, concrete slab, valve pad and nameplate or concrete donut (whichever is required by detail), bracing, and all incidentals necessary and required to complete the work per the Plans and Specifications and to the satisfaction of the Owner and Engineer. Restraining glands (i.e. meg-lugs) for mechanical joint valves shall be included in this item. If called for, tapping valves shall be included in their respective Lump Sum Connection item. Value size to match pipe size of 6" PVC or 8" HDPE.

ITEMS 4 AND 5 - AIR/VACUUM VALVE

The Contract Unit Price per each shall be payment in full for the furnishing of all labor, machinery, equipment, and materials to install the specified air/vacuum valve as shown on the Plans or as required by the Engineer. This item shall include the welded on outlet or MJ tee, tapping saddle, epoxy lined ductile iron fittings, the isolation valves, connection piping, the air/vacuum valve, the manhole, etc., and all appurtenances and incidentals necessary to complete the installation in accordance with the details in the drawings and to the satisfaction of the Owner and Engineer.

ITEM 6 - MECHANICAL JOINT DUCTILE IRON FITTINGS, ALL SIZES

The Contract Unit Price Bid per ton shall be payment in full for the furnishing of all labor, machinery, equipment, materials, concrete thrust blocks, concrete thrust collars, and all incidentals necessary and required to install mechanical joint ductile iron fittings on water mains where indicated, specified, or required by the Engineer. Unauthorized fittings will not be paid for. Fittings shall have mechanical joints with restraining glands (i.e. mega-lugs). Payment will be made on invoice weights of the base fitting excluding the weight of all accessories (glands, bolts, gaskets, etc.). This item shall include all incidentals associated with this work including thrust blocks and rodding.

ITEMS 7 AND 8 – ROAD CROSSINGS

The Contract Lump Sum Price Bid per each shall be payment in full for the furnishing of all labor, materials and equipment, pipe fittings, adapters, steel casing pipe or tunnel liner; spacers and ductile iron restrained joint pipe within the limits of the crossing as indicated on the Plans; lights; flagman; traffic control; pedestrian control; and any and all incidentals necessary to complete the crossing satisfactorily and acceptable to the Alabama Department of Transportation (ADOT), the Railroad Company, the Utility Company, County, City, or other agencies having jurisdiction over the crossing, the Engineer, and the Owner. Pipe restraint devices required at the ends of roadway bore casings and any associated rodding requirements shall be included in this item. All crossings under this Contract shall be made by open cut or boring or tunneling, or as shown on the Plans. No wet bores will be permitted. The Owner will secure a boring permit for highway bores. Permits required for tunneling and/or open cutting shall be obtained by the Contractor. The Contractor, at his expense, shall furnish all bonds and insurance as required by the agency having jurisdiction over the crossing. A release from the agency having authority over each crossing shall be furnished to the Engineer by the Contractor before acceptance is made. The price shall also include, but not be limited to: anchoring pipe, casing spacers; sealing the ends of the casing; piling, shoring, dewatering, etc. to protect the work, adjacent structures, personnel, etc., when conditions warrant such protection. The Lump Sum price shall be payment in full for the completion of the crossing. No extra payment shall be made for rock encountered as part of the crossing. It is the Contractors responsibility to survey the crossings shown on the Plans to determine the type of construction method required (bore or tunnel) and casing type to complete the crossing at the locations shown on the Plans. No extra payment will be made for altering the method of crossing from boring to tunneling during construction or changing casing sizes or types. Casing sizes indicated on the drawings are to be considered as a minimum. Polyethylene encasement shall be paid for under Polyethylene Encasement.

ITEM 9 – CONNECTIONS

The Contract Lump Sum Price Bid shall be payment in full for the furnishing of all labor, machinery, equipment, materials, and all incidentals necessary and required to successfully complete the connections to the existing system and proposed system, as indicated

on the Plans and necessary for a complete installation. This Lump Sum Bid Price shall include, but not be limited to: For "Hot Tap" connections - tapping sleeve/saddle, tapping valves, concrete bracing, valve boxes, valve pad and nameplates or concrete donut (whichever is required by detail), labor and materials for "Hot" tapping existing line, testing, disinfecting, all piping and appurtenances necessary and required that do not have a unit price established in this Contract; For "cut-in" connections - all piping and appurtenances necessary and required that do not have a unit price established in this Contract; and for all types of connections - thrust collars, temporary piping and valves, temporary plugs, complete coordination with Owner, Engineer, and any Authority with jurisdiction over the work areas. Valves, fire hydrant assemblies and authorized fittings shall be paid for under different pay items if there is a unit price established in this basis of payment for the item. If no unit price is established herein then it shall be included in this item. For Connection 13, this price shall include check valve and manhole.

ITEM 10 – SURFACES REPLACED FOR OPEN CUTS

The Contract Unit Price Bid per square yard shall be payment in full for the furnishing of all labor, machinery, equipment, materials, and all incidentals necessary and required for preparing and replacing pavement removed from roads, driveways, and other paved areas. These items shall include all incidentals necessary and required to complete this work. Measurement for asphalt and concrete pavement replacement shall be per square yard as measured by the Engineer in the field. All paving widths shall be coordinated and approved by Engineer before saw cutting. Anything beyond approved widths will be the responsibility of the Contractor with no pay allowed. No extra payment will be made for pavement replacement required for reasons other than open trench pipe installation. Curb and gutter replacement shall be considered an incidental and included under pipe prices. Temporary patches for surfaces are not included in this item.

ITEM 11 – CASING UNDER ROADWAYS

The Contract Unit Price Bid per lineal foot shall be payment in full for the furnishing of all labor, machinery, equipment, materials, and all incidentals necessary and required to install service pipe underneath roads, driveways or other areas indicated on the Plans or required by the Engineer using installation methods such as moling, punching, boring etc. which meets the requirements of ALDOT, County, City, etc. as applicable. Length of crossing to be paid under this item shall be determined by the Engineer for each crossing during construction. This price shall be for installation in rock and/or soils. This price includes casing and service tubing.

ITEM 12 – LIFT STATION IMPROVEMENTS

The Contract Lump Sum Price Bid shall include the furnishing of all labor, materials, equipment and incidentals necessary to complete the construction of the Lift Station Improvements per the Plans and Specifications. The lump sum price bid shall include, but not be limited to: excavating, rock excavation, transporting, placing, and compacting soil fill, the

structures, complete equipment assemblies, all valves (and valve boxes), piping, fittings, all drainage materials and requirements, general water plumbing, shoring, pit, connections to existing lines, and all other work and incidentals necessary and required to construct a complete and properly functioning improvements in accordance with the Drawings and the Specifications.

ITEM 13 - MOBILIZATION

The Contract Lump Sum Price shall be the cost allowed by the Owner for mobilization of Contractor's forces. The cost includes portions or all the Contractor's cost for bonds, insurance, set up of Contractor's forces and all field offices, acceptance by Engineer and Owner of schedule of payment values, and equipment and personnel movement. The price established by the Owner is an allowance for the Contractor and will be paid upon completion of mobilization. Any costs the Contractor may have above this Item shall be included in other items.

ITEM 14 - ELECTRICAL

The Contract Lump Sum Price shall be payment in full for the furnishing of all labor, materials, and equipment for the complete installation of the Electrical System. This Item shall include but not be limited to coordination of incoming power utilities to the site, motor control centers, switchgear, other electrical panels, surge protection, yard and interior lighting, all power, control, signal, fiber optics, and instrument wiring and conduit (including but not limited to that between manufacturer or separately provided control panels and external instruments, sensors, and equipment), building and yard wiring, concrete for conduit encasement, and all appurtenances, incidentals, and miscellaneous equipment shown or specified for this facility or as reasonably inferred or required for a complete and operable facility, clean up, testing, and other services as required for a complete facility in full compliance with the Contract.

ITEM 15 – ALABAMA POWER ALLOWANCE FOR ELECTRICAL SERVICE TO LIFT STATION SITE

The Contract Lump Sum Price represents an allowance in the Contract for the Contractor to provide the necessary 480 VAC three phase electrical service from Alabama Power Company (APCO) to the proposed pump station site at the location required by the Contract Drawings. The Contractor shall coordinate as required with APCO during bid time and throughout construction to ensure all work, costs, and incidentals are included for a complete and fully functional electrical service. This allowance represents the budget costs provided by APCO during design. Payment under this item will only be for APCO's actual invoice amount which may be more or less than the established allowance. The Contractor shall submit APCO's invoice with documentation of the work completed as part of the Contractor's monthly pay request. The Contractor shall be responsible for paying APCO. The Contractor shall contact APCO as required. All costs incurred by the Contractor for his work in coordinating and providing the electrical service shall be included in other pay items. There will be no additional monies paid for delays due to Alabama Power's response.

ITEM 16 - CRUSHED STONE, EXTRA

The Contract Unit price per ton in place shall be payment in full for furnishing of all labor, materials, equipment and all incidentals necessary to complete the installation of crushed stone as required by the Engineer during construction. Gradations covered under this item shall be from #57 to Class 2 rip-rap and shall be determined solely by the Engineer. This item does not include rip-rap shown or inferred from the Drawings or included as part of the Contractor's BMP installation and maintenance. The cost of which shall be included in other items. Crushed stone placement paid under this item shall include only extra crushed stone placed during construction as required by the Engineer. This shall include but not be limited to supplying and placing the crushed stone and all necessary excavation. Tonnage shall be measured from certified invoices from the material supplier.

ITEM 17 - FINAL GRADING AND SITE RESTORATION

The Contract Unit Price Allowance shall be payment in full for the furnishing of all labor, materials, and equipment required to complete final grading and site restoration of disturbed areas at the site with gravel paving or an acceptable growth of grass as indicated or specified. This Item shall include final grassing, grading of gravel, and fertilization as specified. The cost to develop the pumping station site to its final grade including the cost of final grade material, its placement, hauling, and material cost for the required gravel, top soil, etc. shall be included in this item. Temporary grassing or gravel for BMP or other purposes shall be included in other items. Any Contractor costs above this allowance to complete the work shall be included in other Items.

ITEM 18 – OWNER DIRECTED ALLOWANCE FOR EXTRA WORK

This Contract Allowance is an allowance established by the Owner for Extra Work directed by the Owner during construction. Extra Work shall not include work shown or inferred from the Plans and Specifications, the cost of which shall be included in other pay items. For any element of Extra Work paid under this item, the Contractor shall submit a cost proposal to the Owner for the Extra Work. When approved by the Owner, the Contractor shall perform the work in accordance with the approved cost proposal.

ITEM 19 - START-UP AND USE OF IMPROVEMENTS AND THEIR COMPONENTS

The Contract Lump Sum Price Bid shall be paid for furnishing the Owner operable and completed facilities which have successfully passed tests as specified and been approved by all authorities for use by the Owner as intended and is put in service. This pay item includes, but is not limited to, adjustment, receipt of required documentation and other related services as required to demonstrate that the project is ready for operation by the Owner. The price in this item represents an allowance that is established by the Owner and used by all Contractors bidding the project. The amount of money written in this item will be paid the Contractor when the entire project is in satisfactory service since the components are an integral part of

the entire project needed by the Owner. Partial payment may be allowed on this item at the sole discretion of the Owner. Any costs the Contractor may have above this allowance to complete this item shall be included in other bid items. In order to receive payment for this Bid Item, all components must be in proper operation and performing properly.

ADDITIVE ALTERNATE ITEMS

ADDITIVE ALTERNATE ITEM 1A – 10" HDPE PIPE – STATION 0+00 TO 81+60 – HIGHWAY 128

The Contract Unit Price Bid per lineal foot shall be payment in full for the furnishing of all labor, machinery, equipment, materials, and all incidentals necessary and required to install pipe. The Unit Price Bid shall include, but not be limited to: providing the Owner an acceptable pre-construction video of the entire project site (and any other areas which may be affected by construction activities), earth and rock excavation, backfilling, backfilling with crushed stone for drives and paved areas or as required, backfilling with special subgrade material where rock or unstable subgrade material is encountered and removed or as required, the compaction of ditches, dress up, temporary asphalt patching, grassing, fencing, clearing and grubbing as required and allowed by the Plans and Specifications, grading work, removal of debris and excess material, replacing any property damaged, asphalt and concrete replacement and repair, paying all fees, furnishing bonds, concrete bracing, handling and repairing existing utilities and storm drains, providing all requirements of Department of Transportation including traffic and pedestrian control to the satisfaction of the City, State, County, or other agencies with jurisdiction over the work areas, the securing of releases from the Departments of Transportation and local authorities, the setting of alignment and grade stakes, rip-rap shown or inferred from the drawings, dewatering, sheeting and bracing, concrete thrust collars, NPDES Permitting, BMP installation and maintenance, flushing, disinfection, testing, and all other accessories and all incidentals necessary and required to complete the work to the satisfaction of the Owner and Engineer. Additional backfill including bedding required for trenches and rock removal shall be included in this item unless specifically covered by other pay items. All miscellaneous and incidental items required by the Plans and/or Specifications but not covered by other pay items shall be covered by this item. The Contractor shall install all facilities within right-of-way or adjacent easement and ensure any work and trees removed are within the right-of-way and/or easement. This item shall include any extra costs associated with increasing valve and fitting sizes.

BID

Proposal of_____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____ doing business as_____ .*

To the **City of Alexander City, Alabama** (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the construction of **Multi Agency Wastewater Solution – Project "B" Highway 128 Sewer Force Main Bid #24-03 (SRF Project CS010329-05)** in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, at the prices stated below, and in accordance with the "Basis of Payment" herein.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID, each party thereto certifies as to his own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

No BIDDER may withdraw a BID within 60 days after the actual date of the opening thereof or after the Notice of Award is transmitted to the BIDDER, provided the Award is made within the 60 days herein described. Should there be reasons why the Contract cannot be awarded within the specified period, the time may be extended by mutual agreement between the OWNER and the BIDDER.

Upon receipt of written notice of the acceptance of this bid, BIDDER will execute the formal contract attached within fifteen (15) days and deliver a Surety Bond or Bonds as required by the General Conditions. The bid security attached is to become the property of the OWNER in the event the contract and bond are not executed within the time set forth, as liquidated damages for the delay and additional expenses to the OWNER caused there.

BIDDER hereby agrees to commence WORK under this Contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT within the calendar days as specified in Section 1 of the Special Provisions. Bidder further agrees to pay as liquidated damages, the sum as specified in Section 1 of the Special Provisions for each consecutive calendar day thereafter.

* Insert "a corporation", "a partnership", or "an individual" as applicable.

BIDDER acknowledges receipt of the following ADDENDUM:

_____

_____

BIDDER agrees to perform all the work described in the Contract Documents for the following unit prices or lump sum:

Note: The Owner has Sales and Use Tax Exemption status under Alabama law. BIDS shall include only those taxes which are applicable based on this tax exemption status. See Special Provisions for "Application For Tax Certificate of Exemption".

ITEMS OF WORK
BID SCHEDULE

BASE BID

ITEM	QUANT	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
1	11,000	Linear Foot	6" PVC Pipe, Class 200 or 8" HDPE DR 11	$_____	$_____
2	25	Linear Foot	3" PVC Pipe, Class 200	$_____	$_____
3	1	Each	6" D.I. RS Gate Valves, MJ and Valve Boxes	$_____	$_____
4	3	Each	Manual Air Release Valve	$_____	$_____
5	2	Each	Air-Vac Combo Valve	$_____	$_____
6	0.2	Ton	Mechanical Joint Ductile Iron Fittings, All Sizes	$_____	$_____
7	1	Lump Sum	Road Crossing #1	$_____	$_____
8	1	Lump Sum	Road Crossing #2	$_____	$_____
9	1	Lump Sum	Connection #1	$_____	$_____
10	40	Square Yard	Asphalt Pavement Replaced for Cuts	$_____	$_____

ITEM	QUANT	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
11	50	Linear Foot	Casing Under Driveways by Boring 14" X 0.25 Casing for 6" Carrier Pipe	$_____	$_____
12	1	Lump Sum	Lift Station Improvements	$_____	$_____
13	1	Lump Sum	Mobilization	$_____	$_____
14	1	Lump Sum	Electrical	$_____	$_____
15	1	Lump Sum	Alabama Power Allowance for Electrical Service to Pump Station	$**10,000.00**	$**10,000.00**
16	10	Ton	Crushed Stone, Extra	$_____	$_____
17	1	Lump Sum	Final Grading and Site Restoration	$_____	$_____
18	1	Lump Sum	Owner Directed Allowance for Extra Work	$**20,000.00**	$**20,000.00**
19	1	Lump Sum	Start-up and Use of Project Components	$**20,000.00**	$**20,000.00**

TOTAL OF BASE BID $ _____

ALTERNATE ADD TO BASE BID

Note: Only the difference in costs from the Base Bid shall be written in below.

ITEM	QUANT	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
1A	8,160	Linear Foot	10" HDPE DR 11 – Station 0+00 to 81+60 – Highway 128	$_____	$_____

TOTAL OF BASE BID PLUS ALTERNATE ADDS $ _____

ACCOUNTING OF SALES AND USE TAX SAVINGS

Pursuant to Alabama Law, (Alabama Act 2018-234), BIDDER accounts for the Sales and Use Tax savings which are NOT included in the Items of Work - Bid Schedule as follows:

Bidder shall write in the estimated Sales and Use Tax savings which are NOT included in:

1. BASE BID: $ _____

Failure to provide an accounting of Sales and Use Tax savings in the blank(s) above shall be grounds for the Owner to render the bid non-responsive. Other than determining responsiveness, the estimated Sales and Use Tax savings shall not affect the bid pricing nor be considered in the determination of the lowest responsible and responsive bidder. Accordingly, the Contractor will not be paid for the Sales and Use Tax savings written in the blank(s) above. Bidder shall reference the Special Provisions for "Application for Tax Certificate of Exemption".

MATERIAL DELIVERY LEAD TIMES (SEE SPECIAL PROVISIONS)

Indicate the specific number of calendar days required to deliver each specified material order to the jobsite, after each order is submitted by the Contractor (lead time).

PVC Pipe _____ calendar days

Ductile Iron Fittings _____ calendar days

Gate Valves _____ calendar days

Respectfully submitted:

_____ _____

Signature Address

_____ _____

Print Name and Title

_____ _____

Alabama License Number Date

(SEAL - if BID is by a Corporation)

Attest _____

ALABAMA IMMIGRATION LAW COMPLIANCE

State of _____

County of _____

FORM FOR SECTIONS 9 (a) and (b) BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT; CODE OF ALABAMA, SECTIONS 31-13-9 (a) and (b)

AFFIDAVIT FOR BUSINESS ENTITY/EMPLOYER /CONTRACTOR
(To be completed as a condition for the award of any contract, grant, or incentive by the State of Alabama, any political subdivision thereof, or any state-funded entity to a business entity)

Before me, a notary public, personally appeared _____ (print name) who, being duly sworn, says as follows:

As a condition for the award of any contract, grant, or incentive by the State of Alabama, any political subdivision thereof, or any state-funded entity to a business entity or employer that employs one or more employees, I hereby attest that in my capacity as _____ _____(state position) for _____ (state business entity/employer/contractor name) that said business entity/employer/contractor shall not knowingly employ, hire for employment, or continue to employ an unauthorized alien.

I further attest that said business entity/employer/contractor is enrolled in the E-Verify program. (ATTACH DOCUMENTATION ESTABLISHING THAT BUSINESS ENTITY/EMPLOYER/CONTRACTOR IS ENROLLED IN THE E-VERIFY PROGRAM) and will utilize the E-Verify program to verify the employment status of employees and potential employers according to Federal Rules and Regulations.

I further attest that all sub-contractors in my employment shall not knowingly employ, have for employment, or continue to employ an unauthorized alien; and are duly enrolled in the E-Verify program and upon request can produce the appropriate forms verifying such action.

_____Signature of Affiant

Sworn to and subscribed before me this _____day of _____, 2____.

I certify that the affiant is known (or made known) to me to be the identical party he or she claims to be.

_____Signature and Seal of Notary Public

E-VERIFY DOCUMENTATION
AND
STATE CONTRACTORS LICENSE

TO BE INSERTED HERE

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 Multi Agency Wastewater Solution Project "B" Highway 128 Sewer Force Main Bid #24-03
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 Multi Agency Wastewater Solution Project "B" Highway 128 Sewer Force Main Bid #24-03
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)

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*: Multi Agency Wastewater Solution - Project "B" Highway 128 Sewer Force Main Bid #24-03

(*not **Contract** Name)

SRF Project No.: CS010329-05

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: _____

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*: Multi Agency Wastewater Solution - Project "B" Highway 128 Sewer Force Main Bid #24-03

(*not **Contract** Name)

SRF Project No.: CS010329-05

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: _____

CONTRACTORS CERTIFICATION REGARDING SRF REQUIREMENTS

The Contractor acknowledges to and for the benefit of the City of Alexander City ("Purchaser") that it understands the goods and services under this Agreement are being funded with monies made available by the State Revolving Fund (SRF). The Supplemental General Conditions contains provisions such as (1) DBE Requirements (2) Davis-Bacon and Related Acts, and (3) other Contractor requirements. The Contractor hereby represents and warrants to and for the benefit of the Purchaser that (a) the Contractor has reviewed and understands these Requirements and (b) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support and as required by the Purchaser. Notwithstanding any other provision of this Agreement, any failure to comply with this agreement by the Contractor shall permit the Purchaser to recover as damages against the Contractor any loss, expense or cost (including without limitation attorney's fees) incurred by the Purchaser resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or damages owed to the State by the Purchaser).

The selected Contractor will submit to ADEM, with a copy to the Loan Recipient, within 10 days after bid opening, evidence of the preceding positive steps taken to utilize disadvantaged businesses (DBE) in the procurement of subcontractors. The Contractor will complete the Contract Documents within 15 days after the award of the Contract.

The Contractor certifies he has not been debarred for noncompliance with the Federal Labor Standards, Title VI of the Civil Rights Act of 1964, as amended or Executive Order 11246 as amended (Equal Employment Opportunity), or Executive Order 11625 and 12138 (Minority and Women's Business Enterprises)

The Contractor shall comply with the Affirmative Action Equal Opportunity clause, Goals and Timetables and the other requirements. The Contractor shall require his subcontractors to abide by the same rules if the amount of the subcontract is in excess of $10,000.

The Contractor shall comply with the Department of Labor's Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL91-956) and under Section 107 of the Contract Work Hours and Safety Standards (PL 91-54).

_____
Construction Company

_____
Print-Contractor Representative and Title

_____ _____
Date Signature

"General Decision Number: AL20230069 01/06/2023

Superseded General Decision Number: AL20220069

State: Alabama

Construction Type: Heavy
Including Water and Sewer Line Construction

Counties: Chambers, Cherokee, Clay, Cleburne, Coosa, Jackson, Randolph, Talladega and Tallapoosa Counties in Alabama.

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)(2)-(60).

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 $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
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 $12.15 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 2023.

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	01/06/2023

ENGI0312-009 09/01/2011

	Rates	Fringes
Operating Engineers:		
Crane and Cherry Picker	$ 25.90	10.65
Oiler	$ 22.83	10.65

Cranes with 100 ft. or more boom receive $0.25 extra per hour,
Cranes with 200 ft. or more boom receive $0.50 extra per hour,
Cranes with 350 ft. or more boom recieve $1.10 extra per hour,
Cranes with 500 ft. or more boom receive $1.45 extra per hour,
Tower Cranes, Derricks, Climbing Cranes, Ringer Cranes shall receive $0.35 in addition to A-rate and boom pay per hour

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SUAL2007-154 11/28/2007

	Rates	Fringes
ELECTRICIAN	$ 15.96 **	3.57
LABORER: Common or General	$ 8.54 **	0.00
LABORER: Pipelayer	$ 10.13 **	0.00
OPERATOR: Backhoe	$ 13.46 **	0.00
OPERATOR: Bulldozer	$ 16.60	2.64
OPERATOR: Drill	$ 9.50 **	2.36
OPERATOR: Grader/Blade	$ 12.59 **	1.33
OPERATOR: Loader (Front End)	$ 11.67 **	0.00
OPERATOR: Roller	$ 9.45 **	0.00
OPERATOR: Scraper	$ 9.78 **	0.18
OPERATOR: Trackhoe	$ 12.00 **	0.00
TRUCK DRIVER	$ 15.70 **	5.86

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

==========

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

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) (ii)).

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

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

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

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

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

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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

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

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

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

4.) All decisions by the Administrative Review Board are final.

==========

END OF GENERAL DECISIO"

"General Decision Number: AL20230144 01/06/2023

Superseded General Decision Number: AL20220144

State: Alabama

Construction Type: Highway

Counties: Chambers, Cherokee, Clay, Coosa and Tallapoosa Counties in Alabama.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

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)(2)-(60).

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 $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
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 $12.15 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 2023.

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 | 01/06/2023

SUAL2019-023 11/13/2019

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 16.88	0.00
ELECTRICIAN	$ 20.41	7.49
FORM WORKER	$ 15.19 **	0.00
HIGHWAY/PARKING LOT STRIPING: Laborer	$ 11.86 **	0.00
HIGHWAY/PARKING LOT STRIPING: Operator (Striping Machine)	$ 19.72	0.00
IRONWORKER, REINFORCING	$ 16.71	0.00
LABORER GRADE CHECKER	$ 15.89 **	0.00
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 12.28 **	0.00
LABORER: Common or General	$ 11.52 **	0.00
LABORER: Mason Tender - Cement/Concrete	$ 13.32 **	0.00
LABORER: Erosion Control	$ 10.46 **	0.00
OPERATOR: Asphalt Spreader	$ 14.87 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 16.80	0.00
OPERATOR: Broom/Sweeper	$ 12.50 **	0.00
OPERATOR: Bulldozer	$ 15.32 **	0.00
OPERATOR: Crane	$ 24.02	0.00
OPERATOR: Distributor	$ 15.22 **	0.00
OPERATOR: Grader/Blade	$ 18.16	0.00
OPERATOR: Loader	$ 14.28 **	0.00
OPERATOR: Mechanic	$ 17.37	0.00
OPERATOR: Milling Machine	$ 16.51	0.00
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 16.02 **	0.00
OPERATOR: Roller	$ 14.00 **	0.00
OPERATOR: Tractor	$ 17.14	0.00
TRAFFIC CONTROL: Flagger	$ 13.39 **	0.00
TRAFFIC CONTROL: Laborer-Cones/		

Barricades/Barrels -
Setter/Mover/Sweeper.....$ 12.93 ** 0.00

TRUCK DRIVER: Dump Truck.....$ 14.42 ** 0.00

TRUCK DRIVER: Flatbed Truck.....$ 15.72 ** 0.00

TRUCK DRIVER: Lowboy Truck.....$ 15.88 ** 0.00

TRUCK DRIVER: Water Truck.....$ 12.95 ** 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 ($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

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) (ii)).

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

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of

the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

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WAGE DETERMINATION APPEALS PROCESS

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

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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

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

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

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

4.) All decisions by the Administrative Review Board are final.

==========

END OF GENERAL DECISIO"

CONTRACT DOCUMENTS

NOTICE OF AWARD*

To: _____

_____

_____

PROJECT Description: **Multi Agency Wastewater Solution – Project "B" Highway 128 Sewer Force Main Bid #24-03 (SRF Project CS010329-05)**

The OWNER has considered the BID submitted by you on _____ for the above described WORK in response to its Advertisement for Bids and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of $_____.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within fifteen (15) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within fifteen (15) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, 20____.

The City of Alexander City, Alabama

_____

By _____

Name Curtis "Woody" Baird

Title Mayor

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

By _____

this the _____day of _____, 20 _____.

By _____

Title _____

*Note: Award is subject to ADEM/SRF Approval.

NOTICE TO PROCEED

To: _____ Date: _____

_____ Project: **Multi Agency Wastewater**

_____ **Solution – Project "B" Highway 128**

_____ **Sewer Force Main Bid #24-03**

_____ **(SRF Project CS010329-05)**

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 20____ on or before _____,20____ and you are to complete the WORK within _____ consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, 20_____.

The City of Alexander City, Alabama

_____

By _____

Name Curtis "Woody" Baird

Title Mayor

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF PROCEED is hereby acknowledged

By _____

this the _____day of _____, 20 _____.

By _____

Title _____

Bond Number

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____ (Corporation, Partnership, or Individual), hereinafter called Principal, and

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

The City of Alexander City, Alabama
(Name of Owner)

281 James D. Nabors Drive, Alexander City, Alabama 35010
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____,

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Contract with the OWNER, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the construction of:

Multi Agency Wastewater Solution – Project "B"

Highway 128 Sewer Force Main Bid #24-03 (SRF Project CS010329-05)

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one-year guaranty period, and if he shall satisfy all claims and demands incurred under such Contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees

that no change, extension of time, alteration or addition to the terms of the Contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS, WHEREOF, this instrument is executed in 3 (Number) counterparts, each one

of which shall be deemed an original, this the _____ day of _____, 20_____

ATTEST:

_____
(Principal)

_____ By_____(s)
(Principal) Secretary

(SEAL)

_____ _____
(Witness as to Principal) (Address)

_____ _____
(Address)

_____ _____
Surety

ATTEST:

_____
(Surety) Secretary

(SEAL)

_____ By_____
Witness as to Surety Attorney in Fact

_____ _____
(Address) (Address)

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.

Bond Number

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

(Name of Contractor)

(Address of Contractor)

a _____ (Corporation, Partnership, or Individual), hereinafter called Principal, and

(Name of Surety)

(Address of Surety)

hereinafter called Surety, are held and firmly bound unto

The City of Alexander City, Alabama
(Name of Owner)

281 James D. Nabors Drive, Alexander City, Alabama 35010
(Address of Owner)

hereinafter called OWNER, in the penal sum of _____,

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Contract with the OWNER, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the construction of:

Multi Agency Wastewater Solution – Project "B"

Highway 128 Sewer Force Main Bid #24-03 (SRF Project CS010329-05)

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the one-year guaranty period, and if he shall satisfy all claims and demands incurred under such Contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees

that no change, extension of time, alteration or addition to the terms of the Contract or to WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS, WHEREOF, this instrument is executed in 3 (Number) counterparts, each one

of which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

_____
(Principal)

_____ By_____(s)
(Principal) Secretary

(SEAL)

_____ _____
(Witness as to Principal) (Address)

_____ _____
(Address)

_____ _____
Surety

ATTEST:

_____
(Surety) Secretary

(SEAL)

_____ By _____
Witness as to Surety Attorney in Fact

_____ _____
(Address) (Address)

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the PROJECT is located.

CERTIFICATE OF INSURANCE

AND

INSURANCE ENDORSEMENTS

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 20_____ by and between **The City of Alexander City, Alabama**, hereinafter called "OWNER" and _____ doing business as a "Corporation", " Partnership", "an Individual", or Limited Liability Company (LLC) hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the construction of _____ **Multi Agency Wastewater Solution – Project "B"**

Highway 128 Sewer Force Main Bid #24-03 (SRF Project CS010329-05)

2. The CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor, and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the work required by the CONTRACT DOCUMENTS within ten (10) calendar days after the date of the NOTICE TO PROCEED and will complete the same within _____ calendar days unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS. The Contractor further agrees to pay, as liquidated damages, the sum of $_____ for each consecutive calendar day thereafter as hereinafter provided in the GENERAL CONDITIONS and SPECIAL PROVISIONS.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of $_____ or as shown in the BID schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:

(A) Advertisement for Bids

(B) Information for Bidders

(C) Bid

(D) Bid Bond

(E) Agreement

(F) General Specifications

(G) Supplemental General and Special Provisions

(H) Payment Bond

(I) Performance Bond

(J) Notice of Award

(K) Notice to Proceed

(L) Change Order

(M) DRAWINGS prepared or issued by Municipal Consultants, Inc.

numbered _____ through _____, and dated _____, 20_____.

(N) SPECIFICATIONS prepared or issued by Municipal Consultants, Inc.

dated _____, 20_____.

(O) ADDENDA:

No. _____, dated _____, 20_____
No. _____, dated _____, 20_____
No. _____, dated _____, 20_____
No. _____, dated _____, 20_____

6. The OWNER will pay to the CONTRACTOR in the manner and at such times as set forth in the General Conditions such amounts as required by the CONTRACT

DOCUMENTS.

7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

8. The Contractor enters into this Contract with the Owner as an independent contractor and, as such, agrees that neither the Owner nor its officers, agents, employees, engineers or inspectors shall be responsible for the acts or omissions of the Contractor, or any subcontractor, or any of the Contractor's or subcontractor's agents or employees, or any other persons performing any of the work pursuant to this Contract. The Contractor shall be solely responsible for controlling construction manner, means and techniques consistent with the Contract Documents, Plans and Specifications.

9. This Agreement, together with all documents which constitute the "Contract Documents" constitute the entire agreement of the parties, as a complete and final integration thereof with respect to its subject matter. All understandings and agreements heretofore had between and among the parties are merged into this Agreement, which alone fully and completely expresses their understandings. No representation, warranty, or covenant made by any party which is not contained in this Agreement or expressly referred to herein has been relied on by any party in entering into this Agreement.

IN WITNESS, WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in 3 (Number) counterparts, each of which shall be deemed an original on the date first above written.

OWNER:

The City of Alexander City, Alabama

By _____

Name Curtis "Woody" Baird

Title Mayor

(SEAL)

ATTEST:

_____

Name _____

Title _____

CONTRACTOR:

_____

By _____

Name _____

Address _____

_____

_____

(SEAL)

ATTEST:

_____

Name _____

Title _____

SPECIAL PROVISIONS

SPECIAL PROVISIONS
FOR
STARTING AND COMPLETION TIME
AND LIQUIDATING DAMAGES

SECTION I

1.0 STARTING AND COMPLETION TIME

Work specified under this contract shall begin on the date specified in the Notice to Proceed. The completion of work shall be counted from the specified start date in the Notice to Proceed and will be as follows:

180 calendar days

Requests for extension of time will be submitted to the Engineer along with the Contractor's periodic estimate. The Engineer shall ascertain the facts and the extent of the delay and shall recommend to the Owner whether it should extend the time for completing the Project. The Contractor shall provide all documentation requested by the Engineer. Extensions of time, if any, will be made by the Owner only if in accordance with the Contract Documents.

For change orders requesting extensions of time due to rain, wind, flood or other natural phenomenon, the Contractor's written request must be accompanied, at the Owner's request, by a detailed report of weather at this site for the last ten (10) years with averages showing means and statistical deviations from mean averages to support request for extension. No extension shall be made for delays due to rain, wind, flood or other natural phenomenon of normal intensity for the locality.

In the event any material changes, alterations, or additions are made as herein specified, which in the opinion of the Engineer will require additional time for execution of any work under the contract, then in that case, the time of the completion of the Project may be extended through change order. No extensions of time shall be given for any minor changes, alterations or additions. The Contractor shall not be entitled to any reparation or compensation on account of such additional time or extensions of time.

2.0 LIQUIDATING DAMAGE CHARGE

Beginning with the first periodic estimate after the contract completion date, liquidating damage charges may be assessed by the Owner against the Contractor for each calendar day past the contract completion date, plus approved time extensions. The liquidating damage charges shall be deducted from the Contractor's periodic payment by the Owner. The Contractor shall be notified of the liquidating damage charge and shall have ten (10) days in which to file an appeal of the charges with the Owner. The Owner shall review the appeal and render a decision of approval or disapproval. The liquidated damages shall be as follows beginning from the stated or extended date of completion and continuing for so long as the Project remains incomplete.

$ 500 per calendar day

Should the Owner not deduct liquidated damages when it is first entitled to, this shall in no way limit the Owner's right to deduct or claim the entire liquidated damages at whatsoever time the Owner may desire. It is understood and agreed that the above deduction is not a penalty, but money due to reimburse the Owner for inconvenience and damage to the general public, due to the delay in the completion of the Project and is reasonable. The collection of liquidated damages by the Owner shall not constitute an election or waiver by the Owner of recovery of additional delay or non-delay related damages from the Contractor, and the Owner expressly reserves the right to recover actual damages for other harms resulting from delay. The provisions of the liquidated damage clause shall apply and continue to apply even if the Contractor terminates or abandons the Project prior to the scheduled completion dates.

The amounts of such liquidated damages and actual damages incurred by reason of failure to complete the work stipulated in the Contract are hereby agreed upon as reasonable estimates of the costs which may be accrued by the Owner. It is expressly understood and agreed that these amounts are not to be considered in the nature of penalties, but as damages which have accrued against the Contractor. The Owner shall have the right to deduct such damages from any amount due, or that may become due the Contractor, or the amount of such damages shall be due and collectible from the Contractor or Surety.

SPECIAL PROVISIONS
FOR
STANDARD OF QUALITY
FOR BASE BID

SECTION II

1.0 MANUFACTURED ARTICLES

Where certain items are called for or described, it is to establish a "standard" of quality. The Contractor's Proposal shall be based on furnishing the items as called for or described.

2.0 SUBSTITUTE EQUIPMENT/MATERIALS

Contractors may submit for approval of substitute equipment/material. Such items shall be written in on the "List of Material Suppliers and Equipment Manufacturers". The Contractor shall state the reduction in cost, if any, between the substitute and the equipment in the base bid. No extra will be paid the Contractor for any changes required to adapt the substitute equipment or material and the Contractor shall pay the Owner for any necessary redesign and/or construction drawings. All redesign and drawing will be prepared by the Engineer. Substantial evidence of the equal or superior quality shall be submitted with the bid. The Contractor shall also promptly furnish after bid opening such additional information as may be requested by the Engineer such as lists of installations of the same equipment of similar size and complexity (including contact persons and phone numbers), testing and performance data (including both independent laboratory certification and full scale) to clearly indicate full compliance with all specifications. The determination whether or not the substitute equals the "standard" shall be made by the Engineers and Owner. The Owner may determine any substitute equipment or material as not desired to suit his best interest.

SPECIAL PROVISIONS
FOR
BASIS OF AWARD

SECTION III

1.0 REDUCTION OF QUANTITIES

The award will be made to the lowest Bidder for the total bid of all sections as determined in Section 2.0 below. In the event the low bid, taking into consideration the alternate items, is more than the funds allocated for the construction of the Project, the Owner reserves the right, and the Bidder submitting the bid acknowledges and accepts this right, to reduce quantities at the unit price bid, to bring the project within the funds allocated. In the event a reduction in quantities is made, the time allowed for completion of the work shall be reduced proportionately.

2.0 DETERMINATION OF LOW BIDDER

The contract will be awarded to the lowest responsible and responsive Bidder, unless the Owner determines that all the bids are unreasonable or that it is not in the best interest of the Owner to accept any of the bids. The lowest responsible and responsive bid is defined as the total bid of all items on the base bid utilizing the base equipment and materials listed. If more than one equipment or materials supplier is listed in the base equipment/material list, the contractor shall indicate which equipment or material brand he is basing his proposal on.

If Alternate bid items are bid, the Owner shall decide after the Bid Opening what portion of the total project can be completed with the funds available. If no Alternate bids are requested, the Total base Bid will be used to determine the Low Bid. However, if any alternate bid items are to be constructed as determined by the Owner, these Alternate Bid Unit Prices will be added and/or deducted to the Total Base Bid to determine the lowest responsible and responsive Bidder.

SPECIAL PROVISIONS
FOR
SOURCE OF FUNDING

SECTION IV

The Owner has funding secured for the anticipated cost of this Project as noted below. Note that more than one funding source may be utilized at the Owner's discretion. The Award of the Project is at the sole discretion of the Owner.

Project Funding Source:

__**X**__ Cash reserves on hand

_____ Bond Proceeds on hand

_____ Bond Proceeds from a Bond Issue to be completed after Bids are opened

_____ Grant or Award

__**X**__ Direct Reimbursement from a State, Federal or Local Government Agency

_____ Other source which will not become available until after the execution of the Contract

Payment to Contractors shall be in accordance with the Contract Documents and the Code of Alabama 39-2-12

SPECIAL PROVISIONS
FOR
APPLICATION FOR TAX CERTIFICATE OF EXEMPTION

SECTION V

Under Alabama law (Alabama Act 2018-234), the Owner is tax exempt from the payment of all State, County, and Municipal Sales and Use Taxes for *purchases that qualify for an exemption* pursuant to Alabama Department of Revenue (ADOR) Rule No. 810-6-3-.77. Bidders shall not include Sales and Use Taxes in their bid for *purchases that qualify for exemption* under ADOR rules. However, Bidders shall account for the Sales and Use Tax savings (i.e., the Sales and Use Taxes not included in the Contractor's bid) in the designated section of the bid form (included in the Bid Documents) in accordance with Alabama law. All Bidders shall reference Alabama Act 2018-234 and the ADOR - Sales and Use Tax Rules (specifically Rule No. 810-6-3-.77) prior to bidding. Bidders shall include all Sales and Use Taxes for purchases of non-exempt materials and items, etc., as well as all other applicable taxes. It shall be the responsibility solely of the Bidder to determine which purchases for this project are exempt from Sales and Use Tax and which purchases are not exempt.

Following execution of the Contract and in accordance with ADOR Rule No. 810-6-3-.77, the Contractor and any Sub-Contractors shall submit an Application for Sales and Use Tax Certificate of Exemption (ADOR Form ST: EXC-01) to the ADOR that is specifically for this tax-exempt project. The Contractor and any Sub-Contractors shall comply with all requirements of the ADOR and shall obtain the Certificates of Exemption (ADOR Form STC-1) prior to ordering any materials for the project that qualify for exemption of Sales and Use Taxes. The Owner will make available any information that is requested by the Contractor and is required by the ADOR for the Contractor and any Sub-Contractors to obtain their Certificates of Exemption. In accordance with ADOR Rule No. 810-6-3-.77, the Owner will also fulfill its obligation to submit its Application for Sales and Use Tax Certificate of Exemption specifically for this tax-exempt project.

SPECIAL PROVISIONS
FOR
INSURANCE REQUIREMENTS

SECTION VI

1. All bidders shall have their insurance provider thoroughly review all insurance requirements prior to Bid opening to ensure the Contractor includes sufficient monies to meet all insurance requirements. This review by the insurance provider shall be detailed and complete. The review shall determine pricing and availability of all specific insurance requirements including specific endorsements. This review shall determine all additional and special insurance that the Contractor must acquire to be in full and complete compliance with all insurance requirements. Prior to bidding, all bidders shall furnish to their insurance providers complete copies of all insurance requirements contained in the General Specifications Section of this Contract, all insurance requirements in other sections of the documents (including but not limited to the Special Provisions), and those required by permits, etc.

2. As soon as indication is given that the low bidder will apparently be awarded the contract, the Contractor shall have his insurance provider begin making whatever arrangements may be necessary to allow all required insurance, including all specific requirements (e.g., specific endorsements, etc.) for this particular project, to be promptly obtained so as not to delay execution of the contract.

3. Per the General Specifications, the Contractor will be required to provide copies of the Contractor's automatic policy endorsements or original policy endorsements acceptable to the Owner. Each endorsement shall indicate the policy number and be complete in full accordance with the General Specifications and to the satisfaction of the Owner and Engineer. The policy endorsements shall be filed with the Owner prior to the Owner's execution of the Contract. Automatic and/or original policy endorsements for additional insureds and waivers of subrogation for ALL policies shall be as broad as (i.e., similarly worded to) the following General Liability endorsements:

    a. Endorsements for the Additional Insured - ISO's CG 20 10 11/85 or the combination of CG 20 10 10/01 and CG 20 37 10/01

    b. Endorsements for Waivers of Subrogation - ISO's CG 24 04 10 93 or CG 24 04 05 09.

    Samples of acceptable ISO forms are provided on the following pages. Although these sample endorsements are for General Liability, ALL endorsements for ALL policies shall be similarly worded and acceptable to the Owner.

4. Per the General Specifications, "All Risk" Insurance (including flood insurance) shall be provided, if applicable. "All-Risk" Insurance shall be provided for all plants, pumping stations, buildings, tanks, structures, and equipment, etc. "All Risk" Insurance shall be provided as applicable for other portions of the project.

5. If project includes SRF Funding, Flood Insurance shall meet all SRF requirements.

POLICY NUMBER: **COMMERCIAL GENERAL LIABILITY**

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – (FORM B)

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART.

SCHEDULE

Name of Person or Organization:

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

WHO IS AN INSURED (Section II) is amended to include as an insured the person or organization shown in the Schedule, but only with respect to liability arising out of "your work" for that insured by or for you.

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 20 10 10 01

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – SCHEDULED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name of Person or Organization:

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

A. **Section II – Who Is An Insured** is amended to include as an insured the person or organization shown in the Schedule, but only with respect to liability arising out of your ongoing operations performed for that insured.

B. With respect to the insurance afforded to these additional insureds, the following exclusion is added:

2. Exclusions

This insurance does not apply to "bodily injury" or "property damage" occurring after:

(1) All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the site of the covered operations has been completed; or

(2) That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 20 37 10 01

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – COMPLETED OPERATIONS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name of Person or Organization:
Location And Description of Completed Operations:
Additional Premium:

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

Section II – Who Is An Insured is amended to include as an insured the person or organization shown in the Schedule, but only with respect to liability arising out of "your work" at the location designated and described in the schedule of this endorsement performed for that insured and included in the "products-completed operations hazard".

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 24 04 10 93

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name of Person or Organization:

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

The TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US Condition (Section **IV** – COMMERCIAL GENERAL LIABILITY CONDITIONS) is amended by the addition of the following:

We waive any right of recovery we may have against the person or organization shown in the Schedule above because of payments we make for injury or damage arising out of your ongoing operations or "your work" done under a contract with that person or organization and included in the "products-completed operations hazard". This waiver applies only to the person or organization shown in the Schedule above.

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 24 04 05 09

WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

SCHEDULE

Name Of Person Or Organization:
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.

The following is added to Paragraph **8. Transfer Of Rights Of Recovery Against Others To Us** of **Section IV – Conditions:**

We waive any right of recovery we may have against the person or organization shown in the Schedule above because of payments we make for injury or damage arising out of your ongoing operations or "your work" done under a contract with that person or organization and included in the "products-completed operations hazard". This waiver applies only to the person or organization shown in the Schedule above.

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SPECIAL PROVISIONS
FOR
CONSENT OF SURETY
RELEASE OF LIENS
PAYMENT OF DEBTS AND CLAIMS

SECTION VII

When the Owner and the Engineer have completed a review of the Work and of the request for final payment and accepted all work, final payment of the amount determined to be due under the Contract will be made to the Contractor, provided that all provisions of the Contract have been met, including all aspects of Section IX.3 FINAL PAYMENT contained in the General Specifications. In particular, the Contractor shall provide:

- Certified evidence that all payrolls, all amounts due for labor and materials, and all other indebtedness connected with the work have been fully paid and satisfied, and that there are no outstanding claims or demands against the Contractor in any manner connected with the work.

- A release of all claims and claims of lien against the Owner and its agents and Engineer from the Contractor and all major subcontractors (the Owner may waive the requirement for subcontractor releases) arising under and by virtue of the Contract, on form provided by the Owner, duly executed by the Contractor and with the consent of the Surety. The Contractor may specifically exclude claims of the Contractor from the operation of the release if specifically excluded there from in stated amounts and the reason therefore. The Contractor may with the consent of the Owner representative, if any subcontractor refuses to furnish such a release, furnish a bond with surety satisfactory to the Owner representative to indemnify against such claims.

Forms are provided on the following pages.

CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS AND PAYMENT OF DEBTS AND CLAIMS

PROJECT:
(project name)

CONTRACT DATE:

TO OWNER:
(name and address of Owner)

STATE OF:

COUNTY OF:

I CERTIFY to the best of my knowledge and belief that all work has been performed and materials supplied in strict accordance with the terms and conditions of the corresponding contract documents between the_____, hereinafter called the OWNER, and, _____, hereinafter called the CONTRACTOR, for the above referenced project.

I further certify and declare that all bills for materials, supplies, utilities and for all other things furnished or caused to be furnished by the CONTRACTOR and used in the execution of the contract are fully paid and that there are no unpaid obligations, liens, claims, security interests, encumbrances, liabilities and/or demands of agencies, subcontractors, materialmen, mechanics, laborers or any others resulting from or arising out of any work done, caused to be done or ordered to be done by the CONTRACTOR under the contract, except as listed below.

I further certify and declare that, except as listed below, the CONTRACTOR (including but not limited to the Contractor, Subcontractors, all suppliers of material and equipment, and all performers of work, labor, or services) releases and forever discharges as well as indemnifies and holds harmless the OWNER and ENGINEER (Municipal Consultants, Inc.) from any and all obligations, liens, claims, security interests, encumbrances and/or liabilities arising by virtue of the contract and authorized changes between the contracting parties, and any and all claims and demands of every kind and character whatsoever against the OWNER and ENGINEER (Municipal Consultants, Inc.), arising out of or in any way relating to the contract and authorized changes.

EXCEPTIONS:

CONTRACTOR:
(name and address of Contractor)

BY: _____
(signature of authorized representative)

_____
(printed name and title)

Subscribed and sworn to before me on this _____day of _____, 20___.

_____
Notary Public
My commission expires: _____

CONSENT OF SURETY TO FINAL PAYMENT

PROJECT:
(project name)

CONTRACT DATE:

TO OWNER:
(name and address of Owner)

In accordance with the provisions of the Contract between the OWNER and the CONTRACTOR as indicated above, the
(name and address of Surety Company)

, SURETY COMPANY,

on bond of
(name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the CONTRACTOR, and agrees that the final payment to the CONTRACTOR shall not relieve the SURETY COMPANY of any of its obligations to
(name and address of Owner)

, OWNER,

IN WITNESS WHEREOF, the SURETY COMPANY has hereunto set its hand on this _____day of _____, 20___.

_____
Surety Company

_____
Signature of authorized representative

_____
Printed name and title

SPECIAL PROVISIONS
FOR
CERTIFICATION REQUIREMENTS

SECTION VIII

1.0 CERTIFICATION REQUIREMENTS

The Contract requires that the Contractor provide written certification for various items. These certifications shall be furnished on forms provided by the Engineer. Copies of some of the required certification forms are included in this Special Provision. For the other certifications, the Contractor shall request the certification forms individually prior to the need for the form.

The Contractor shall provide the certifications in a timely manner concurrently with the occurrence being certified. Additionally, at the completion of the project, the Contractor shall submit copies of all certifications (except submittal certification forms) collectively in a single three-ring binder with a Table of Contents listing each certification contained in the binder. The certifications in the binder shall be submitted prior to the payment of the Startup payment item. All required warranty forms shall also be included in this three-ring binder and its Table of Contents.

The Contractor shall review and understand the certification requirements and all other requirements contained (1) in the Shop Drawings, Submittals, and O & M Manuals section of the General Specifications and (2) in the "All Equipment" specification. Both of these specifications contain many requirements (including the certification requirements) that apply throughout the project. Additional certification requirements are contained in various other specifications.

SUBMITTAL CERTIFICATION FORM

PROJECT: _____ OWNER: _____

GENERAL CONTRACTOR: _____

EQUIPMENT MANUFACTURER: _____

SUBMITTAL DESCRIPTION: _____

CONTRACTOR'S SUBMITTAL IDENTIFICATION NUMBER: _____

EQUIPMENT MANUFACTURER:

I do hereby certify that I have responsible control over this submittal. This submittal has been thoroughly reviewed and all project requirements, along with submittal requirements are completely understood. The submittal is in full accordance with all submittal requirements contained in the General Specifications, except as clearly itemized in the enclosed submittal documentation. I certify that the submittal clearly shows all connecting wiring (including power controls, instrumentation, and SCADA) including but not limited to voltages, power sources, and (where applicable) signal types. By signing below, I certify to the above and acknowledge that the Engineer is not required to review any submittal that is not in full accordance with all submittal requirements.

By:_____ Equipment Manuf.: _____
(Printed Name)

Signature:_____ Date:_____

Title:_____

GENERAL CONTRACTOR:

I do hereby certify that I have carefully reviewed this submittal. This submittal has been reviewed and coordinated by the Electrical Subcontractor and SCADA/system integrator. This submittal has been thoroughly coordinated as required. I certify that the submittal clearly shows all connecting wiring (including power controls, instrumentation, and SCADA) including but not limited to voltages, power sources, and (where applicable) signal types. I further certify that the paint system proposed in the submittal meets all the project painting specifications including, but not limited to, preparation, coating system, number of coats, thickness and color. This submittal contains long term and short term storage instructions specific for the project including, but not limited to, whether or not equipment must be stored in conditioned space, heated space, or only out of the weather, etc. This submittal contains a listing of all spare parts and these spare parts are in conformance with the Specifications. The submittal states the manufacturer's field services being provided. All exceptions are listed on an attached sheet. I acknowledge that the Engineer is not responsible for determining any exceptions to the project requirements or for reviewing any exceptions unless they are clearly pointed out on a page in the submittal entitled **"EXCEPTIONS"** that is signed and dated by the Contractor. By signing below, I certify to the above and acknowledge that the Engineer is not required to review any submittal that is not in full accordance with all submittal requirements.

By:_____ General Contractor: _____
(Printed Name)

Signature:_____ Date:_____

Title:_____

ELECTRICAL SUBCONTRACTOR: (Only applicable if equipment relates to electrical, controls, instrumentation, or SCADA)

I do hereby certify that I have carefully reviewed this submittal. This submittal has been reviewed and coordinated by the Electrical Subcontractor and SCADA/system integrator. This submittal has been thoroughly coordinated as required. I certify that the submittal clearly shows all connecting wiring (including power controls, instrumentation, and SCADA) including but not limited to voltages, power sources, and (where applicable) signal types.

By:_____ Electrical Subcontractor: _____
(Printed Name)

Signature:_____ Date:_____

Title:_____

SUBMITTAL EXCEPTIONS

Project: _____

Submittal: _____

This sheet shall be included with all submittals. List all exceptions below. If there are no exceptions, write "None" and include this executed sheet.

I certify that all exceptions have been listed above.

By: _____ (Printed Name)

_____ (Signed Name)

Date: _____

Certification of Proper Installation for

_____
(Print Name of Equipment)

I hereby certify that I have thoroughly inspected and reviewed the referenced equipment and its installation. It has been checked, adjusted and lubricated as applicable. The electrical and safety features meet the requirements of the manufacturer. This equipment meets all the requirements of the Manufacturer and is ready for normal operation.

_____ _____
Project Name Date

_____ _____
Name – print Signature

_____ _____
Company Name - print Position – print

_____
Phone # of Representative
Signing Certificate

This certification does not relieve the Contractor from any of the requirements of the plans and specifications nor does it indicate acceptance of the equipment by the Owner.

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

SECTION I
DEFINITION OF TERMS

In these Specifications, or in any Documents or Instruments in construction operations where these Specifications govern, the following terms, or pronouns in place of them, shall be interpreted as follows:

I.1 ADDENDA

Written or graphic instruments, issued prior to the execution of the agreement which modify or interpret the Contract, Plans, and Specifications by additions, deletions clarifications, or corrections.

I.2 A.S.T.M.

The American Society for Testing Materials.

I.3 BIDDER

A person, firm or corporation submitting a written Proposal in answer to an advertisement or request for Bids for the construction of the improvement.

I.4 CHANGE ORDER

A written instrument prepared by the Engineer and signed by the Owner, Contractor and Engineer stating their agreement upon a change in the Work, the amount of the adjustment in the Contract Sum, if any, and the extent of the adjustment in the Contract Time, if any.

I.5 CONTRACT

The written Agreement between the Owner and the Contractor, covering the performance of the work and the furnishing of the labor, equipment and materials. The Contract shall include, but shall not be limited to, the "Notice to Contractors," "Proposal," "Plans," "General Specifications," "Standard Specifications," "Supplemental Specifications," "Special Provisions," "Contract Agreement," and "Contract Bonds," together with all the Agreements and "Change Orders" that are required to complete the work in accordance with the Plans and the Contract.

I.6 CONTRACT BID PRICE

The total of the products of the estimated quantities of the items of the work listed in the Proposal and the unit prices bid.

I.7 CONTRACT BONDS

The approved indemnity bonds furnished by the Contractor and his Surety to guarantee completion of the Contract.

I.8 CONTRACT COMPLETION TIME

The period in calendar days from the time specified for the commencement of work to the time specified for its total completion.

I.9 CONTRACTOR

The individual, firm or corporation, the Party of the Second part to the Contract, who has entered into a Contract awarded him by the Owner, acting directly or through his agents or employees.

I.10 ENGINEER

The Engineer employed by the Owner, or his representative.

I.11 EQUIPMENT

Machinery, tools, and supplies for the construction of the work.

I.12 EXTRA WORK

Work authorized in writing by Change Order and performed by the Contractor, for which there is no basis of payment in the Contract Documents and Plans.

I.13 EXTRA WORK ORDERS

Written orders by Change Order to the Contractor authorizing work or furnishing of materials for EXTRA WORK, as defined in these Specifications.

I.14 INSPECTOR

A person employed by the Owner or Engineer to make inspection of materials and work.

I.15 ITEM

A specified class of work for which bid prices are in the Bid Documents.

I.16 MATERIAL

Any substance to be used in connection with the improvements.

I.17 NOTICE TO PROCEED (WORK ORDER)

Written notice from the Owner to the Contractor allowing work to start.

I.18 OWNER

The Party of the First Part to the Contract.

I.19 PLANS

All approved drawings which are on file at the office of the Owner or Engineer, or their reproductions showing the details of the work covered by the Contract.

I.20 PROPOSAL

The formal signed Bid Form with prices provided by the Bidder.

I.21 PROPOSAL FORM

All prepared forms on which Bids are submitted in the Bid Documents and all items in the Specification - Contractual Documents.

I.22 PROPOSAL GUARANTY

The Bid Bond or cashier's check to be furnished by the Bidder as a guarantee that he will enter into a Contract for the work as bid.

I.23 RESPONSIBLE BIDDER

Responsible Bidder shall mean a Bidder who, among other qualities determined necessary for performance, is competent, experienced, and financially able to perform the Contract.

I.24 RESPONSIVE BIDDER

Responsive Bidder shall mean a Bidder who submits a bid that complies with the terms and conditions of the invitation for bids, including plans, drawings, specifications and other provisions of the Contract Documents.

I.25 RETAINAGE

Retainage shall mean that money which has been held or retained by the awarding authority from Contractor's pay requests conditioned upon final completion and acceptance of all work in connection with the Project. Payment of retainage to the Contractor may be reduced by other contract considerations.

I.26 RIGHT-OF-WAY

The area acquired for use in constructing, operation and maintaining the work.

I.27 SPECIAL PROVISION

Clauses or memoranda, applying to the Contract of which these Specifications are a part, and/or amending these Specifications.

I.28 SPECIFICATIONS

The requirements, including Supplemental and Special Provisions applying to the Contract, establishing the type and kind of materials, applicable standards of quality and care, and equipment to be furnished and incorporated in the work.

I.29 STREET

Any or all portions of any dedicated street, avenue, alley, road, or other public highway.

I.30 SUBCONTRACTOR

Any individual, firm or corporation undertaking work under the Contract with an Agreement between himself and the Contractor, and approved by the Surety with the Owner reserving the right to disapprove the subcontractor. The Contractor shall be fully responsible for all his subcontractors including but not limited to safety.

I.31 SUPERINTENDENT

The representative of the Contractor who is present at the work at all times and authorized to interact with the Engineer and who is capable of efficiently superintending the work. The superintendent shall act as a manager which excludes him from operating equipment or performing any construction labor.

I.32 SUPPLEMENTAL AGREEMENT

A Written Agreement between the Contractor and the Owner with the consent of the Surety, modifying the original Contract.

I.33 SUPPLEMENTAL SPECIFICATIONS

Specifications supplemental to or superseding specified portions of the Specifications.

I.34 SURETY

The corporate body, licensed under the laws of the state in which the work is to be performed and bound with the Contractor for the performance of the Contract and payment of all claims recoverable under the Contract Bonds.

I.35 WORK

All performance required of the Contractor under the terms of the Contract to complete and provide the Owner the final project as described in the plans and contract.

SECTION II
PROPOSAL REQUIREMENTS AND CONDITIONS

II.1 QUALIFIED BIDDERS

Proposal Forms will be considered only from Contractors licensed under the laws of the state in which the work is to be done. A copy of the Contractor's license in the state work is to be performed must be attached to the bid. Only Contractors having met all qualification requirements as set forth in these Specifications shall be considered qualified. If the Owner requires prequalification of bidders, the bidder must successfully complete the Owner's requirements in the time frame required in the prequalification solicitation and these Specifications.

II.2 PROPOSAL FORM

The Engineer will furnish Bidders a Proposal Form showing the items of the work and/or materials to be furnished, the amount of the Proposal Guaranty, and the date, time

and place of the opening of proposals and the time in which the work must be completed. The Proposal Form will contain all papers bound with or attached to the Specification-Contractual Documents and addenda and are part of the Contract and/or Proposal and must not be detached or altered.

II.3 INTERPRETATION OF ESTIMATES

The estimates of work listed in the Proposal Form (including Basis of Payment and Items of Work) are to be considered only approximate quantities of items and are to be used as a basis for comparing bids. The Owner does not by any means guarantee that the approximate quantities given will hold in the construction of the work. Final installed quantities may vary significantly from the estimates shown.

Final Payment will be made for actual quantities of the work performed as approved by the Engineer, at the contract prices bid. Should the quantities of the pay items be more or less than the quantities estimated, the contract unit prices bid in the Proposal will prevail.

II.4 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF WORK

Bidders are required to thoroughly examine the site of the proposed work, the Proposal Form, Plans, Specifications and the Contract. The submission of the Proposal shall be evidence that the Bidder has made such thorough examination and that the Contractor's bid includes all necessary components to provide the Owner with a fully functional facility that is complete in all respects. No compensation will be allowed for losses caused by failure to comply with this requirement.

II.5 PREPARATION OF PROPOSAL

Bidder's Proposal must be submitted on the Forms furnished him by the Engineer. The Bidder must specify in ink; in figures; if a space is provided, in words; a unit price; and a total price for each of the separate items. In case of error or discrepancy the sum obtained by adding all of the products of the unit prices and the estimated quantities shall prevail, and this shall be the Contract Bid Price. The prices in words will govern if a space is provided in the Bid Form. If a space for words is not provided on the Bid Form, the written unit price in figures will prevail for each work item. The total of that Bid Item that is accepted is the product of the Bidder's written unit price and the estimated quantity of that Bid Item.

The Proposal shall be signed by the Bidder. Name and address must be shown; if a firm or partnership, the name and address of each member of the firm, or partnership must be shown; if a corporation, the president, vice-president or secretary shall sign and affix the corporate seal. If the person signing the Proposal is an agent, the agent must attach written authorization from the corporation. The Proposal must show the name of the corporation, the state under which the corporation is chartered and the name, title and address of the officer executing the proposal.

Proposal Forms shall be enclosed in an envelope, sealed and addressed to the Owner with the Bidder's name and address inscribed on the outside and a warning not to be opened until the bid date. Proposals may be submitted to the Owner in person, by mail, or by agent, at any time prior to the day and time set for the opening of bids. Proposals will be

opened at the designated office at the time set forth in "Advertisement for Bids." Only bids submitted by Contractors licensed by the state laws in which the work is to be done will be considered. Proposals shall be submitted in the specification and contractual documents form in the proper order. No Proposal will be received after the time specified in the "Advertisement for Bids". A Bidder may withdraw, personally or by telegraphic or written request, any time prior to the closing time for receipt of bids. No Bidder may withdraw for a minimum period of sixty (60) days after the date set for the opening, but the period may be modified in the Bid Documents.

If any person submitting a bid is in doubt as to the meaning of any part of the Plans, Specifications, or other Contract Documents, he may submit to the Engineer a written request for an interpretation. Any interpretation of the Documents will be made only by an addendum and a copy of such addendum will be mailed or delivered to each person receiving a set of Documents. The Owner or Engineer will not be responsible for other explanations or interpretations.

Prior to bid opening, the Owner will make available to prospective Bidders, upon request, any information that it may have as to subsurface conditions and surface topography at the work site. Investigations conducted by the Owner or its Engineers of subsurface conditions were made for the purpose of study and design, and neither the Owner nor the Engineer assumes any responsibility whatever in respect to the sufficiency or accuracy of borings, or of the logs of test borings, or of other investigations that have been made, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unforeseen developments may not occur.

Logs of test borings, geotechnical reports, or topographic maps showing a record of the data obtained by the investigations of surface and subsurface conditions shall not be considered a part of the Contract Documents, and are available only for the convenience of the Bidders. Such logs and reports represent only the opinion of the Geotechnical Engineer as to the character of the materials encountered by him in his investigations of the test borings.

Information derived from inspection of logs of test borings, or pits, geotechnical reports, topographic maps, or from Drawings showing location of utilities and structures will not in any way relieve the Contractor from any risk, or prevent him from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the Contract Documents.

The Owner and Engineer shall not be responsible for any interpretations or conclusions drawn from any subsurface exploration reports or borings. Each Bidder is to base his bid upon his determination of the subsurface conditions and of the types and quantities or material to be encountered or needed. Additional tests or other exploratory operations may be made at no cost to the Owner.

II.6 IRREGULAR PROPOSALS

Proposals may be rejected as being non responsive if they contain omissions or uncompleted forms, alterations of form, additions, conditional bids, improper alternate bids, incomplete bids, erasures, or irregularities. Combination bids submitted as specified will not be classed as irregular. Proposals in which the unit or lump sum prices bid are obviously

unbalanced may be rejected. Bidders shall supply the names and addresses of major material suppliers and subcontractors as requested in the bid proposal and if not provided will be grounds for the Owner to disqualify the Bidder for not being responsive.

II.7 PROPOSAL GUARANTY

No Proposal will be considered unless accompanied by a cashier's check drawn on a bank in the Owner's state or Bid Bond from a company duly authorized and qualified to make bond in the Owner's state. The bond amount should be five percent (5%) of the Contract Bid but in no case more than $10,000.

II.8 OPENING OF PROPOSALS

Proposals will be opened and read publicly at the time and place indicated in the "Advertisement for Bids." Bidders or their authorized agents are invited to be present.

II.9 DISQUALIFICATION OF BIDDERS

A Bidder using the same or different names for submitting more than one Proposal will be disqualified. A Bidder may submit a Proposal as a Subcontractor to other principals and not be disqualified provided he does not withdraw his bid after bid opening.

If there is a reason for believing that collusion exists among the Bidders, any or all Proposals may be rejected. Those participating in collusion may be barred from submitting bids on the same or other work with the Owner.

The Owner can disqualify and/or reject bids where the Bidder does not comply with the requirements of the Contract Documents. The Owner reserves the right to reject any bid that is submitted by a Bidder that is determined by the Owner to not be a responsible Bidder or whose bid proposal is not responsive. In determining whether a Bidder or bid is responsible, the Owner reserves the right to also request and consider the factors in Section III.2 of the General Specifications.

II.10 COMPLIANCE WITH LAWS AND ORDINANCES

Each Bidder shall inform himself of, and the Bidder awarded a contract shall comply with, federal, state, and local laws, statutes, and ordinances relative to the execution of the work. This requirement includes, but is not limited to, applicable regulations concerning minimum wage rates, the use of domestic products, U.S. steel and resident labor, non-discrimination in the employment of labor, protection of public and employee safety and health, environmental protection, the protection of natural resources, fire protection, burning and non-burning requirements, permits, fees and similar subjects. The attention of all Bidders is called to the fact that the work will be subject to compliance with all applicable building and technical codes and will be subject, in addition to all other inspections, to inspection by a representative of the City's and/or County's building inspection department which has jurisdiction over the project, if any. If the project is a Public Works projects as defined by Alabama Code, Title 39 (1997), the bidders will be governed by the above Code. No adjustments or compensation will be allowed for losses caused by failure to comply with such requirements.

II.11 GENERAL CONTRACTOR'S PERMITS OR LICENSES

The attention of all Bidders is called to the provisions of the State law governing general contractors as set forth in ALA.CODE §34-8-1 et seq. (1975), particularly in regard to the need for and evidence of a State general contractor's license. The provisions of said state are adopted herein by reference and form a part of the Contract with the selected Bidder should this project be awarded.

Bidders will be governed by said statutes insofar as they are applicable. To summarize the above quoted statutes, ALA.CODE §34-8-1, et seq. (1975) provides that no one is entitled to bid and no contract may be awarded to anyone who does not possess a valid general contractor's permit or license, including specialty classifications for the work, as provided by the foregoing sections of the State Code, and rules and regulations promulgated pursuant thereto and that said bid may not be considered without evidence being produced that he is so qualified. Trade contractors must be duly licensed in accordance with applicable law. The Owner may not enter into a contract with a nonresident corporation that is not qualified under the State law to do business in Alabama.

SECTION III
AWARD AND EXECUTION OF CONTRACT

III.1 CONSIDERATION OF PROPOSALS

After the Proposals are opened, read and checked, the results will be made public. Until the final award of the Contract, the Owner reserves the right to reject any and all Proposals, and to waive technical errors. A Proposal will not be considered unless signed by the Bidder or his authorized agent and accompanied by cashier's check drawn on a state bank in the Owner's state or Bid Bond.

III.2 AWARD OF CONTRACT

The successful Bidder will be notified by "Notice of Award" mailed to the address shown on his Proposal.

In order to be considered for the award, the Bidder shall present to the Owner, when requested, satisfactory evidence that:

(a) He has the necessary capital and financial resources to undertake and complete the project.

(b) He has equipment, in good working order, adequate for performance of work within the time specified.

(c) He has within his organization, at the time, the construction management and supervisory personnel available for assignment to the project.

(d) The construction management and supervisory personnel are skilled and experienced in the particular type of work to be undertaken on the project. The bidder's attention is called to "V.2 CONTRACTOR".

(e) He has performed and completed similar work of similar magnitude in a satisfactory manner.

(f) There are no outstanding claims with the Owner on previous projects.

(g) He has complied with all qualification requirements set forth in these Specifications.

The Owner reserves the right to reject any proposal if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Contract and complete the work contemplated therein.

The Contractor shall use the personnel he submits as evidence of qualification throughout the construction of the project.

III.3 CANCELLATION OF AWARD

The Owner reserves the right to cancel the award of the Contract before its execution by either the Contractor or Owner without any liability against the Owner or the Engineer.

III.4 REQUIREMENTS OF CONTRACT BONDS

In order to insure the performance of the Contract and indemnify and save harmless the Owner and the Engineer from all damages, the Bidder, to whom the Contract is awarded, shall within fifteen (15) days from the award furnish the Owner, Surety Bonds equal to one hundred (100%) per cent of the total contract amount for Performance of Work and Payment of Labor and Materials.

Bonds shall be made on approved Bond Form, furnished by a Surety company authorized to do business in the state. The Bonds shall be countersigned by an authorized agent who is a resident of the state. The Bond shall have attached power of attorney of the signing official. Bonds shall be valid for twelve (12) months from date of final acceptance of the work.

III.5 EXECUTION OF CONTRACT BY CONTRACTOR

The Contract shall be signed by the Bidder receiving the award and returned to the Owner with Contract Bonds within fifteen (15) days of Notice of Award.

III.6 APPROVAL OF CONTRACT AND EXECUTION BY OWNER

The Owner shall approve and execute the Contract within fifteen (15) days after it has been completed in its entirety with all requirements properly met and its presentation to the Owner unless the Contractor agrees in writing to a longer period. No contract is binding upon the Owner until it has been executed by the Owner. The date of the execution of the Contract shall be when signed by the Owner. The "Notice to Proceed" may be held by the Owner for a reasonable time to remedy details of the project.

III.7 FAILURE TO EXECUTE CONTRACT

Should the successful Bidder or Bidders to whom a Contract is awarded fail to execute a Contract(s) and furnish acceptable Contract securities and evidence of insurance, as required, within fifteen (15) days after the prescribed forms have been presented to him/her, the Owner shall retain the proposal guaranty, or recover from the principal or the sureties, if the guaranty is a bid bond, the difference between the amount of the Contract as awarded, and

the amount of the proposal of the new lowest Bidder. If no other bids are received, the full amount of the proposal guaranty shall be so retained and recovered as liquidated damages for such default. Any sum so retained or recovered shall be the property of the Owner. In the event of the death of the lowest Bidder (if an individual) between the opening of the bids and ten (10) days following award of the Contract the Owner shall return the Proposal Guaranty to the estate of the Bidder.

III.8 WAIVER OF TRIAL BY JURY

The parties to the Contract desire to avoid the additional time and expense related to a jury trial of any disputes arising hereunder. Therefore, it is mutually agreed by and between the parties hereto, and for their successors and assigns, that they shall and hereby waive trial by jury of any claim, counterclaim, or third-party claim, etc., including any and all claims of injury or damages, etc., brought by either party against the other arising out of or in any way connected with the Contract and the relationship which arises here from. The parties acknowledge and agree that this waiver is knowingly, freely and voluntarily given, is desired by both parties, and is in the best interest of both parties. Further, the parties mutually agree that all such proceedings or related proceedings shall be filed in and conducted in a court located in the county of the Owner's central office location.

SECTION IV
SCOPE OF WORK

IV.1 INTENT OF PLANS AND SPECIFICATIONS

The Plans, Specifications, Bidder's Documents, Contract Documents, Bidder requirements, and all other agreements are interrelated and their intent is to prescribe a complete improvement. The Contractor shall perform all items of work in the Proposal Forms, Plans, and reduced work or extra work as ordered. The Contractor shall furnish, unless provided otherwise, all material, machinery, equipment, supplies, transportation and labor for the completion of the project. The Contractor shall, for the price bid, perform all work shown on the Plans, required by the Specifications, or as reasonably inferred, requested, or as required for a complete and workable project. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. Not all details are shown, particularly for architectural, equipment, and building details. Where details are not shown, the Contractor shall submit proposed details to Engineer for review, and shall perform the work in accordance with details accepted by the Engineer.

IV.2 ALTERATION OF PLANS AND CHARACTER OF WORK

The Engineer may without notice to the Surety and without change in the unit bid prices, make alterations in the Plans or the work and its quantities to complete the proposed

construction. Alterations shall not be considered as a waiver of any of the conditions of the Contract or Bonds.

IV.3 CHANGE ORDERS

The Engineer may order additional or reduced levels of work or materials. If not listed as a pay item or if not included in the Contract Unit Prices, it will be Extra Work, modified work, or deductive work and the total Contract Price unchanged, increased, or decreased. The Engineer will ask the Contractor for a proposed cost to complete the Work. If the Owner approves the proposed cost, it shall become a part of the Contract. If the Owner considers the price excessive on extra work, the Owner may have the Contractor perform the work on force account. The Contractor shall not, except in an emergency, perform work that he may deem "extra work" without first giving prior written notice to the Engineer. In all circumstances, the Contractor shall take appropriate measures to mitigate extra cost and time. Whenever changes are made, whether they eliminate or deduct work or create extra work or when differing conditions are encountered, credits or payments for a Change Order will be made by use of any one of the following methods:

(1) Unit prices or combinations of unit prices which formed the basis of the original Contract.

(2) A lump sum mutually accepted based upon the Contractor's estimate which is properly itemized and supported by sufficient substantiating data to permit evaluation by the Engineer and Owner.

(3) Actual cost of performing the work (estimated cost for reduced work) plus fifteen (15%) percent of actual cost to cover supervision, overhead, bond, profit, and all other costs. The Contractor shall submit to the Owner itemized cost sheets showing actual cost of performance of the work. Actual costs are defined as Required Labor Costs, Labor Insurance, Workmen's Benefits, and Social Security; Cost of Required Materials; and actual Rental Costs of Required Construction Equipment. When the work is performed under this method, the Contractor shall take appropriate measures to mitigate the costs and time incurred.

The Contractor shall promptly price and provide all other information to the Engineer to allow prompt evaluation and processing of change orders. The Contractor shall devote sufficient attention to change orders and provide adequate resources to start and complete change order work in an expeditious manner. The Contractor shall not be entitled to any reparation or compensation on account of such additional time or extension of time. The Contractor shall not be entitled to extra time or extra compensation associated with his failure to always act in a timely manner.

For unit price items, the quantities shown in the “Items of Work” reflect estimates. The actual quantities will be adjusted during construction to reflect the conditions encountered, or other changes or Owner preferences. Inasmuch as the actual quantities may vary considerably from the quantities listed in the schedule or shown on the drawings, the bidders shall insert prices that represent his actual cost. The Contractor will be paid for only

the quantities actually installed and approved for payment. Modification to quantities with contractually established unit prices does not constitute extra work.

IV.4 CLEANUP

During construction, the Contractor shall continuously keep all dirt, mud, and dust, etc., cleaned from all roads, streets, highways and parking lots, etc. that may be affected by his work. The Contractor shall take whatever measures are necessary to maintain such roads, streets, and highways in a clean and safe condition at all times.

The Contractor shall clear and remove debris from the project sites as a result of construction. He shall maintain and restore in an acceptable manner all property, both public and private, and leave the Right-of-Way, adjacent property, and sites of the improvements in a neat condition.

He shall thoroughly clean all discoloration, mud, dirt, rust, paint, markings, concrete splatter, ink or other lettering, and stains of any nature, etc. from all structures and surfaces, etc.

The Contractor shall take appropriate measures during and throughout construction to prevent discoloration and staining, etc., of all surfaces during construction. He shall provide cleaning of all mud, concrete splatter, oil, and stain-producing materials, etc. during construction as required to facilitate final cleaning. Regardless, all discoloration and staining, etc., shall be totally removed at the completion of construction. The Contractor shall use pressure washing, steam cleaning, chemical cleaning, and whatever additional measures may be necessary to totally remove all traces of all discoloration and all stains of all types, etc. The cleaning shall be conducted in a manner that the final surface appearance is uniform and attractive.

When facilities are cleaned prior to the completion of all work, and then startup, operation, or other activities by the Owner or Contractor result in the need for additional cleaning, such cleaning shall be performed by the Contractor.

These cleaning requirements apply to the entire project including but not limited to all, floors, walls, ceilings, structures, buildings, roofs, windows, enclosures, equipment, walks, sidewalks, steps, stairs, metal surfaces, fiberglass surfaces, plastic surfaces, masonry, paving, concrete, asphalt, and all other surfaces, etc.

These cleaning requirements also apply to all electrical facilities, including but not limited to, inside and outside of electrical panels, conduits, pull boxes, and lights, etc. Protect electrical facilities from concrete splatter when concrete is being placed. Clean all dust and debris, etc. from the inside of all electrical and control panels, etc.

SECTION V
CONTROL OF WORK

V.1 ENGINEER

Project communication is generally through the Engineer and the work shall be accomplished under the inspection of the Engineer. The Engineer shall decide questions which arise concerning materials furnished, and work performed. The Engineer shall interpret the Plans and Specifications during the fulfillment of the Contract. The Engineer shall have

authority to decide disputes and mutual right between Contractors. The Engineer is not authorized to increase the obligation of the Owner to the Contractor, except in accordance with the terms of the Contract.

The Engineer may inspect the Work at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the Engineer will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of on-site observations as an engineer, the Engineer will keep the Owner informed of progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

The Engineer will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Engineer will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Engineer will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work. The Engineer has no authority to supervise or control the Contractor (or subcontractors) or any of their personnel.

The Engineer shall have no obligation or duty to prepare a list of incomplete work until the Contractor has complied with all the requirements of Project Completion. However, should the Engineer produce any preliminary list of incomplete work and provide it to the Contractor, the Engineer is in no way responsible for listing all incomplete or unacceptable items. Such a list may require more time and personnel than the Engineer could devote and may be totally impractical if significant work remains. Whether or not any preliminary list of work is prepared by the Engineer, the Contractor shall not be entitled to any claim whatsoever in regard to such a list. If such a list is given to the Contractor, it shall be solely for the convenience of the Contractor and shall not in any way be considered to be a complete or semi-complete list of incomplete work. The Contractor shall not in any way assume that the list is in any way representative of all the work remaining or is even representative of the importance or magnitude of the remaining work. It is the responsibility of the Contractor to prepare his own listing of incomplete work.

The Engineer will have authority to reject Work which does not conform to the Contract Documents. However, neither this authority of the Engineer nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Engineer to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

The Engineer shall review and approve or take other appropriate action on the Contractor submittals, such as shop drawings, product data, samples and other data, which the Contractor is required to submit, but only for the limited purpose of checking for conformance with the design concept and the information shown in the Construction Documents. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods,

coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. The Engineer's review shall be conducted in a reasonable time period while allowing sufficient time in the Engineer's judgment to permit adequate review. Review of a specific item shall not indicate that the Engineer has reviewed the entire assembly of which the item is a component. The Engineer shall not be responsible for any deviations from the Construction Documents and in all cases the Contractor shall remain responsible for the deviations. The Engineer shall not be required to review partial submissions, submittals containing significant inaccuracies, submittals not properly and thoroughly coordinated by the Contractor, or those for which submissions of correlated items have not been received.

V.2 CONTRACTOR

The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Engineer at once.

The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless Contract Documents give other specific instructions concerning these matters.

The Contractor shall be fully responsible to the Owner for all acts and all omissions of the Contractor's employees, Subcontractors and their agents and employees, and all other persons performing portions of the Work for the Contractor. The Contractor shall be solely and fully responsible for all safety associated with all work by his personnel, subcontractors, suppliers, agents, and employees, etc. The Contractor shall be fully responsible for the quality of work of and for supervising all work by his subcontractors, suppliers, agents, and employees, etc. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Engineer in the Engineer's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor. The Contractor shall be responsible for inspection of portions of Work already performed under this Contract to determine that such portions are in proper condition to received subsequent Work. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

The Contractor's superintendent, project manager, assistant project manager, and other key project personnel shall be thoroughly knowledgeable regarding all the types of work required to safely and fully complete the entire project in full accordance with all the Plans and Specifications. They shall have a complete understanding of all the potential dangers that may be encountered in the work required by this project. They shall implement and enforce proper safety procedures throughout the entire duration of the construction. They shall

also be very well-experienced in their position in performing similar projects (including water and wastewater projects where the project involves water or wastewater) with the same or greater complexity. All Contractor personnel shall be well-experienced at all tasks they are performing. The full-time project manager shall have acceptable experience being the full-time project manager on at least three prior similar projects of similar type and complexity. For projects where a pump station is to be constructed or modified, the minimum required experience shall be similar pump stations or treatment plants on projects of similar or greater complexity and size. For projects where a treatment plant is to be constructed or modified, the minimum experience shall be treatment plant experience on projects of similar or greater complexity and size.

The Contractor shall utilize office and field personnel who have a full understanding of all the risks and potential dangers that may be associated with all the different types of work involved in the project.

The Contractor shall be solely responsible for insuring that he is in full compliance with all Contract requirements, all requirements in the specifications, and all requirements in the drawings.

V.3 DRAWINGS

The Plans accompanying these Specifications form a part of the Contract and include the drawings showing the location and details of the work insofar as practicable. No change or alteration shall be made in the plans without the written permission of the Engineer. The figure dimensions on the Plans are assumed to be correct, but the Contractor is warned to check carefully all dimensions before proceeding with the construction. Should any errors be discovered, the Engineer's attention shall be immediately directed to same, and his decision in the matter shall be final.

V.4 COORDINATION OF PLANS AND SPECIFICATIONS

These Specifications, the Supplemental Specifications, the 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 provide for a complete work. All details and requirements related to items of work or equipment, etc., are not shown in one location in the plans or in one specification. The Contractor shall use the complete set of plans and specifications in its entirety to determine and comply with all project requirements. In case of discrepancy, figured dimensions, unless obviously incorrect, shall govern over scaled dimensions. Supplemental Specifications shall govern over the General Specifications. Plans shall govern over Specifications. Special Provisions shall govern over Specifications, Supplemental Specifications and Plans. The latest revision or its replacement of a professional association's specification or regulatory requirement shall govern.

It is the intent of the Drawings and Specifications that the Contractor shall furnish all labor, tools, materials, equipment, transportation and services necessary for the proper execution of the work so shown and/or described, unless specifically noted otherwise. The Contractor shall execute all work so described in full conformance with the Plans, Specifications and all Contract Documents; shall perform all incidental work necessary to

complete the project in an acceptable manner; and shall fully and satisfactorily complete all work, facilities, and improvements, ready for use, occupancy and operation by the Owner in a timely manner. To avoid delaying the schedule, the Contractor shall always spot check by exposing, measuring, etc. the existing facilities early in the project to coordinate the changes as shown or implied by the Contract Documents to existing facilities i.e., piping, equipment, etc.

The Contractor shall not take advantage of errors or omissions in the Plans or discrepancies between the Plans and Specifications. It shall be his responsibility to notify the Engineer of any errors or discrepancies found and ask for a clarification. The Engineer will make the corrections or clarifications. After discovery of such inconsistencies or ambiguities by the Contractor, any work done by the Contractor on any part of the project affected by such inconsistencies or ambiguities before receipt of written corrections from the Engineer shall be at the Contractor's risk.

V.5 SHOP DRAWINGS, SUBMITTALS, AND O & M MANUALS

The Contractor shall provide all shop drawings, setting layouts and schedules, pipe layout and installation schedules, piping installation details, and such other drawings as may be necessary for the proper and satisfactory prosecution of the work in accordance with the intent of the Drawings and Specifications and to secure a complete and operable project capable of satisfactory performance of the service intended. Upon the request of the Contractor, the Engineer may waive this requirement in the case of standard manufactured items named in the Specifications. The drawings shall be submitted in accordance with an orderly schedule based upon time required for fabrication or manufacture, delivery, and installation of items presented in shop drawings which is coordinated with the Contractor's construction schedule and allows the Engineer reasonable time to review submittals including re-submittals. The Engineer's review time will be longer for submittals for complex equipment and for submittals where the Contractor has not completely complied with all submittal requirements.

Shop drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Engineer shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

The actions required to be taken by the Contractor during the submittal process shall include, but shall not be limited to the following:

(a) The Contractor must thoroughly review and coordinate all submittal data before forwarding such material to the Engineer for his review, shall indicate on the submittal material that he has made such a review, and shall verify such indication or statement by his signature or initials on the Contractor's stamp. The Contractor shall clearly mark all corrections, etc., on the submittals, shop drawings, and O&M Manuals prior to furnishing to the Engineer. If the corrections and markup, etc., are significant, the Contractor shall have the manufacturer or fabricator, etc., prepare a new corrected submittal or shop drawing or O&M Manual prior to furnishing to the Engineer. The new submittal shall also be reviewed

by the Contractor in full accordance with the requirements herein prior to furnishing to the Engineer. Further, all electrical and control submittals shall be thoroughly reviewed and coordinated by the Electrical Subcontractor who shall also stamp and sign or initial those submittals. The requirement for review and coordination by the Electrical Subcontractor of electrical and controls also applies to equipment not being provided by the Electrical Subcontractor. All electrical and control submittals (regardless of the manufacturer or supplier) shall also be thoroughly coordinated by SCADA or instrumentation supplier/manufacturer/system integrator prior to making the first submittal. Any submittals apparently not having been thoroughly reviewed or fully coordinated by the Contractor, and Electrical Subcontractor and system integrator as appropriate, may be returned to him (without review, or with partial review, by the Engineer) for re-submittal. Any comments, questions, corrections, or modifications to the submittal as a result of the review by the Contractor, Electrical Subcontractor and system integrator shall be made to the submittal (by the original producer of the submittal unless approved otherwise by the Engineer) prior to the first submittal to the Engineer. All parties required to review or coordinate the submittals shall utilize personnel who are qualified and experienced at reviewing such submittals.

Each submittal shall be numbered consecutively in order of submission to the Engineer. Resubmittals shall be designated with the original submittal number and the suffixes A, B, C, etc., as required, to indicate consecutive resubmissions.

(b) Submittal items shall be referenced to the applicable Division, Section and page numbers of the Specifications.

(c) Submittal items shall be referenced to sheets (by number) of the Contract Drawings on which such items appear, when applicable.

(d) Any and all particular features of the items submitted that may deviate from those specified and/or shown in the Contract Specifications or Drawings shall be clearly indicated by notations on the submittals and on a separate “Exceptions” sheet submitted by the Contractor.

(e) Submittals shall be legible and should be original information. Copies of facsimiles will not be accepted. The “Exceptions” sheet shall be completed by the Contractor and included with all his submittals. The “Exceptions” sheet shall state “None” if there are no exceptions and shall be included with the submittal. The “Exceptions” sheet must be executed (signed and dated) by the Contractor. The Contractor shall include in the list of exceptions all discrepancies in the submittal. (For example if an item is shown to have one coating in one part of the submittal but a different coating in another part of the submittal, the Contractor shall list such discrepancies as exceptions.) The Engineer shall not be required to find all discrepancies or exceptions as that is the responsibility solely of the Contractor to list all exceptions and discrepancies. The Engineer shall not be required to evaluate any request for an exception unless it is clearly listed on the “Exceptions” sheet included with the submittal.

(f) Submittals for equipment, materials, etc. from different specification divisions shall not be made under a single letter of transmittal.

(g) Submittals shall be stamped "Submittals" on exterior of their envelope or package.

(h) The submittals shall contain all information required for the Engineer to determine, if he desires, if the item being proposed fully and completely complies with all

requirements of the Specifications. Where all such information is not submitted, this shall represent the Contractor's certification that such items are in full compliance with all requirements of the plans and specifications.

(i) The Contractor shall cross out all non-applicable information, models, and options, etc. such that all information remaining pertains specifically to the items being furnished.

(j) The submittal shall show all required information relating to coordination with or connection to other equipment. Properly coordinate the location and orientation of all equipment. Insure equipment does not conflict with other requirements or structures, etc. All control panels and all wiring, including interface with other signals, alarms, or equipment, shall be clearly shown. Clearly show all field wiring and all connections to other equipment including the terminal numbers in other equipment. The Contractor shall fully coordinate all equipment and connections provided for work as shown in the submittal with Electrical, Control, and Panel Suppliers and/or Subcontractors. All electrical and control functions shall be clearly labeled. Provide supplementary notes and descriptions if needed to avoid any confusion.

(k) Equipment shop drawing submittals shall contain the manufacturer's handling and storage requirements, including all maintenance required during storage, type of storage (indoor, outdoor, etc.), heat source, or storage temperature requirements, short term or long term requirements, and all other pertinent storage and maintenance requirements for type of job, location, and exposures. This storage information shall be clearly written, easy-to-understand, detailed, and complete. If preprinted storage instructions are provided, cross out all non-applicable information. Storage instructions shall separately state instructions for short-term storage, long-term storage, and storage after equipment is installed but before placed into fulltime operation. Where motors are part of the submitted equipment, provide the same type of storage information specific to the motors that are provided. Unless clearly stated otherwise by the manufacturer's storage information, storage in utility trailers, or portable storage units (Conex, etc.) shall not be considered indoor or inside storage. Where the required storage requirements are not clear to the Engineer, the equipment shall be stored indoors and inside a permanent structure with conditioned temperature for cooling by air conditioning and heating.

(l) Show anchor bolts and installation requirements. Specifically list all spare parts that will be provided. Specifically list all installation, startup, and training services that will be provided.

(m) Provide all other information requested by Engineer to assist him in understanding the items being provided, the operation of the equipment and controls, the submittals, and the coordination with other equipment.

(n) Provide manufacturer's certification and Contractor's certification that all submittal requirements are fully complied with except as specifically noted. These certifications shall be on a form prepared by and furnished by the Engineer.

(o) Where product samples are submitted for review, the Contractor shall submit a minimum of three samples (i.e. in triplicate) which will be retained by the Engineer/Owner. The samples shall be clearly labeled by permanent labeling to identify the item, date, submittal number, model and/or color, etc., as applicable. All colors to utilized on the project shall be submitted at one time to coordinate and facilitate color selection by the

Owner. Where required, color charts or samples shall be included in the color submittal for the following items as a minimum: paints, thorocoat, sealants, caulk, brick, mortar, block, fans, louvers, doors, and windows, and other similar items, etc. Provide color samples for other items as applicable or as required.

(p) All equipment manufacturers shall include in their submittal a Submittal Certification Form prepared by the Engineer and executed by the manufacturer's engineer in responsible charge stating that (1) they have responsible control over the submittal, (2) they have thoroughly reviewed and understand the project requirements and the submittal requirements, (3) the submittal is in full accordance with submittal requirements contained in the General Specifications except as the manufacture itemizes below, and (4) an acknowledgement that the submittal will not be reviewed by the Engineer if it is not in full accordance with all submittal requirements.

(q) The equipment manufacturer's Submittal Certification Form prepared by the Engineer shall include a space which shall be executed by the Contractor stating that (1) he has carefully reviewed the submittal, (2) it has been reviewed and coordinated by Electrical Subcontractor and SCADA/system integrator, (3) it has been thoroughly coordinated as required, (4) the paint system proposed in the submittal meets all the project painting specifications including but not limited to preparation, coating system, number of coats, thickness, color, (5) the submittal contains long term and short term storage instructions specific for the project including but not limited to whether or not equipment must be stored in conditioned space, heated space, or only out of the weather, etc. (In the absence of clearly written instructions to the contrary, equipment shall be stored in heated and air conditioned space.), (6) the submittal contains listing of all spare parts and these are in conformance with the specifications, (7) the submittal states the manufacturer's field services being provided, (8) the submittal states that all exceptions are listed on an attached sheet, and (9) an acknowledgement that the submittal will not be reviewed by the Engineer if it is not in full accordance with all submittal requirements.

(r) The equipment manufacturer's Submittal Certification Form prepared by the Engineer shall include a space which shall be executed by the Electrical Subcontractor stating that (1) he has carefully reviewed the submittal, (2) it has been reviewed and coordinated by Electrical Subcontractor and SCADA/system integrator, (3) it has been thoroughly coordinated as required, (4) the submittal clearly shows <u>all</u> connecting wiring (including power, control, instrumentation, and SCADA) including but not limited to voltages, power sources, and (where applicable) signal types. This Electrical Subcontractor certification is not required on items that have no electrical or wiring components.

The Engineer shall not be required to review submittals that are not in full compliance with all the submittal requirements. However, should the Engineer elect to review such submittals, the review time will be longer.

The Engineer does not necessarily review all details of all submittals. For some submittals, the Engineer's review may be very limited. Regardless of the Engineer's review or limited or partial review, the Contractor remains fully responsible for full compliance with all requirements of the plans and specifications.

Unless a greater number is called for in various portions of these Specifications the minimum number of copies of submittal data shall be six (6).

Deviations from the Drawings and Specifications shall be called to the attention of the Engineer by the Contractor at the time when such shop drawings or other drawings are first submitted to the Engineer for his consideration. The Engineer's review of any data shall not release the Contractor from responsibility for such deviations, or any subsequent deviations not noted by the Contractor or the Engineer. Any disclaimers or similar statements in the submittals shall not relieve the Contractor, Subcontractor, manufacturer, or equipment supplier of their responsibility.

The Contractor shall coordinate and verify dimensions, arrangements, configurations, and orientation, etc., to insure that all items fit properly in the space available and are accessible for maintenance and replacement, etc.

Shop drawings and other drawings submitted for review by the Engineer shall bear the Contractor's certification. The certification shall represent that he has reviewed, checked, and approved such drawings; that they are in harmony with the requirements of the project and with the provisions of the Contract Documents; that he has verified all field measurements, construction criteria, materials, catalog numbers, and similar data; and that the work represented by the shop drawings is recommended by the Contractor and that the Contractor's Guaranty will fully apply. The Contractor shall insure that all markups in the submittal and all comments returned with the submittal are properly incorporated in all products delivered to the project. Regardless of the Contractor's procedures and by virtue of the Contractor submitting the data to the Engineer, he thereby certifies the above and that he has coordinated the submittal with his work. If the Engineer marks up the shop drawing or submittal, the Contractor shall carefully review, check, and coordinate the Engineer's comments prior to releasing the shop drawings and shall promptly notify the Engineer if he disagrees or doesn't understand the markings. Regardless, the Contractor remains fully and solely responsible for compliance with the plans and specifications.

The finished assemblies represented by the shop drawings and other such drawings are required to be in conformance with the standards of the Occupational Safety and Health Administration, wherever applicable. Manufacturer or contractor shall prepare detailed installation drawings for each assembly.

The Contractor shall submit Operation and Maintenance (O&M) manuals for all equipment of all types provided for the project. This also includes but is not limited to all electrical equipment, monitoring equipment, instrumentation, and controls, etc. O&M Manuals shall be handled the same as other submittals, and shall be accompanied by the same Submittal Certification Form executed by the Manufacturer and the General Contractor. The manual shall contain sufficient drawings, with all equipment components clearly labeled and identified, such that maintenance personnel can promptly determine each and every individual component requiring maintenance and its location as discussed in the manual. The drawings shall be detailed and easy to understand. The manual shall address all recommended maintenance as well as all safety precautions and procedures. The manuals shall fully describe all the features of all equipment. The controls and panels, including but not limited to all alarms, lights, and switches, etc., shall be clearly explained. The O&M manuals shall have a table of contents and be tabbed, bound, and arranged as necessary for easy reference and use. The Contractor shall review the O&M manuals to insure compliance with all submittal requirements prior to submitting them to the Engineer. The manuals shall be revised as

necessary prior to making submittal to the Engineer. Two initial manuals shall be submitted a minimum of 90 days prior to equipment startup for Engineer review. The manuals shall be customized specifically to this project and specific for the equipment actually provided. If the O&M manual contains references to equipment components or parts or material different from that actually furnished, the Contractor shall cross out the inapplicable references or sections. The manual shall not include references to "optional" features or components, etc., without clearly and specifically clarifying whether such an option was actually provided. If an optional feature is provided, delete references to "optional". If an optional feature is not provided, cross out references to the feature. The submitted manual will not be considered acceptable if it contains inapplicable references that are not marked out. Any O&M manuals apparently not having been thoroughly reviewed or fully coordinated by the Contractor, may be returned to him (without review, or with partial review, by the Engineer) for re-submittal. The Contractor shall submit originals or very high quality copies.

The O&M manual for a piece of equipment shall contain an Equipment Maintenance Summary Form that summarizes all routine maintenance requirements of the equipment provided in a concise, easy to follow format. The form shall also clearly indicate maintenance frequency, required lubricants, and lubricant quantity. The form shall also clearly show any required initial oil changes due to the use of different lubricants for storage or due to short change intervals at startup. The form shall be located in its own tabbed division and the tab shall be clearly labeled "Maintenance Summary."

The exact location of every lubrication point or adjustment point, etc, shall be clearly shown and labeled in high quality drawings or photographs. The drawings or photographs shall be such that maintenance personnel can quickly discern the exact location of all items requiring attention. Provide multiple drawings (both overall system and detailed) or photographs where helpful for immediate understanding.

All O&M manuals shall be organized, arranged, and tabbed to allow operators and maintenance personnel to easily and promptly find all needed information. Provide whatever features, figures, and drawings, etc., may be desirable for a very user-friendly manual. Where the manual pertains to multiple models of non-identical equipment, each separate model shall be in its own tabbed division of the manual and the division shall be clearly labeled and contain all the information, drawings, and maintenance summary for that specific model.

After the O&M manual is accepted by the Engineer, the Contractor shall submit six (6) copies of the final O&M Manual.

V.6 DATA FOR SHOP DRAWINGS

The Contractor shall submit, for review by the Engineer, complete catalog data for materials and every manufactured item of equipment and all components to be used in the work, including: specific performance data, material description, rating, capacity, working pressure, material gauge or thickness, brand name, catalog number, general type, and other pertinent data. Where equipment or material is of a minor nature, the Contractor shall furnish the Engineer a complete list, giving names of manufacturers, catalog numbers, and other applicable data. Submittals shall be compiled by the Contractor and reviewed by the Contractor and Engineer before equipment is ordered. Where details of items of equipment

are affected by details of items of other equipment, submittals for such associated items of equipment shall be compiled by the Contractor and reviewed by the Contractor and Engineer before any such associated items of equipment are ordered.

Catalog data for equipment and materials submitted by the Contractor shall not supersede the Contract Documents. The Contractor shall check the equipment, materials, and work described by the catalog data against the requirements set forth in the Contract Documents in order to determine the existence of any errors or deviations. The review by the Engineer shall not relieve the Contractor of the responsibility for correcting and/or remedying such deviations from the Drawings and/or Specifications, either by redesign or by submitting equipment or materials fully meeting the requirements of the Contract Documents. The Contractor shall, in writing, call the attention of the Engineer to equipment and materials deviations at the time of the submittal. If the equipment or material should be accepted, the Contractor will ensure the proper fit of the equipment in the work and guarantee that the equipment or material is suitable for the service intended and that the performance of the equipment or material, with respect to life and efficiency, will equal or exceed that of the equipment or material specified. The form, extent and specifics of the Contractor's Guaranty shall be subject to the decision of the Engineer. Review by the Engineer of the Contractor's submittals of catalog data shall not relieve the Contractor of responsibility for errors in the submittals.

Engineering concurrence of all data described above is a prerequisite to the ordering of the equipment or materials by the Contractor, and, in the case where shop drawings may be required, the acceptability of the shop drawings is also a prerequisite to the manufacture of the item.

V.7 COOPERATION WITH UTILITIES

The Owners or Operators of Private or Public utilities shall have access to the work for the installation or repair. When taking any utilities out of service for construction purposes, the Contractor shall attain the permission and coordinate and comply with whatever requirements the utility Owner may have to minimize the time the utility must be removed from service. This may include such requirements as performing the work at night, weekends, or early morning hours (midnight and later) as may be designated by the utility Owner. The number of shutdowns shall be minimized. This may require two or more separate, independent crews both working simultaneously. All shutdowns shall be carefully planned by the Contractor to insure minimal disruption with a written plan submitted by the Contractor. Backup equipment and materials shall be provided by the Contractor as appropriate or required. No compensation shall be allowed because of the delay or interference caused by such work.

V.8 COOPERATION OF THE CONTRACTOR

The Contractor will be supplied with three copies of the Plans and Specifications. The Contractor shall have on the Work, at all times, one copy of the Plans and Specifications. The Contractor will cooperate with the Engineer, Owner and other Contractors.

The Contractor shall have a competent Superintendent with authority to direct the work as required by the Engineer. The Superintendent shall be furnished irrespective of the amount of work sublet and shall have authority over all subcontract work.

It may be necessary that certain items of work be completed, fully tested and placed in service before other facilities can be constructed. This often applies when the project involves work associated with existing treatment plants, pump stations, or lift stations, etc. The plans and specifications may not call out any or all of the work elements where such sequencing is necessary. It is the Contractor's duty to identify any such or similar sequencing and implement such sequencing at no additional cost or time to the Owner. The structures and facilities that the Contractor shall have completed and ready for operation in order to fulfill the above requirement shall be scheduled with the Engineer. After all testing and equipment adjustment has been performed to the satisfaction of the Engineer, the facilities shall be placed in operation with the assistance of the Contractor. The personnel of the Owner shall then perform all operating functions in accordance with instructions previously received from equipment manufacturers. The Contractor shall be required to keep the existing facilities and place new units in operation in a manner to best keep the existing facilities operating. All start-up shall be scheduled with the Engineer.

V.9 SITE ENGINEERING

The Plans show the lines and grades for the prosecution of the work. The Contractor shall be fully responsible for construction to the alignment, elevations and dimensions and shall provide the stake-out of the project off of existing bench marks and stations. The Contractor shall be held responsible for the preservation of all stakes and bench marks. If, in the opinion of the Engineer, any of the construction stakes or bench marks have been carelessly or willfully destroyed or disturbed by the Contractor, the cost to the Owner of replacing them shall be charged against the Contractor.

The Contractor shall set the elevation of all structures, tanks, pipes, and gates, etc. The Contractor shall be solely responsible for verifying all such elevations prior to pouring concrete, etc. The Contractor shall be solely responsible for the satisfactory removal and replacement of any structure, tank, pipe, or gate, etc. that is later determined not to be in full compliance with contract requirements.

The Contractor shall furnish all materials for marking and maintaining points and lines and shall furnish such labor as may be required. When required by the Contract Documents, the Contractor shall provide independent and adequate building facilities to perform field laboratory and/or office for inspection. The Plans and Standard Specifications will indicate the requirements for any required facilities.

V.10 INSPECTORS, ASSISTANTS, AND REPRESENTATIVES

Inspectors, assistants or representatives shall not be authorized to alter the Plans and Specifications; nor shall they act as foreman for the Contractor, or interfere with the management of the work. Any advice which they may give the Contractor shall not be construed as binding the Engineer or the Owner in any way, nor releasing the Contractor from fulfilling all of the terms of the Contracts. Inspectors, assistants, and representatives are not authorized to supervise or control the Contractor or subcontractor personnel or their work.

V.11 INSPECTION OF THE WORK

The Contractor shall furnish the Engineer with facility for ascertaining whether or not the work performed and materials used are in accordance with the requirements and intent of the Contract. At any time before final acceptance of the work, the Contractor shall, if the Engineer requests, remove or uncover such portions of the finished work as the Engineer may direct. After the examination, the Contractor shall restore the work to the standard required by Specifications. If the work is acceptable and if the Engineer had been given ample opportunity to inspect the work prior to its being covered, the uncovering or removing shall be paid for as Extra allowed the Contractor. No work shall be done nor materials used without providing the Engineer the opportunity to inspect. Failure to reject any defective work or material shall not prevent later rejection whether or not such Work is fabricated, installed, or completed. Failure to detect or reject defective work shall not relieve the Contractor of his responsibilities nor impose any liability on the Engineer. Inspection is not acceptance and shall not constitute acceptance by the Owner. The Contractor is solely responsible for performing all the work in full accordance with all the requirements of the Contract.

V.12 DEFECTIVE WORK

Defective work shall be removed and replaced without extra compensation. Should the Contractor fail to remove defective work when so ordered by the Engineer, the Engineer may withhold payment. Any work not in full compliance with the requirements of the plans and specifications shall be considered defective work.

In any case, the amount previously paid to the Contractor for defective work may be reduced at any time the Owner determines it is in his best interest. The Owner may also, at any time, deduct amounts and require the Contractor to reimburse amounts and withhold further payment for all costs associated with the complete correction of the defective work to the full satisfaction of the Owner. These deductions or reimbursements shall include, but not be limited to, the full cost of satisfactorily removing all work not in full compliance with all Contract requirements, as well as any other work that must be removed or modified in order to correct or replace the work in non-compliance.

If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as determined by the Owner to be appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

V.13 UNAUTHORIZED WORK

Work done in excess of that provided by the lines and grades shown on the Plans or as given by the Engineer, or any extra work done without the written authority of the Engineer, will be considered as unauthorized, and will not be paid for. If Unauthorized Work is directed to be removed it shall be handled as provided by Article V.12.

V.14 MAINTENANCE OF THE WORK

The Contractor will be required to continuously maintain the work under the Contract from the date of Notice to Proceed until the work is completed and accepted. The work shall be maintained in a manner which maximizes the safety and convenience of all persons in the vicinity of the work. Maintenance work, until finally accepted, shall be included in the Contract Prices. The Contractor shall restore without compensation, all damages to the Work before its acceptance. During suspension of Work, the Contractor shall be responsible for all materials and construction.

The failure of the Contractor to comply with maintenance of the Work may result in notification by the Engineer to the Contractor's superintendent or his employee in charge to comply with the required maintenance. If the Contractor fails to remedy unsatisfactory maintenance within three (3) days after the date of issuance of this notice, the Owner may proceed to maintain the work. However, regardless of whether or not the Contractor is notified of his failure to maintain the work, and regardless of whether or not the Owner maintains the work, it shall remain the responsibility, solely, of the Contractor to maintain the work. The entire cost of this maintenance will be deducted from monies due the Contractor.

This requirement applies to all aspects of the work. This includes but is not limited to such items as site, materials, equipment, supplies, cleaning, and electrical components and work, etc.

V.15 RECORD DOCUMENTS

Engineer shall provide to the Contractor, one complete set of Contract Documents to be used by the Contractor for the purpose of documenting as constructed information for all elements of Work. These as constructed documents generated by the Contractor may then be used by the Engineer in preparing Record Drawings for the Project.

The Contractor shall make legible and accurate notations to the drawings to indicate changes. All changes shall be recorded as construction progresses and within 24 hours of a change being made. Work shall not be covered, concealed, or otherwise made inaccessible until all information has been recorded by the Contractor. Record Documents shall be maintained in a clean, dry, legible, and orderly fashion and shall not be used for construction purposes. Record Documents shall be clearly labeled: “Record Documents, Not for Construction”.

Changes shall be recorded in erasable colored pencil. Alternate colors may be used to emphasize different types of changes. Changes shall be “clouded” to draw attention to effected area(s). Changes shall be legibly marked and shall include descriptions when necessary. Changes shall be dated and initialed by the Contractor.

Record Documents shall be made available to the Engineer or the Owner at all times. The Engineer may review and approve, on a monthly basis, the Record Documents. Portions of the Record Documents determined to be incomplete or incorrect by the Engineer, shall be corrected by the Contractor before monthly Pay Requests are approved. Before requesting final payment, Contractor shall provide Engineer with a completed set of clean, fully legible Record Documents. Record Documents may be reviewed by Engineer for clarity and completeness; however, the Contractor has sole responsibility for the correctness, and

accuracy of the Record Documents. The Owner may withhold final payment until the Record Documents are complete, accurate, and have met all other requirements specified herein.

Record Documents required by this Section shall be in addition to any other Record/As Built requirements contained elsewhere in the Plans and/or Specifications.

SECTION VI
CONTROL OF MATERIALS

VI.1 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS

All materials or equipment used on the Work shall meet the requirements of the Specifications. The source of supply of the materials or equipment shall be approved by the Engineer before delivery is started. If it is found that products from a source are unacceptable, the Contractor shall furnish materials from other sources.

The Contractor shall warrant to the Owner and the Engineer that, unless otherwise specified, all materials and equipment furnished under this Contract shall be new, and both workmanship and materials shall be of good quality, free of faults and defects, and in conformance with the Contract Documents. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials. In selecting and/or approving equipment for installation in the Project, neither the Owner nor Engineer assume responsibility for injury or claims resulting from failure of the equipment to comply with applicable federal, state, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials. Material and/or equipment damaged by any cause during the construction period shall be subject to rejection by the Engineer; reconditioning and/or repairing material and/or equipment is not acceptable.

VI.2 SAMPLES, TESTS FOR SPECIFICATION COMPLIANCE

All materials shall be approved by the Engineer. Materials used without prior approval shall be considered unauthorized and will not be paid for. Tests for suspected faulty materials, work, or tests not mentioned in this Section shall be conducted by an independent testing laboratory approved by the Engineer. Such tests shall be paid for by the Contractor. Certified copies in duplicate of each test shall promptly be furnished the Engineer. Laboratory testing common to the project shall be paid by the Owner at a laboratory of his choice, unless specified otherwise. These tests include concrete breaks, inspection, soil tests, and liner tests as defined in these Specifications.

The Contractor shall cooperate, coordinate, and assist the Engineer with all testing the Owner deems appropriate for the project. Make appropriate arrangements with the Engineer and provide safe access, etc., so that all such testing can be preformed. There shall be no extra time or payment associated with this work. If retesting is necessary due to not passing on the first test, all costs associated with retesting shall be the responsibility of the Contractor.

Acceptance of materials by the Engineer shall not relieve the Vendor, or the Contractor from repairing or replacing defective materials. Any materials rejected at the site

of the work shall be removed from the premises by the Contractor in accordance with Articles V.12 and V.13.

VI.3 SALVAGE MATERIALS AND UNUSED EQUIPMENT AND MATERIALS

All existing materials and/or equipment removed and not required to be reused or relocated remains the property of the Owner. These materials and equipment will be stored orderly at the job site in accordance with the Owner's instructions. All unusable items as determined by the Owner will be disposed by the Contractor as excess materials.

All unused construction materials or equipment remaining at completion of the project will remain the property of the Contractor unless the Owner has purchased unused property through the Contract and has rightful ownership or agrees to purchase or accept ownership of materials or equipment. Making payment of stored materials throughout the job does not constitute the Owner's willingness to purchase unused materials or equipment at the end of the Work.

VI.4 STORAGE OF MATERIALS AND/OR EQUIPMENT

Materials and/or equipment to be incorporated in the work shall be properly housed or otherwise protected from corrosion and damage so as to ensure the preservation of their finish, quality, and fitness for the work. Where considered necessary to secure proper protection, the materials shall be placed on racks, platforms, or hard clean surfaces not subject to surface drainage. Factory finished items shall be stored above ground, covered, individually sealed, or housed indoors as required. Equipment shall as a minimum be stored and maintained in accordance with the manufacturer's recommendations, or in accordance with the Plans and Specifications if those storage requirements are more stringent. Equipment that has been installed but not being operated by the Owner shall be stored and protected by the Contractor in accordance with the recommendations of the manufacturer and plans and specifications. The Contractor shall be aware of the potential difficulties involved in the storage of equipment fitted with bearings which may suffer damage from a long period of idleness, and shall take such precautionary measures as may be required to preserve the life expectancy of the bearings. Materials not properly stored, housed and maintained in condition for service as intended will be deducted from the stored materials and will not be incorporated in the work. Full instructions on storage should be provided with the shop drawings (See Sections V.5 and V.6). The Contractor shall be solely responsible for equipment that is damaged due to flooding or improper storage.

No equipment (including but not limited to process equipment, electrical equipment, HVAC equipment, or mechanical equipment, etc.) shall be stored in a location where it may be flooded or otherwise unintentionally submerged, etc.

Stored materials and equipment shall be located and arranged so as to facilitate observation. When the Contractor desires to accept delivery of material or equipment which cannot be accommodated or housed on the site of the work he may, but only with the permission of the Owner, store such material and/or equipment in an insured and bonded warehouse within a 60 mile radius of the project site. Any agreement for rental of such storage space by the Contractor shall contain a provision that the material and/or equipment

thus stored shall not be subject to a lien for payment of storage. A certificate of insurance shall be furnished. The storage facility shall be climate-controlled, if appropriate. The Owner shall be protected against loss of or damage to such stored equipment by the terms and endorsements of the Contractor's insurance policies.

The Contractor shall develop an inventory of stored equipment showing the maintenance required during storage and containing a place for the Contractor to sign off when the maintenance is performed. The maintenance provided shall be stated, dated, and signed by the person performing the work. The Contractor shall notify the Engineer's representative sufficiently prior to performing the work to allow the representative to accompany the Contractor during the maintenance. The Stored Equipment Maintenance Inventory shall be submitted to the Engineer with each monthly pay request. If there is no pay request during a month, the Contractor shall submit the updated inventory monthly until project acceptable.

VI.5 U.S. PRODUCTS PREFERENCE

The successful Bidder (Contractor) shall comply with ALA. CODE §39-3-1 (1975), shall agree to utilize in the execution of the Project, materials, supplies and products manufactured, mined, processed or otherwise produced in the United States or its territories, if the same are available at reasonable and competitive prices and not contrary to any sole source specifications. It is further stipulated that a breach of the foregoing provision of this agreement by the Contractor in failing to utilize domestic products shall result in a downward adjustment in the Contract price equal to any realized savings or benefit to the Contractor.

VI.6 USE OF DOMESTIC STEEL

The attention of all Bidders and that of the successful Bidder (Contractor) is drawn to ALA.CODE §39-3-4 (1975), requiring the use of steel produced within the United States for municipal construction projects when specifications in the construction contract require the use of steel and do not limit its supply to a sole source. This provision is subject to waiver if the procurement of domestic steel products becomes impractical as a result of national emergency, national strike or other causes. Violations of the use of domestic steel requirements shall result in a downward adjustment in the Contact price to equal any savings or benefit to the Contractor.

SECTION VII
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

VII.1 LAWS TO BE OBSERVED

The Contractor shall comply with all laws, regulations, and permits. The Contractor and his Surety shall indemnify and save harmless the Owner and the Engineer and all of their representatives or agents against any claim or liability arising from or based on the violation of any law, regulation, or permit requirement, whether by himself, his employees, or his subcontractors. The Contractor agrees to indemnify and/or reimburse the Owner for any fines, violations, charges, suits, or sums of money imposed by the Alabama Department of Environmental Management (ADEM), Environmental Protection Agency (EPA), or any agency overseeing and/or issuing regulation, law or permit for any violation arising out of the

work by the Contractor pursuant to this agreement. The Contractor agrees to reimburse the Owner for all costs the Owner incurs due to the Contractor's non-compliance or alleged non-compliance with laws, regulations, and permits.

VII.2 PERMITS AND LICENSES

The Owner will procure general permits such as those required by highway departments or other utilities to allow the proposed facilities to be installed on public rights of way or privately owned rights of way; however, the Contractor shall procure all other required permits and licenses, pay all royalties and fees, and give all notices necessary. Special or supplemental permits for the Contractor's means and methods of construction such as blasting permits shall be the full responsibility of the Contractor. An exception for blasting permits is discussed in Section VII.13.

Requirements from permits acquired by the Owner for construction will be strictly adhered to by the Contractor with all stipulations within the Contractor's control being fulfilled. The Contractor shall be solely responsible for satisfying all requirements and costs of all permits and licenses acquired by the Owner regardless of whether such requirements are imposed on the Owner or are imposed directly on the Contractor. This includes, but is not limited to, any permit issued by utilities, railroad, streets or highways, governmental agencies, or regulatory agencies, etc. This shall include, but by no means be limited to, such requirements as bonds, insurance, indemnification, flagmen, and traffic control, etc. The Contractor shall obtain special or supplemental permits required by agencies to complete the work in accordance with Section VII.13. The Contractor shall indemnify the Owner and Engineer in accordance with Section VII.1.

VII.3 PATENTED DEVICES, MATERIALS AND PROCESSES

If the Contractor uses any design, device, material, or process covered by letters, patent or copyright, the Contractor and the Surety shall indemnify and save harmless the Owner and the Engineer and all their authorized representatives from any suits, or claims for infringement.

VII.4 PUBLIC CONVENIENCE AND SAFETY

The Contractor is required to conduct his work as to ensure the least possible obstruction to traffic, to ensure the least possible inconvenience to the general public, businesses, and the residents in the vicinity of the work, and to ensure the protection of persons and property. Maintain continuous access to businesses (during and near to hours of operation) and hospitals, etc. No disturbing noise will be allowed particularly in residential areas between the hours of 9:00 p.m. until 7:30 a.m. unless an emergency occurs. Permission of the proper authority is required before any road or street is closed to the public. The maintenance of continuous accessibility of fire-fighting equipment to fire hydrants and to such areas as are necessary for the provision of fire protection is a requirement of the Fire Department or the authority having jurisdiction. The provision of temporary measures as required to ensure the safe use of sidewalks and streets by the public is the responsibility of the Contractor. The proper functioning of all gutters, sewer inlets, drainage ditches and irrigation ditches is to be ensured by constant clean-up along with the work and by provision of

temporary facilities where required for the maintenance of natural surface drainage. The implementation of all such maintenance measures and safety precautions is the responsibility of the Contractor. Respond promptly and appropriately to all complaints. Coordinate and cooperate with affected property Owners and keep them advised of work schedules and activities.

No road, sidewalk or vehicle path shall be closed by the Contractor except by permission of the Engineer, and while closed the Contractor shall maintain traffic through or around the Work. The Contractor shall notify emergency agencies and the Engineer before the starting of construction of any situations that might inconvenience or endanger traffic. All right-of-ways shall be kept continuously open and maintained in passable and safe condition. The Contractor shall clean-up and place streets back in service as soon as possible. Paving shall be patched as soon as possible. Use cold-mix asphalt as temporary patch if required by plans or specifications, or if helpful in continuously maintaining public safety or convenience.

The convenience of the general public and of residents along the road or other travelways shall be provided for in a satisfactory manner. Where roads or streets are not available for use as detours, traffic shall be permitted to pass through the Work. The traveling public shall have precedence over Contractor's vehicles, and shall not be delayed for the convenience of the Contractor. The Contractor shall provide flagmen whose sole duties shall consist of controlling the movement of public traffic. No additional charges will be paid for traffic routing or control.

The Contractor shall provide and maintain temporary roads to provide access to the Work, driveways, houses or buildings affected by the work. Temporary bridges for pedestrians shall be provided over surfacing, pavement, sidewalks or muddy areas.

The provision by the Contractor of warning signs, warning lights, barricades and watchmen is subject to the requirements of "Safety and Health Regulations for Construction" of the Occupational Safety and Health Administration, U. S. Government Department of Labor; the State "Manual on Uniform Traffic Control Devices for Streets and Highways"; and other authorities having jurisdiction in the areas and traffic control. The Contractor is solely responsible for satisfying all safety and traffic control requirements of authorities concerned with or affected by this work. The Contractor shall provide, install, and continuously maintain all traffic control and other safety features, etc. as may be desirable for the protection, safety, and convenience of the public. The Contractor is solely and fully responsible for protecting the public. This responsibility applies both during working hours and non-working hours, 7 days per week, for the entire duration of the project.

VII.5 PROTECTION AND RESTORATION OF PROPERTY, STREETS AND LANDSCAPE

The Contractor shall not enter upon private property without obtaining permission from the owners and lessees. The Contractor shall be responsible for the preservation of all public and private property. The Contractor will obtain necessary information of existing utilities, and shall give notice to the owners or authorities at least forty-eight (48) hours before his operations will affect such property. The Contractor shall not interfere with the operation of utilities. The Contractor shall at his own expense, take necessary precautions to avoid interruption of service or damage.

Work under this Contract shall include the restoration of all paved areas and macadamized roadways to their original condition at his own expense. If the Contractor fails to restore disturbed areas promptly, the Owner, after giving three (3) days' written notice, may have the pavement restored and deduct cost from the payment due the Contractor. However, any such action or lack of action, by the Owner shall not relieve the Contractor of any of his obligations under this Contract, including but not limited to safety. The Contractor must conform to the prevailing State Highway Code and Railroad Company requirements at his own expense. The Contractor shall maintain roads, streets, and highways affected by his work in a safe condition at all times.

When damage or injury is done to public or private property by the Contractor, he shall repair such damage or injury so that it is equal or better condition to the property before damage.

VII.6 INDEMNIFICATION

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Engineer, Engineer's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss of expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including loss of use resulting there from, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, equipment or material supplier or manufacturer, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder.

Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described herein.

In claims against any person or entity indemnified under this Section by an employee of the Contractor, a Subcontractor, equipment or material supplier or manufacturer, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Section shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor, Subcontractor, or equipment or material supplier or manufacturer under workmen's compensation acts, disability benefit acts or other employee benefit acts.

The obligations of the Contractor under this Section shall not extend to the liability arising out of active negligence, sole negligence, willful misconduct of, or for defects in design furnished by, the Owner and Engineer, their agents, consultants, and/or employees provided that such negligence or defect are the primary cause of the injury or damage.

The Owner may retain money due for actions or claims for injuries or damages until settled. The Owner and/or the Engineer, or their representatives shall not be liable to the Contractor for damages or delays resulting from work by third parties or by injunctions or other restraining orders obtained by third parties.

VII.7 INSURANCE

All bidders shall have their insurance provider thoroughly review all insurance requirements well prior to Bid opening to ensure the Contractor includes sufficient monies to meet all insurance requirements. This review by the insurance provider shall be detailed and complete. The review shall determine pricing and availability of all specific insurance requirements. This review shall determine all additional and special insurance that the Contractor must acquire to be in full and complete compliance with all insurance requirements. Prior to bidding, all bidders shall furnish to their insurance providers complete copies of all insurance requirements contained in the General Specifications Section of these Contract Documents, all insurance requirements in other sections of the documents (including but not limited to the Special Provisions and Supplemental General Conditions), and those required by permits, etc. See the Special Provisions for additional insurance requirements.

(a) General: The Contractor shall purchase and maintain such insurance as will protect him from claims set forth below which may arise from the Contractor's execution of the work, whether execution be by the Contractor, any Subcontractor, any one directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. The Contractor and/or any subcontractors waive subrogation as to the Owner, its officers, agents, employees, consultants, and Engineer (Municipal Consultants, Inc.). This waiver of subrogation shall apply to all policies, including but not limited to, General Liability, Automobile, All-Risk (Builder's Risk), Worker's Compensation, and Umbrella Insurance. This shall be stated as such in all policies and on all certificates. The full aggregate limits shall apply per job or contract. This shall be stated as such in all policies and on all certificates. Insurance for Contractor or any of its agents, employees or subcontractors shall cover both on-site and off-site operations under this Contract and insurance coverage shall extend to any motor vehicles or other related equipment, irrespective of whether the same is owned, non-owned or hired. Coverages shall include, but not be limited to:

(1) Claims under worker's compensation, disability benefit and other similar employee benefit acts;
(2) Claims for damages because of bodily injury, occupational sickness or disease, or death of employees;
(3) Claims for damages because of bodily injury, sickness or disease, or death of any person other than employees;

(4) Claims for damages insured by usual personal injury liability coverage which are sustained (i) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (ii) by any other person;
(5) Claims for damages because of injury, destruction, or loss of use of tangible property; and
(6) Where work under this Contract includes any exposure to navigable waterways and/or adjoining water areas, the Contractor shall obtain

insurance coverage to include Federal Longshoreman's and Harborworker's Act (USL & H) and Federal Jones Act or other insurance required by other applicable law or regulation.

The Contractor's insurance shall cover both On-going Operations and Completed Operations related to the project. Coverage for On-going Operations shall be in effect from the beginning date of the Contract until final payment is made to the Contractor by the Owner. Coverage for Completed Operations shall be in effect for a minimum period of one (1) year after final payment is made to the Contractor by the Owner and/or any time the Contractor is working on the project after final payment has been made to the Contractor by the Owner. There shall be no interruption of insurance coverage during the transition from On-going Operations to Completed Operations.

Maintenance of proper insurance coverage is a material element of the Contract. Failure to maintain, renew and/or provide evidence of renewal may be treated by the Owner as a material breach of Contract. The lack of insurance does not negate the Contractor's obligations under this Contract including, but not limited to, indemnification of the Owner and Engineer from any damages resulting from the Contractor's failure to obtain, maintain or renew the minimum insurance policies and endorsements required herein.

(b) Certificate of Insurance: Original Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to the Owner's execution of the Contract. These Certificates shall contain the following:

(1) Unconditional provision that coverage afforded under the policies will not be canceled unless at least thirty (30) days prior Written Notice has been given to the Owner and Engineer.

(2) The Contractor's and any subcontractor's general liability, automobile liability insurance, and umbrella (and/or excess) insurance shall endorse the Owner, its officers, agents, employees, consultants and Municipal Consultants, Inc., as additional insureds for any claims arising out of work performed under this Contract. Umbrella (and/or excess) liability shall follow form to the underlying insurance. All insurance shall be primary without contribution from any insurance or deductibles available to the additional insureds.

(3) There shall be a statement for all policies that the Contractor and any subcontractor waive subrogation as to the Owner, its officers, agents, employees, consultants and Municipal Consultants, Inc.

(4) There shall be a statement that full aggregate limits apply per job or contract.

(5) Confirmation of coverage of x, c, and u.

(c) Policy Endorsements: Copies of the Contractor's automatic policy endorsements or original policy endorsements acceptable to the Owner shall be filed with the Owner prior to the Owner's execution of the Contract. All policy endorsements shall endorse

the Owner, its officers, agents, employees, consultants and Municipal Consultants, Inc. and these parties/organizations shall be listed as such in the Endorsement Schedule included on the endorsements. The policy number shall be listed in all Schedules. Policy endorsements for additional insureds and waivers of subrogation shall be for both On-going and Completed Operations as defined above. Automatic and/or original endorsements for additional insureds and waivers of subrogation for ALL policies (i.e. General Liability, Automobile Liability, All Risk (Builder's risk), Umbrella Insurance, Workman's Compensation, etc.) shall be as broad as (i.e. similarly worded to) the following General Liability endorsements and be acceptable to the Owner:

(1) Additional Insured Endorsements - ISO's CG 20 10 11/85 or the combination of CG 20 10 10/01 and CG 20 37 10/01.

(2) Waivers of Subrogation Endorsements - ISO's CG 24 04 10 93 or CG 24 04 05 09.

(d) Liability Insurance: The Contractor shall procure and maintain at the Contractor's expense, during the work, liability insurance as hereinafter specified:

(1) Contractor's General Public Liability and Property Damage Insurance including vehicle coverage issued to the Contractor and protecting the Contractor from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising in connection with any operations under the Contract Documents, whether such operations be by the Contractor or by any Subcontractor employed by the Contractor. Insurance shall be written with a limit of liability of not less than $1,000,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident, and a limit of liability of not less than $2,000,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than $1,000,000 for all property damage sustained by any one person in any one accident and a limit of liability of not less than $2,000,000 aggregate for property damage sustained by two or more persons in any one accident. The insurance shall provide full coverage for x, c, and u.

(2) The Contractor shall acquire and maintain, if applicable, Fire and Extended Coverage Insurance upon the Project to the full insurable value thereof for the benefit of the Owner, the Contractor, and Subcontractors as their interest may appear. This provision shall in no way release the Contractor or Contractor's surety from obligations under the Contract Documents to fully complete the Project.

(e) Worker's Compensation Insurance: The Contractor shall procure and maintain, at the Contractor's own expense, during the Contract Time, in accordance with the provisions of the laws of the state in which the Work is performed, Workman's Compensation Insurance,

including occupational disease provisions, for all of the Contractor's employees at the site of the Project and in case any Work is sublet, the Contractor shall require such Subcontractor similarly to provide Workmen's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous work under this Contract at the site of the project is not protected under Workmen's Compensation statute, the Contractor shall provide, and shall cause each Subcontractor to provide, adequate and suitable Insurance for the protection of its employees not otherwise protected.

(f) "All Risk" Insurance: The Contractor shall secure, if applicable, "All Risk" type Builder's Risk Insurance for Work to be performed. Unless specifically authorized by the Owner, the amount of such insurance shall not be less than 100% of the insurable value. The policy shall cover not less than the losses due to fire, explosion, hail, lightning, vandalism, earthquake, malicious mischief, wind, collapse, riot, aircraft, water damage (other than caused by flood) and smoke during the Contract Time, and until the Work is accepted by the Owner and final payment has been made. The "All Risk" policy shall include testing and start-up and allow for utilization of the Work by the Owner. The policy shall name as additional insured the Owner, its officers, agents, employees, consultants, and Engineer (Municipal Consultants, Inc.). Flood insurance and all Additional Insured and Waiver of Subrogation Endorsements must be carried in "All Risk Policy" or by separate policy.

(g) Consistent with the requirement for all insurance coverages provided by the Contractor, the Contractor shall notify the Owner and Engineer in writing 30 days prior to the expiration of the Contractor's Builder's Risk Insurance and Flood Insurance. The Contractor shall maintain the specified Builder's Risk Insurance and Flood Insurance continuously for the duration of the project and until the Work has been accepted by the Owner. In no case, shall the Contractor anticipate acceptance by the Owner when planning for discontinuance of the required Builder's Risk Insurance or Flood Insurance.

(h) Umbrella Excess Liability Over Primary Insurance: The Contractor shall take out and maintain during the term of this Contract, and any extensions thereof, Umbrella Excess Liability Insurance. The minimum limits of coverage shall be $5,000,000 aggregate. The coverage shall be over the required general liability insurance and automobile liability insurance as a minimum. There shall be no gaps or sublimit deductibles, etc. The Owner, its officers, agents, employees, consultants, and Engineer (Municipal Consultants, Inc.) shall be named as additional insureds in all umbrella policies.

(i) Protection of the Owner and Engineers: The Owner, its officers, agents, employees, consultants, and Engineer (Municipal Consultants, Inc.) shall be named as additional insureds in all insurance policies carried by the Contractor or that of his subcontractors for this Contract. If the Contractor or his Surety cannot name the Owner, its officers, agents, employees, consultants, and Engineer (Municipal Consultants, Inc.) as additional insureds in any policies providing the coverage above, the Contractor shall purchase and maintain Owner's Protective Liability Insurance (OCP Policy) in the amount of not less than $5,000,000 and the named insured shall be the Owner, its officers, agents, employees, consultants, and Engineer (Municipal Consultants, Inc.) during the life of this agreement. The coverage shall remain in full effect for both On-going Operations and Completed Operations as described above in Section VII.7(a). The insurance shall protect the Owner, its officers,

agents, employees, consultants, and Engineer (Municipal Consultants, Inc.) from any claim or loss arising from any act or failure to act on the part of the Contractor or his Subcontractors. All insurance shall be primary without contribution from any insurance or deductibles available to the additional insureds and OCP policy holders.

(j) Miscellaneous Insurance: Provide all insurance required by railroads, other utilities, etc. Provide, on the behalf of the Owner, all such insurance required of the Owner by railroad, other utilities, etc.

(k) Neither the setting of insurance limits or requirements nor the acceptance or approval of the same by the Owner imply or represent that the limits or the insurance carrier is sufficient or that such insurance actually has been obtained, that being the responsibility of the Contractor. These insurance requirements shall be considered as a minimum. The Contractor shall consult with his insurance agent to determine whatever greater levels of insurance may be desired. The provision of insurance shall in no way limit the Contractor's responsibility under the Contract nor limit his responsibility to indemnify and hold harmless the Owner and Engineer.

(l) See the Special Provisions for additional insurance requirements.

VII.8 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES

The Contractor shall fully cooperate with private and public utilities in accordance with Section V.7. Where the Contractor's operations are adjacent to properties or utilities, work shall not be started until arrangements for their protection have been made. The Contractor shall be solely responsible to the Owners and Operators of properties or utilities for injuries or damages. If required by the Owner, he shall furnish special Protective Public Liability and Property Damage Insurance in an amount specified. The Contractor shall co-operate with the owners of utilities if any of their facilities are removed or rearranged. The Contractor shall be responsible for costs associated with this item.

In the event of interruption to utility services or potential damage to the utility caused by the Contractor, the Contractor shall promptly notify the proper authority. He shall cooperate in the restoration of service promptly. The Contractor shall be responsible for all costs associated with this item.

VII.9 PERSONAL LIABILITY

There shall be no liability upon the Owner or Engineers, or their authorized representatives, or employees, either personally or as officials of the Owner or engineering company.

VII.10 NO WAIVER OF LEGAL RIGHTS

The Owner or the Engineer shall not be precluded from showing the true and correct amount and character of the Work performed and materials furnished by the Contractor by any measurement, estimate, or certificate incorrectly made during the course of the Work. The Engineer shall have the right to reject any part of the Work or materials should it be found to be inconsistent with the Contract. The Owner shall not be precluded from recovering from the Contractor and his surety damages for the Contractor's failure to comply with the terms of

the Contract. Neither the inspection by the Owner or the Engineer or any of their officers, employees, agents, or subconsultants, nor any order by the Owner for payment of money, nor any payment for, or acceptance of, the whole or any part of the Project by the Owner or Engineer, nor any extension of time or change order, nor any possession taken by the Owner or its employees, shall operate as a waiver of any provision of this Contract, or any power herein reserved to the Owner, or any right to damages, nor shall any waiver of any breach in this Contract be held to be waiver of any other or subsequent breach. Acceptance or final payment shall not be final and conclusive with regards to rejected Work at any time before or during the warranty period; to latent defects; fraud or such gross mistakes as may amount to fraud; or as regards to the Owner's rights under any warranty.

VII.11 SAFETY AND CONSTRUCTION METHODS

The Contractor at his own expense, shall maintain project and public safety. The Contractor agrees to hold the Owner and Engineers harmless and indemnify them from all claims for damages resulting from construction of the project by the Contractor or Subcontractors, his agents or employees. The Owner and/or Engineers are not responsible for providing the Contractor a safe place to work nor for the safety of any equipment, procedure or material used on construction or incorporated into the work. The Contractor shall be solely responsible for the means and methods of construction and for safety.

The Contract or Owner may sometimes impose limitations or other requirements on the Contractor's sequence of construction. Such limitations or requirements do not constitute control of the Contractor's means or methods, nor relieve the Contractor's responsibility for safety.

When the use of explosives is necessary, the Contractor shall use care to prevent damages to life or property and shall comply with all rules and regulations of the governing authorities. Notwithstanding any other provisions contained in these Contract Documents, and notwithstanding whether any claim alleges negligence, intention or willful injury, absolute liability or any other theory of recovery, Contractor and his surety shall indemnify and hold harmless Owner, its directors, agents and employees, engineer, engineer's consultants, agents and employees, or any of them from and against all claims, damages, losses and expenses, including, but not limited to, attorney's fees, arising out of or resulting from blasting activities, the use, transportation, or storage of explosives generally or any other dangerous material or ultra-hazardous activity. If no local laws or ordinances apply, storage of explosives shall not be closer than 1,000 feet from the road, street, any building or area of public use. Fuel tanks, systems and appurtenances shall be stored and utilized in a way to comply with OSHA and regulatory agencies.

The Contractor, in the prosecution of his work under the Contract, is bound by the requirements of "Safety and Health Regulations for Construction" of the Occupational Safety and Health Administration, U. S. Government Department of Labor, and of other authorities having jurisdiction in safety matters.

Under the terms and conditions of this Contract, the Engineer shall not act as Safety Engineer or Safety Supervisor, since such responsibility remains solely with the Contractor. The Engineer shall not be responsible for establishing safety practices or for prescribing safety measures for the Contractor and his methods of construction.

The Contractor is solely and completely responsible for conditions of the job site, including safety of all persons and property affected directly or indirectly by his operations during the performance of the work; and this requirement is not limited in application to normal working hours, but applies continuously twenty-four (24) hours per day until acceptance of the work by the Owner, and thereafter shall be subject to the terms and conditions of the Guaranty.

The duty of the Engineer is to review the work in order to determine its acceptability in accordance with the Specifications and to conduct construction review of the Contractor's performance for the benefit of the Owner. This shall not be construed as a duty to review the adequacy of the Contractor's safety measures or construction methods on or near the construction site and/or to direct the actions of the Contractor's employees in the performance of the work as such duties are not included among the responsibilities of the Engineer.

VII.12 SANITARY PROVISIONS

The Contractor is responsible for the maintenance of proper sanitary conditions in the area of his work. The provision and maintenance of such sanitary accommodations as may be required for the use of his employees and of his subcontractor's employees is subject to the Rules and Regulations of the State Board of Health and to all local Codes and Ordinances.

VII.13 EXISTING CONSTRUCTION AND FACILITIES

Where construction work under this Contract is adjacent to or crosses highways, railroads, streets, roads, access facilities, or utilities under the jurisdiction of State, County, City or other public agency, public utility or private entity, the Contractor is required to furnish such bond (cash or surety as required), insurance agreement or satisfy any other permit conditions as may be required before executing such construction work. A copy of the bond or insurance agreement (when required) must be filed with the Owner before any work is done. The Contractor is responsible for his means and methods of construction to satisfy the permitting authority and to obtain the desired result as shown within the Contract Documents.

Although the Owner will procure general permits such as those required by highway departments or other utilities to allow the proposed facilities to be installed on public rights of way or privately owned rights of way, it is the responsibility of the Contractor to obtain special or supplemental permits for his means and methods of construction such as blasting permits. However, if and only if the rules and regulations of the agency having jurisdiction over the work will not allow the Contractor or his blasting subcontractor to obtain a blasting permit (but instead require the Owner to obtain the blasting permit as a formality), then the Owner will not withhold from assisting the Contractor with submitting a reasonable blasting permit application (in the Owner's name) provided that the following minimum requirements are understood/met to the full satisfaction of the Owner:

(1) The Owner nor the Engineer in no way suggests or implies that a blasting permit can be obtained for the entire project or any part of the project in the Contractor's name or the Owner's name. The Contractor shall have reviewed the project in its entirety and satisfied himself during bid time that his proposed

means and methods (i.e. blasting) are reasonable and acceptable to the agency having jurisdiction over the work.

(2) The Contractor shall provide written documentation from the agency having jurisdiction over the work stating that the blasting permit cannot be obtained in the Contractor's (or his subcontractor's) name, but instead must be obtained in the Owner's name as a formality.

(3) The request for a blasting permit shall be considered reasonable to the Owner in all respects.

(4) The Contractor, on behalf of the Owner, shall comply with and adhere to all stipulations set forth in the blasting permit agreement and any other requirements set forth by the permitting agency.

(5) Notwithstanding any other provisions contained in these Contract Documents, and notwithstanding whether any claim alleges negligence, intention or willful injury, absolute liability or any other theory of recovery, Contractor shall indemnify and hold harmless Owner, its directors, agents and employees, engineer, engineer's consultants, agents and employees, or any of them from and against all claims, damages, losses and expenses, including, but not limited to, attorney's fees, arising out of or resulting from blasting activities, the use, transportation, or storage of explosives generally or any other dangerous material or ultra-hazardous activity.

(6) The Contractor shall be fully responsible for preparing and providing all permit applications, all necessary documentation, maps, sketches, additional insurance, bonds, indemnifications, etc. as may be required by the permitting agency and/or Owner to obtain the blasting permit. If required by the Owner, the Contractor shall furnish special Protective Public Liability and Property Damage Insurance in an amount specified.

(7) The Contractor shall be fully responsible for all costs resulting from special or supplemental permits for his means and methods of construction such as blasting permits.

(8) The Contractor shall execute any supplemental agreements or amendments to the Contract Documents that may be required to fully satisfy the Owner regarding the Contractor's complete responsibility and overall liability for the blasting operations.

(9) The Contractor shall perform pre-blast surveys, seismograph testing, and any other activity required to ensure no damage to surrounding property. When

required by the Owner, the Contractor shall submit a complete blasting plan sealed by a professional engineer in the state where the work is to be performed.

(10) The Contractor shall only employ experienced blasting professionals to perform the pre-blast surveys, seismograph testing, blasting plans, and all other activities associated with the blasting operations. The Contractor shall provide the resumes of the companies and individuals actually performing the pre-blasting and blasting activities when requested by the Owner.

(11) The Contractor shall be fully responsible for the replacement and/or repair of all existing construction, utilities, or facilities damaged in the execution of work under this Contract.

(12) The Contractor shall furnish releases from all authorities affected by the work before final acceptance of the work under this Contract.

(13) The coordination, timing, and the overall schedule of the permitting process shall be the full responsibility of the Contractor to ensure all work is completed within the allotted Contract Time set forth in the Special Provisions. Any permitting activities requiring the Owner's participation shall be coordinated well in advance by the Contractor and sufficient time shall be allotted for such activities.

SECTION VIII
PROSECUTION AND PROGRESS

VIII.1 SUBLETTING OR ASSIGNING OF CONTRACT

The Contractor shall perform the Contract under his direction and responsibility. A Subcontractor shall be recognized only as an employee or agent of the Contractor and his removal may be required by the Owner.

VIII.2 PROSECUTION OF WORK

The Contractor shall begin the Work under the Contract within ten (10) calendar days after issuance of the Notice to Proceed. He shall give the Engineers notice to start work at least seventy-two (72) hours before beginning work. The Contractor shall notify the Engineers twenty-four (24) hours before he expects to undertake particular construction or testing.

Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work. The Contractor shall employ an ample force and provide adequate construction equipment to insure its completion within the Contract time. The Contractor shall properly plan, coordinate, and schedule all work to insure completion within the Contract Time.

All work shall receive the personal attention of the Contractor or of a competent superintendent who shall have authority to act for him. The Contractor shall notify the Engineers of the person authorized to act as superintendent. The Contractor shall have his superintendent on site at all times when work is being performed. The superintendent shall be a full time employee of the general contractor and not of a subcontractor. Any employee of the Contractor or Subcontractor found by the Owner to be incompetent, shall be dismissed from the work.

The Contractor shall utilize the same suppliers, equipment manufacturers, and subcontractors as he listed in the bidding documents that he submitted with his bid. The Contractor shall be fully responsible for all work and safety practices of all his subcontractors.

To coordinate work to be accomplished with affected entities, a progress meeting will be held periodically at the project site. The progress meeting will be held on Fridays and will be attended by the Engineer's inspector, Owner's representative, Contractor's superintendent, Contractor's project manager from his home office, affected subcontractor(s), and other parties who may be invited. The Owner reserves the right to establish the time of the meeting, change frequency of meetings, change meeting days, or to cancel the meeting.

Prior to starting up any equipment, the Contractor shall insure that all tanks, piping, and equipment, etc., are thoroughly cleaned of any debris or substances that may cause damage. The Contractor shall be fully responsible for all startups. He shall insure that all operations are in accordance with the manufacturer's recommendations. If certain equipment is not to be operated or is to operate only under special procedures, the Contractor shall be fully responsible for insuring that such procedures are carefully followed. The Contractor shall lock out (with his own locks) and tag out breakers, controls, equipment, valves, and gates, etc., where needed to prevent unintended operation by others. The Contractor shall clearly communicate any special operating instructions to the Owner and Engineer in writing.

Color Selection Conference: Prior to the selection by the Owner of any colors (including but not limited to colors of paint, block, brick, mortar, louvers, soffit, gutters, roofing, doors, windows, furniture, counters, cabinets, molding, lighting, and all other materials or equipment to be provided by the Contractor), the Contractor shall furnish triplicate samples of all colors to be selected. After review of the colors by the Owner and Engineer, a conference shall be held to be attended by the Contractor, Owner, and Engineer for the Owner to make his selections. One of the samples shall be retained by the Owner, one by the Engineer, and the third by the Contractor.

The Contractor shall cooperate with the Engineer and keep him informed regarding all planned short-term and long-term activities. This includes but is not limited to all startup and testing, etc., issues. The Contractor shall notify the Engineer in advance of all such activities so that the Engineer may observe these if he desires. The Contractor shall provide the Engineer with copies of all manufacturer startup and testing reports, etc.

If changes are made on the project to accommodate the Contractor's requests, the Contractor shall be solely responsible for all associated changes, including but not limited to electrical, control, instrumentation, and SCADA changes. He shall make all such changes at his own expense to maintain the same functionality, flexibility, expandability, and redundancy etc. as provided by the original design. There shall be no extra time awarded due to agreeing to the Contractor's request.

Provide copies of all manufacturer or manufacturer representative, etc. site visit reports, startup reports, test reports, and all other manufacturer or installer reports (including but not limited to troubleshooting or service reports) to the Engineer promptly after the action occurs. If problems occur after startup or during the warranty period, and a service visit or repair, etc., is needed, the Contractor shall promptly provide to both the Engineer and Owner a written report from the service provider describing the problem and the corrective actions taken.

The Contractor shall provide temporary power and temporary utilities as needed to construct the project. All power costs and utility costs, including those for testing, shall be the responsibility of the Contractor until the Owner accepts the project or, at the Owner's discretion, begins beneficial use of the project. Regardless, the Contractor shall be responsible for extra utility costs incurred by or billed to the Owner due to the Contractor's activities or non-compliance with the Contract, or late completion.

It shall be the responsibility solely of the Contractor to properly prosecute all works in a safe manner that fully and continuously protects all people at the site(s) as well as the public. Neither the Owner or the Engineer are responsible for safety. Only the Contractor has the authority to control his work and to implement safe work practices.

VIII.3 TEMPORARY SUSPENSION OF WORK

The Owner shall have the authority to suspend the Work or parts for periods due to unsuitable weather or conditions which he considers unfavorable for satisfactory prosecution of Work, or for failure of the Contractor to perform any provisions of the Contract. No additional compensation shall be paid the Contractor for suspension. Upon suspension, the Work shall be properly protected. The Contractor shall not suspend the Work without the approval of the Owner. The Engineer will be notified twenty-four (24) hours before work is to be resumed.

Should the Work be stopped by an injunction, court restraining order, process or judgment directed to either of the parties hereto, then such delay shall not be charged against the Contract time. The Owner will not be liable to the Contractor for such delay or termination of the Work. If it should become necessary to stop work, the Contractor shall properly store materials and equipment, and properly protect the Work.

VIII.4 USE OF COMPLETED PORTIONS OF THE WORK

The Owner shall have the right to take possession of and use any completed or partially completed portion of the work, notwithstanding that the time for completing the entire work or such portions of the work may not have expired; but such taking possession and use shall not be deemed to be acceptance or substantial completion of any work not completed in accordance with the Plans, Specifications, and Contract Documents.

VIII.5 SATURDAY, SUNDAY, HOLIDAY, AND NIGHT WORK

Work on Saturdays, Sundays, Holidays, or at night may be required when special connections to existing systems are to be made, when new facilities are to be placed in service, when existing facilities are to be taken out of service, when it is more advantageous to the utilities involved, or when an emergency arises in the work schedule. In such cases the

Owner must be notified prior to beginning work. The work should be scheduled well in advance and arrangements made for prosecution of the work with minimum inconvenience to the public. All work required on Saturdays, Sundays, Holidays, or at night shall be so performed without additional expense to the Owner. Maintenance work normally required for protection of persons, or for protection of the work or property, will be permitted at any time. No equipment or system where controls or any other complicated processes are involved shall be place in service on Friday, Saturday, Sunday, observed Holidays, or any day before observed Holidays without the consent of the Owner.

VIII.6 CONSTRUCTION SCHEDULE

The Contractor is instructed to submit to the Engineer, prior to initiating the work but not later than ten (10) days after the execution of the Contract, a schedule of construction operations so planned as to ensure completion of the work within the time limit specified in the Proposal and in the Contract Agreement. The maintenance of such schedule in order to fulfill the terms of the Contract Agreement is the responsibility of the Contractor, and he may employ such reasonable and proper measures, subject to other conditions of these Documents, as he deems to be required to expedite the work and to ensure that it will be fully and satisfactorily completed within the stated time limit. The Contractor shall not be allowed additional compensation for employment of such measures.

The Contractor shall show in the schedule the proposed dates of commencement, completion, and cost (if cost was not delineated in Basis of Payment) of the various subdivisions of work comprising the project, and also shall show in the schedule the estimated amount of each monthly payment (periodic estimate) that will become due to the Contractor as he maintains the progress schedule prepared by him.

VIII.7 AVOIDANCE OF POLLUTION CONTRIBUTION DURING CONSTRUCTION OPERATIONS

The employment of all safeguards and all precautions necessary to minimize contributions of pollution to water courses during the construction operations is the responsibility of the Contractor. The proper performance of excavating and backfilling operations, the interception and diversion of surface drainage around excavated areas or areas having the soil cover disturbed, the construction of temporary terraces or dikes, and the use of silt fences or other silt retaining means will be necessary to prevent concentration of run-off over freshly excavated or backfilled areas and to minimize stream pollution resulting from soil transported in run-off from the construction site. At the conclusion of the work, and after all temporary facilities have been removed, all areas disturbed by construction operations shall be restored to as good a condition as when found, or to condition as may be specified for the particular area. The Contractor shall comply with all ADEM and EPA laws, regulations, guidelines, and permits, etc.

VIII.8 USE OF CHEMICALS

All chemicals used during construction of the project or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reagent, or of other classification, must show approval of EPA, USDA, or FDA, according to the purposes for

which the particular chemical is to be used. Application of all such chemicals and disposal of residues therefrom are dependent upon the instructions and recommendations of the manufacturer's of the respective chemicals.

VIII.9 COMPLETION DATE AND LIQUIDATED DAMAGES

The Owner will issue a Notice to Proceed to the Contractor. The Notice to Proceed will state the date upon which work shall start, and the Contractor will then be allowed the number of calendar days shown in the Special Provisions to totally complete all work. Liquidated Damages shall be as indicated in Special Provisions.

The Contractor shall proceed expeditiously with adequate forces and shall achieve final acceptance of all Work within the Contract Time. If the Contractor is unavoidably and directly delayed in progress of the Work by unpredictable circumstances created by a separate contractor employed by the Owner; by changes ordered in the Work; by unavoidable casualties; or by delay authorized by the Owner, then the Contract Time may be extended by Change Order for such reasonable time as the Owner may determine. The Contractor shall not be entitled to any reparation or compensation on account of such additional time or extension of time. Change to specific work element may only constitute an increase time for that work element and may not necessarily increase the time for the entire project. Time extension will be allowed only if the justifiable delay directly affects the Contractor's schedule for the entire project. In such case, the time extension shall be only for the direct extra time required due to the change itself. No extra time shall be allowed for the Contractor's failure to address the change and perform the extra work in the most expeditious manner possible. In all cases, the Contractor shall properly plan and fully perform his work in a manner to minimize any extra time required. If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated and that weather conditions had an adverse effect on the scheduled construction. (See Special Provisions).

VIII.10 DEFAULT OF CONTRACT

If the Contractor fails to begin the Work within the time provided, or to perform the Work to insure its completion in the time allowed 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 if it should persistently or repeatedly refuse or fail to supply enough properly skilled workmen or if it should refuse or fail to make prompt payment to persons supplying labor or materials for the Project under the Contract, or persistently disregard instructions of the Engineer or Owner or fail to observe or perform any provisions of the Contract Documents, or fail or otherwise be guilty of a substantial violation of any provision of the Contract Documents, or discontinues the prosecution of the Work for any other cause whatsoever, or does not carry on the Work for any other cause whatsoever, or does not carry on the Work in an acceptable manner, or becomes insolvent or is adjudicated a bankrupt, or commits any act of bankruptcy or insolvency, or allows any final judgment to stand against him unsatisfied for a period of ten (10) days, the Owner may give notice by registered mail to the Contractor and Surety, of such default. If within ten (10) days after

notice the Contractor does not remedy or the Surety does not take over the work, the Owner shall have authority, without impairing the obligation of the Contract Bonds, to take over the completion of the Work. If the Contractor or Surety does not substantially begin Work and remedy the default after the ten (10) day period, the Owner shall not be obligated to make further payment to the Contractor, including any amounts which may be due for previously performed Work, if he was diligently pursing the Work. The Contractor and his Surety shall be liable for all costs incurred by the Owner including but by no means limited to construction, administration, legal, and engineering, in completing the Work and all liquidated damages. In case the expense incurred by the Owner is less than the sum payable under the Contract, the Contractor or his Surety shall be entitled to receive the difference. In case the expense exceeds the sum payable under the Contract, the Contractor and his Surety shall be liable to the Owner in the amount of the excess. The surety shall assume all warranties required by the Contract Documents whether work is performed by defaulting contractor or contractors which complete the project.

VIII.11 OWNER MAY TERMINATE FOR CONVENIENCE

Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):

1) for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2) for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3) for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects. attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4) for reasonable expenses directly attributable to termination.

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

VIII.12 PAYMENTS ON ACCOUNT/PAYMENTS WITHHELD/RETAINAGE

Provide a complete and detailed schedule of values to the Engineer in a timely manner prior to the 1st payment request. The schedule of values shall be patterned after the bid items in the Contract but much more detailed. This schedule shall be in a format with breakdowns and amounts, etc., acceptable to the Owner. The schedule of values shall be revised until it is satisfactory to the Owner. The Owner shall not be required to make or continue payments until the Schedule of Values is acceptable to the Owner. The submittal of this schedule of values by the Contractor shall act as a certification by the Contractor that the

values reflect the total cost such that the cost associated with unperformed work items is sufficient to fully complete the work. Provide an explanation with the schedule of values explaining what work is included in each item. The schedule of values and pay request shall be revised whenever it appears that the monies remaining to be paid may not be sufficient to cover the entire cost (including overhead and profit, etc.) of the remaining work. This may result in deduction being made from items previously paid for.

Upon presentation of a verified application for payment, as the Work progresses, the Owner shall make partial payments (generally monthly) to the Contractor for the billable work performed less payments already made and less deductions for any incomplete, unacceptable, or defective work. The Contractor shall include neatly organized backup data and detailed calculations fully supporting all the items in his pay request. All such information shall be arranged in a manner required by the Engineer. The required format may vary as the project progresses. Also include totals and percentages for both total work performed to date and work remaining after the current pay request. On relocation projects reimbursable by the Alabama Department of Transportation, application for payment will be submitted by the Owner to the Alabama Department of Transportation. When reimbursement funds are received by the Owner from the State, payment will be made to the Contractor. In making partial payments to the Contractor, there shall be retained five (5%) percent of the estimated amount of work done and value of materials suitably stored on the site or suitably stored and insured offsite (offsite storage must be approved). Provided, however, after fifty (50%) percent of the project has been satisfactorily completed, no further retainage will be withheld. The calculation of percent completed shall be based on the value of work actually in place and agreed upon by the Engineer. The value of stored materials shall not be considered in the calculation of percent completed. Submittals must be approved and all comments addressed to the satisfaction of the Engineer before any payment is made on the items the submittal addresses.

The Contractor will be paid only for items listed in the "Items of Work". The Contractor shall include the cost of any and all work required, but not specifically listed, in the cost of the items listed. The Contractor shall include in the Contract Sum all allowances stated in the Contractor Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, or the Contractor chooses. Unless otherwise provided in the Contract Documents, allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts. The Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances. Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order.

The Contractor's submittal of an Application for Payment (that is, a request for payment) shall be a certification by the Contractor that he is familiar with the work performed, has inspected the work performed, certifies that all work billed for on the current and previous applications has been completed in accordance with all the requirements of the Contract, and certifies that the status of completion indicated is accurate and that the amounts requested for payment are accurate. The Application for Payment shall be the Contractor's certification (1)

that all work billed for has been properly completed to the percentage or amount shown, and (2) that all work billed for complies fully with all requirements of the plans and specifications.

The Contractor further warrants that upon submittal of an Application for Payment, all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work. Such applications shall not include requests for payment of amounts the Contractor does not intend to pay or has not paid, where applicable to a Subcontractor or material supplier because of a dispute or for any other reason. When requested, the Contractor shall promptly provide the Engineer proof of payments made. The proof shall be a certified statement from the subcontractor or material supplier showing the invoice amounts and the amount actually received for the project. Retainage or other amounts to be paid later shall not be included in the amounts paid. The proof of payment shall be clearly stated and acceptable to the Engineer.

The issuance of a Certificate for Payment will constitute a representation by the Engineer to the Owner, based on the Engineer's observations at the site and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Engineer's knowledge, information and belief, quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon completion; to results of subsequent tests and inspections; to minor deviations from the Contract Documents correctable prior to completion; and to specific qualifications expressed by the Engineer. The issuance of a Certificate for Payment will further constitute a representation that the Contractors is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Engineer has (1) made exhaustive or continuous inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor' right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

The Engineer may decide not to certify payment and may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Engineer's opinions the representations to the Owner required above cannot be made. If the Engineer is unable to certify payment in the amount of the Application, the Engineer will notify the Contractor and Owner. If the Contractor and Engineer cannot agree on a revised amount, the Engineer will issue a Certificate for Payment for the amount for which the Engineer is able to make such representations to the Owner. If the Contractor feels that he is entitled to be paid more, he shall promptly provide to the Engineer detailed and complete documentation demonstrating that he has earned the amounts he requested and that sufficient monies remain to be paid to fully complete all the requirements of the plans and specifications.

Retainage may be held by the Owner until final completion and acceptance of all work covered by the Contract Documents. No other escrow or deposit arrangements are

acceptable to the Owner. When maintenance periods are included in the Contract Documents, such period shall be considered a component part of the Contract and retainage will be held until the expiration of such periods.

Unless specified otherwise in the Basis of Payment, separate structures or buildings, public work, or other separately identifiable divisions of the Contract in regard to which a separate price has been stated in the Contract Documents or can be separately ascertained, are integral parts of the complete project, and the Owner will not release retainage or make payment in full or separate divisions even though that part of the project may be complete, accepted, and in full service until the entire project and all components thereof have been completed, tested, accepted, and are in satisfactory service.

All materials and work covered by partial payments as provided for herein shall become the sole property of the Owner; provided, however, the Contractor shall not be relieved from the sole responsibility for the care and protection of materials, equipment, and work upon which payments have been made and for the restoration of any damaged work.

When work has been determined to be unacceptable, the Owner may at any time deduct the full cost, as estimated by the Engineer, of removing the unacceptable work and replacing it with work fully meeting the requirements of the Contract. The Owner may at any time refuse to pay for any work that will be affected by the removal and replacement of unacceptable work. The Owner shall not be required to pay for, or may at any time, deduct the full cost of removal and replacement, of all affected work that is dependent on or supported by or connected to, etc., unacceptable work or work not demonstrated to be in full compliance with all Contract requirements.

When requested, the Contractor shall promptly provide full support and detailed documentation clearly showing (1) that the amounts previously paid and currently being requested are justified, and (2) that sufficient monies remain for fully completing all work items of concern. There shall be no obligation for the Engineer to approve a payment amount requested if the Contractor does not acceptably demonstrate that the item (including any associated remedial work) can be totally completed per all Contract requirements for the amount remaining. In addition to retainage, additional amounts will be withheld for start-up, testing, cleanup, grassing, price adjustments, etc., and any and all other required work until all such work is totally complete in all respects. The Contractor shall not receive full payment for a work item until it is totally complete in all respects. Payment for an item shall not preclude later withholding for that item if it is determined that the payment should not have been made or if a problem develops with the work previously paid for. In addition, the Owner may also withhold payment of the whole or any part of a verified or approved application for payment from the Contractor to such an extent as may be necessary to protect itself from loss on account of any of the following causes discovered subsequent to its verification or approvals:

1) Defective work.

2) Evidence indicating probable filing of claims by other parties against the Contractor.

3) Failure of the Contractor or subcontractor to promptly make payments to subcontractors or for materials, labor, food stuffs and supplies.

4) Damage to another contractor under separate contract with the Owner.

5) Assessment of liquidated damages or fines, fees, etc.

6) Overestimated quantities or percent completion from previous estimates.

7) Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum.

8) Reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay.

9) Persistent failure to carry out the Work in accordance with the Contract Documents.

When the above grounds are removed, applications for payment will then be verified and/or approved for amounts not previously verified and approved because of them.

VIII.13 NO DAMAGE FOR DELAY

If the Contractor is delayed, hindered, or impeded at any time in the progress of the Work for any reason or by any alleged act or neglect of the Owner, or the Engineer, or by an employee of any of them or by a separate vendor, manufacturer or Contractor employed by the Owner, or by changes ordered in the scope of the Work, or by other causes beyond the Contractor's control, then the Contract Time may be extended at the sole discretion of the Owner by Change Order for such reasonable time as is agreed to by the Owner. However, notwithstanding any other provisions in the Contract Documents, and whether contemplated or not, and whether or not arising by active interference; the Owner, Engineer, and their respective agents and employees shall not be liable for any damages for delay whether for direct or indirect costs, extended home office overhead, idle or inefficient labor or equipment, cost escalations, or monetary claims of any nature arising from or attributable to delay by any cause whatsoever. The Contractor's sole and exclusive right and remedy for delay by any cause whatsoever is an extension of the Contract Time but no increase in the Contract Sum.

SECTION IX
PROJECT COMPLETION

IX.1 SUBSTANTIAL COMPLETION

"Substantial completion" shall be that degree of completion of the entire Project, unless otherwise provided for, as evidenced by the Engineer's written notice of substantial completion, sufficient to provide the Owner, at its discretion, the full-time use of the work or defined portion of the work for the purposes for which it was intended. "Substantial completion" of a Project shall be that degree of completion that has provided a minimum of 7 continuous days of successful, trouble-free operation of the entire project facilities in a "fully automatic" manner acceptable to the Owner and Engineer and with all redundant and alternative systems fully operational. The Contractor shall demonstrate that all features of the project function properly and reliably in the intended mode during this seven-day period in order for the project to be considered eligible for substantial completion. All alternative modes of operation and flexibility must be demonstrated during this period. All equipment contained in the Project, plus all other components required in the Plans and

Contract Documents to enable the Owner to operate the project facilities in the manner that was intended, shall be complete on the substantial completion date. The Project herein described is a complete Project in its entirety and shall include clean-up and other aesthetically pleasing requirements of the project. Completion of individual components of the Project cannot be considered for substantial completion until the sum total of these components are complete and thus, the components when operating properly will provide the Owner with a complete Project.

When the Contractor considers that the Project is substantially complete, the Contractor shall carefully review all requirements of the plans and specifications, carefully compare the work completed to the work required, and prepare and submit to the Engineer a detailed, complete list of all items to be completed or corrected and request an inspection for substantial completion. The Contractor shall not misrepresent the work as substantially complete when a limited investigation indicates that the work is not substantially complete. The failure by the Contractor to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents. After inspection and/or if an operating facility, after a minimum of seven continuous days of successful, trouble-free operation has been achieved during startup, the Engineer may, at his sole discretion, issue a written notice of substantial completion for the purpose of establishing the starting date for specific equipment guarantees or warranties, and to establish the date the Owner will assume the responsibility for the cost of operating such equipment.

Said notice shall not be considered as final acceptance of any portion of the Project or relieve the Contractor from completing the remaining work, including any remaining performance or acceptance testing, within the specified time and in full compliance with the Contract Documents. Specifically, the issuance of a written notice of substantial completion shall not relieve the Contractor of his obligation to promptly remedy any omissions and latent or unnoticed defects in the Project covered by the written notice of substantial completion.

IX.2 FINAL INSPECTION

After the Contractor properly completes all work on his detailed list of items to be completed or corrected, he shall again carefully review all requirements of the plans and specifications and carefully compare the work completed to the work required by the plans and specifications. He shall complete any work not completed in accordance with the plans and specifications, as well as any other required work that may be brought to his attention by others. When all work is complete, the Contractor shall notify the Engineer and Owner that his work is complete. The Contractor shall not misrepresent the work as complete when a limited investigation indicates that the work is not complete.

Upon notice from the Contractor that its work is complete, the Engineer and/or other representatives of the Owner shall make a final inspection of the Work or Project and conduct test or tests, if applicable. The Engineer shall notify the Contractor of all apparent and/or visible instances where the Project fails to comply with the Plans and Specifications and Contract Documents, as well as any defects he may discover (punch list). The Contractor shall immediately make such alterations as are necessary to make the Project comply with the Plans and Specifications and to the satisfaction of the Engineer.

Verification, approval, inspection, final inspection, issuance of final acceptance, issuance of final certificate of payment, action or approval by the Owner upon the final certificate of payment or final acceptance shall not in any way relieve the Contractor of responsibility for faulty materials or workmanship.

IX.3 FINAL PAYMENT

When the Contractor shall have completed all of the work in accordance with the terms of the Contract Documents, he shall certify to the Owner that he has completed all of the work. The Contractor shall also prepare and submit to the Owner a Final Request for Payment in an amount which shall be the Contract Amount plus all approved additions, less all approved deductions and less previous payments made. The Contractor shall give "Notice" of the completion of the work by an advertisement in a newspaper of general circulation published within the City or County in which the work has been done, for a period of four successive weeks. A final payment shall not be made upon the Contract until the expiration of 30 days after the completion of the "Notice". Proof of publication of the "Notice" shall be made by the Contractor to the authority by whom the Contract was made by affidavit of the publisher and a printed copy of the "Notice" published. If no newspaper is published in the County in which the work is done, the "Notice" may be given by posting at the courthouse for 30 days, a proof of same shall be made by the judge of probate, sheriff, and the Contractor.

When the Owner and the Engineer have completed a review of the Work and of the request for final payment and accepted all work, final payment of the amount determined to be due under the Contract will be made to the Contractor, provided that:

(1) Any deficiencies in the Work noted during the review shall have been satisfactorily corrected.

(2) The Contractor shall have submitted certified evidence that all payrolls, all amounts due for labor and materials, and all other indebtedness connected with the work have been fully paid and satisfied, and that there are no outstanding claims or demands against the Contractor in any manner connected with the work.

(3) Proof of publication of "Notice" of completion in newspaper in manner described by law.

(4) A properly executed and duly certified voucher for payment, verified by Engineer or other representative.

(5) A release of all claims and claims of lien against the Owner and its agents and Engineer from the Contractor and all major subcontractors (the Owner may waive the requirement for subcontractor releases) arising under and by virtue of the Contract, on form provided by the Owner, duly executed by the Contractor and with the consent of the Surety. The Contractor may specifically exclude claims of the Contractor from the operation of the release if specifically excluded therefrom in stated amounts and the reason therefore. The Contractor may with the consent of the Owner representative, if any subcontractor refuses to furnish such a release, furnish a bond with surety satisfactory to the Owner representative to indemnify against such claims.

(6) In accordance with ALA.CODE §39-2-12(c), a non-resident Contractor

shall satisfy the Owner that he or she has paid all taxes due and payable to the State, the Owner and all applicable political subdivisions.

Upon Project completion and acceptance by the Owner's representatives, but not before the expiration of thirty (30) days after completion of the "Notice", the amount due the Contractor pursuant to the Contract Documents shall be paid. On relocation projects reimbursable by the Alabama Department of Transportation, application for payment may be submitted by the Owner to the Alabama Department of Transportation. When reimbursement funds are received by the Owner from the State, payment will be made to the Contractor.

IX.4 ACCEPTANCE OF FINAL PAYMENT CONSTITUTES RELEASE

The acceptance by the Contractor of the final payment shall release the Owner, the Engineer, as representatives of the Owner, and their officers, employees, agents, and subconsultants from all claims and all liability to the Contractor for all things done or furnished in connection with the Project, and every act of the Owner and others relating to or arising out of the work. No payment, however, final or otherwise, shall operate to release the Contractor or his Sureties from obligations under this Contract and the Performance Bond, Payment Bond, and other bonds, warranties and guarantees as herein provided.

SECTION X
WARRANTY AND GUARANTEES

X.1 WARRANTY AND GUARANTEE

The Contractor warrants to the Owner and the Engineer that all materials, work, and equipment furnished under this Contract will be new unless otherwise specified and that all work, materials and equipment will be of good quality, free from fault and defects in conformance with the Contract Documents. All work, materials, and equipment not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The warranty shall be for one year from the date of the Final Acceptance or the date of Substantial Completion of the full Project completed in its entirety, whichever is first. If within one (1) year from the beginning date of the warranty period, any of the work, materials or equipment is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so. This warranty includes all equipment even if the specific equipment warranty from the equipment manufacturer has expired. This obligation shall survive termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

If the Project involves a roof on a building or other structure, then the Contractor shall execute and provide the Roofing Guarantee. The guarantee shall be delivered to the Owner and Engineer prior to final payment. If the Project involves termite treatment, the Contractor shall furnish to the Owner a written warranty certifying that the applied soil poisoning treatment will prevent the infestation of subterranean termites and that if subterranean termite activity is discovered during the warranty period, Contractor shall re-treat the soil and repair or replace any damage caused by termite infestation. The warranty shall be for a period of five (5) years from the date of treatment signed by Applicator and Contractor.

X.2 CORRECTION OF DEFECTIVE WORK DURING WARRANTY/ GUARANTEE PERIOD

The Contractor hereby agrees to make, at his own expense, all repairs or replacements necessitated by defects in materials or workmanship, provided under the terms of this Contract, and pay for any damage to other works resulting from such defects, which become evident within 1 year after the beginning date of the warranty period by the terms of any applicable special guarantee required by the Contract Documents unless the Owner has previously given the Contractor a written acceptance of such defects. The Contractor shall promptly correct such defects upon receipt of a written notice from the Owner to do so. This obligation shall survive the termination of the Contract.

Unremedied defects identified for correction during the warranty period described herein before, but remaining after its expiration, shall be considered as part of the obligations of the warranty. Defects in material, workmanship, or equipment which are remedied as a result of obligations of the warranty shall subject the remedied portion of the Project to an extended warranty period of 1 year after the defect has been remedied. Repetitive malfunction of equipment shall be cause for equipment replacement and an extension of the guarantee period for the equipment to a date 1 year following acceptable replacement. The Contractor further assumes responsibility for a similar guarantee for all work and materials provided by subcontractors or manufacturers of packaged equipment components.

The Contractor also agrees to hold the Owner and the Engineer and employees harmless from liability or damages, including the Engineer and attorneys' fees, and cost and expenses of litigation of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written order for same from the Owner or its agent. If the Contractor fails to make the repairs and replacements promptly, or in an emergency where delay would cause serious risk, or loss, or damage, the Owner may have the defective work corrected or the rejected work removed and replaced, and the Contractor and his Surety shall be liable for the cost thereof. The Contractor during the warranty period shall repair/replace as rapidly as possible any and all equipments, materials, etc., which are found to be defective. Should any items not be repaired/replaced within thirty (30) days from the time it is reported to the Contractor by the Owner, then the warranty period shall be extended on that item for a period equal to the time that the item has remained defective, incomplete, or inoperable as determined by the Owner. The Contractor must certify that the item has been corrected. The Owner's rights under this Article shall be in addition to, and not a limitation of, any other rights and remedies available by law.

Nothing contained in this Section shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one year as described in this Section relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

SRF SUPPLEMENTAL GENERAL CONDITIONS

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: CS010329-05

Table of Contents:

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)

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: AL20230069 01/06/2023

Superseded General Decision Number: AL20220069

State: Alabama

Construction Type: Heavy
Including Water and Sewer Line Construction

Counties: Chambers, Cherokee, Clay, Cleburne, Coosa, Jackson, Randolph, Talladega and Tallapoosa Counties in Alabama.

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)(2)-(60).

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 $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
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 $12.15 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 2023.

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	01/06/2023

ENGI0312-009 09/01/2011

	Rates	Fringes
Operating Engineers:		
Crane and Cherry Picker	$ 25.90	10.65
Oiler	$ 22.83	10.65

Cranes with 100 ft. or more boom receive $0.25 extra per hour,
Cranes with 200 ft. or more boom receive $0.50 extra per hour,
Cranes with 350 ft. or more boom recieve $1.10 extra per hour,
Cranes with 500 ft. or more boom receive $1.45 extra per hour,
Tower Cranes, Derricks, Climbing Cranes, Ringer Cranes shall receive $0.35 in addition to A-rate and boom pay per hour

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SUAL2007-154 11/28/2007

	Rates	Fringes
ELECTRICIAN	$ 15.96 **	3.57
LABORER: Common or General	$ 8.54 **	0.00
LABORER: Pipelayer	$ 10.13 **	0.00
OPERATOR: Backhoe	$ 13.46 **	0.00
OPERATOR: Bulldozer	$ 16.60	2.64
OPERATOR: Drill	$ 9.50 **	2.36
OPERATOR: Grader/Blade	$ 12.59 **	1.33
OPERATOR: Loader (Front End)	$ 11.67 **	0.00
OPERATOR: Roller	$ 9.45 **	0.00
OPERATOR: Scraper	$ 9.78 **	0.18
OPERATOR: Trackhoe	$ 12.00 **	0.00
TRUCK DRIVER	$ 15.70 **	5.86

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 ($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

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) (ii)).

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

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

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

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

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

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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

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

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

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

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

"General Decision Number: AL20230144 01/06/2023

Superseded General Decision Number: AL20220144

State: Alabama

Construction Type: Highway

Counties: Chambers, Cherokee, Clay, Coosa and Tallapoosa Counties in Alabama.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

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)(2)-(60).

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 $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
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 $12.15 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 2023.

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 | 01/06/2023

SUAL2019-023 11/13/2019

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 16.88	0.00
ELECTRICIAN	$ 20.41	7.49
FORM WORKER	$ 15.19 **	0.00
HIGHWAY/PARKING LOT STRIPING: Laborer	$ 11.86 **	0.00
HIGHWAY/PARKING LOT STRIPING: Operator (Striping Machine)	$ 19.72	0.00
IRONWORKER, REINFORCING	$ 16.71	0.00
LABORER GRADE CHECKER	$ 15.89 **	0.00
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor	$ 12.28 **	0.00
LABORER: Common or General	$ 11.52 **	0.00
LABORER: Mason Tender - Cement/Concrete	$ 13.32 **	0.00
LABORER: Erosion Control	$ 10.46 **	0.00
OPERATOR: Asphalt Spreader	$ 14.87 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 16.80	0.00
OPERATOR: Broom/Sweeper	$ 12.50 **	0.00
OPERATOR: Bulldozer	$ 15.32 **	0.00
OPERATOR: Crane	$ 24.02	0.00
OPERATOR: Distributor	$ 15.22 **	0.00
OPERATOR: Grader/Blade	$ 18.16	0.00
OPERATOR: Loader	$ 14.28 **	0.00
OPERATOR: Mechanic	$ 17.37	0.00
OPERATOR: Milling Machine	$ 16.51	0.00
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 16.02 **	0.00
OPERATOR: Roller	$ 14.00 **	0.00
OPERATOR: Tractor	$ 17.14	0.00
TRAFFIC CONTROL: Flagger	$ 13.39 **	0.00
TRAFFIC CONTROL: Laborer-Cones/		

Barricades/Barrels -
Setter/Mover/Sweeper.....$ 12.93 ** 0.00

TRUCK DRIVER: Dump Truck.....$ 14.42 ** 0.00

TRUCK DRIVER: Flatbed Truck.....$ 15.72 ** 0.00

TRUCK DRIVER: Lowboy Truck.....$ 15.88 ** 0.00

TRUCK DRIVER: Water Truck.....$ 12.95 ** 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 ($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

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) (ii)).

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

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the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

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Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

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

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests

for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

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

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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

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

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

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

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

XVI – American Iron and Steel Requirement

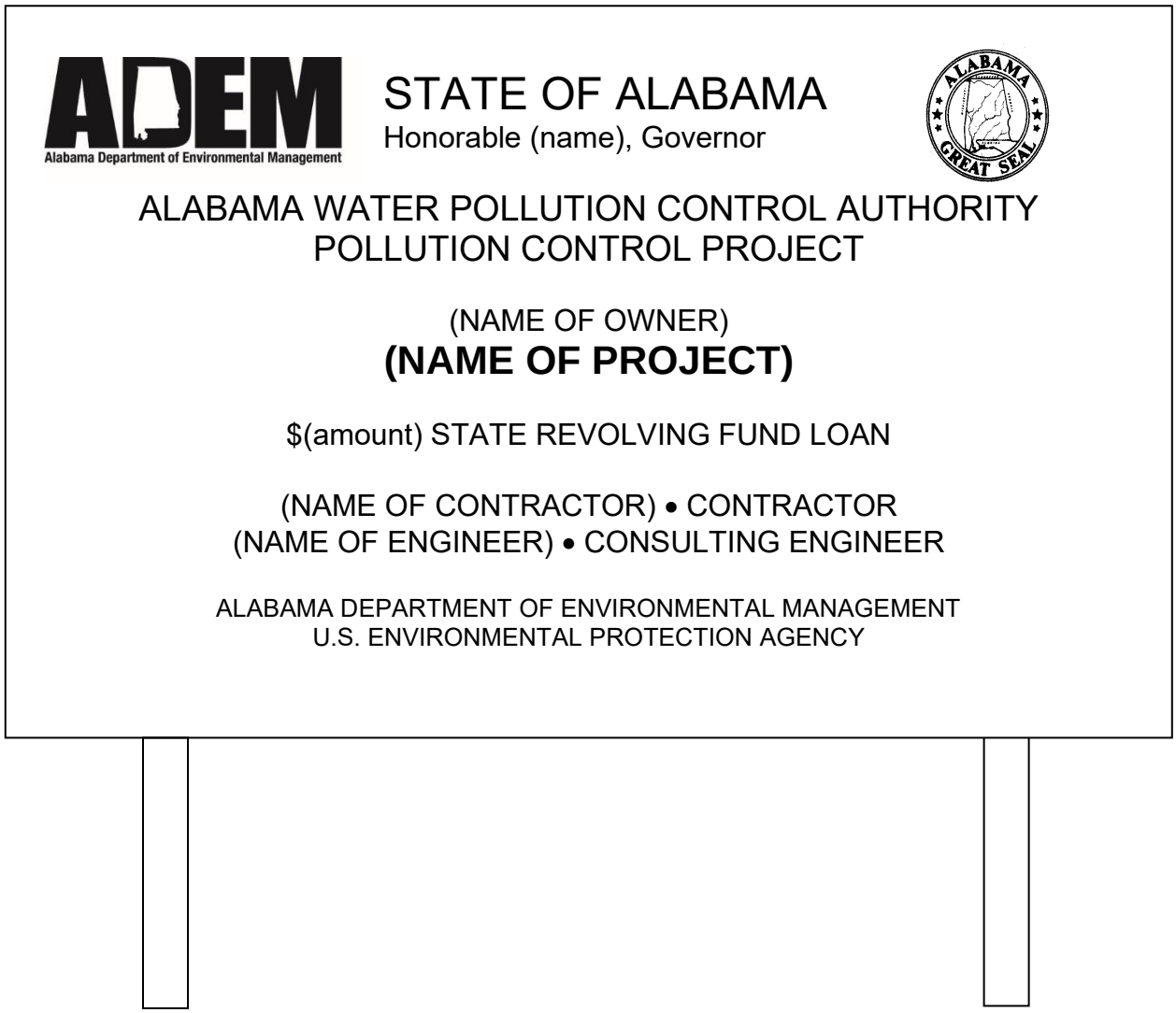
Section 4.13 Compliance with 2014 Appropriations Act. (a) The Loan Recipient agrees to comply with all federal requirements applicable to the Authority Loan (including those imposed by P.L. 113-76, Consolidated Appropriations Act (the "2014 Appropriations Act") and related SRF Policy Guidelines) which 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

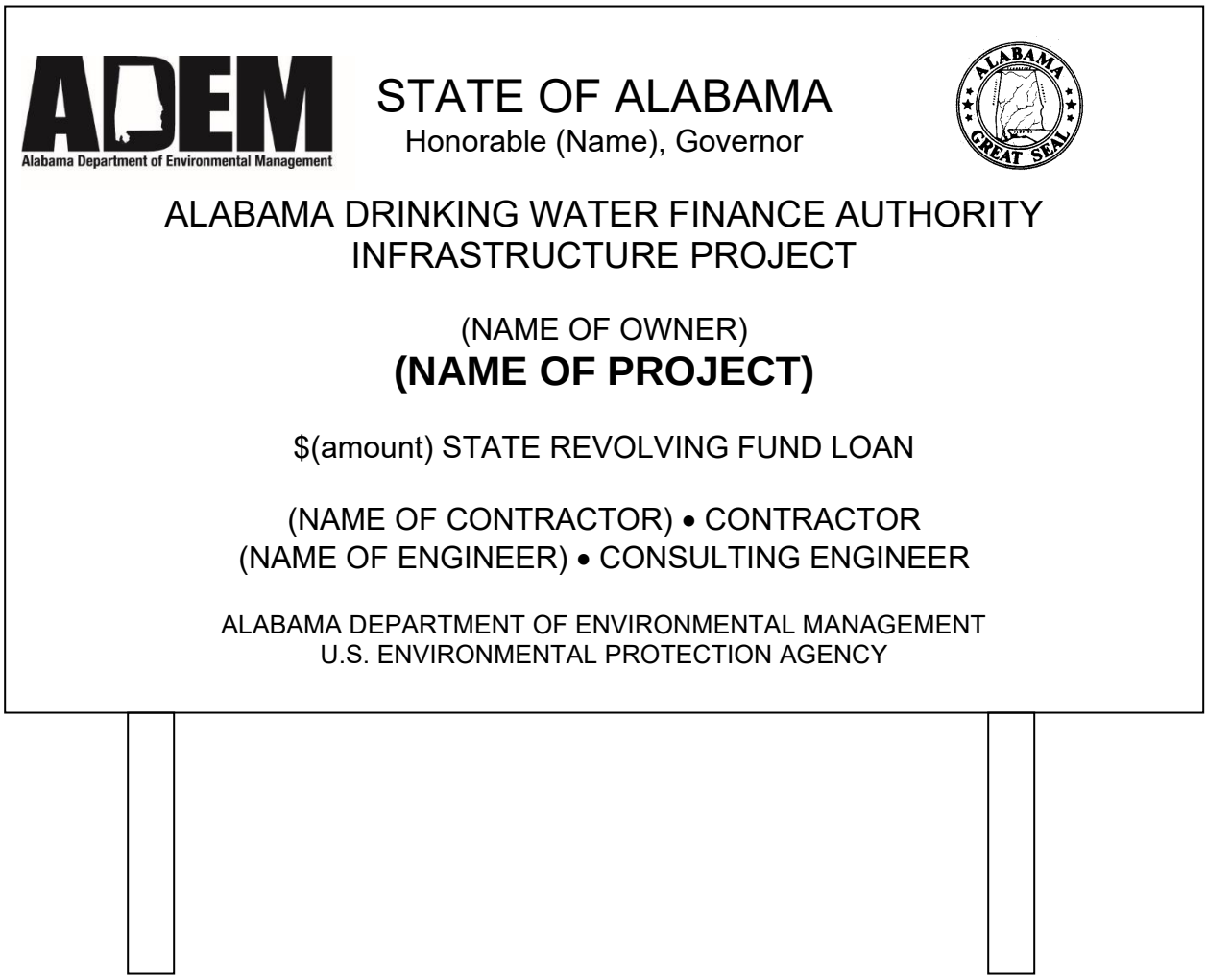
The Contractor acknowledges to and for the benefit of the _____, Alabama ("Purchaser"), and the Alabama Water Pollution Control Authority or the Drinking Water Finance Authority (the "State Authority") that it understands the goods and services under this Agreement are being funded with monies made available 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:

_____

_____

L. The Recipient is responsible for reporting and making payment of any applicable federal and state taxes which may be due as a result of payments received pursuant to this Agreement.

M. Any publications produced with funds from this award must display the following language: "This project [is being] [was] supported, in whole or in part, by federal award number SLFRP2635 awarded to the State of Alabama by the U.S. Department of the Treasury."

O. The recipient must construct a project sign that meets the following requirements:

(a) Sign is to be constructed of ½" MDO plywood or similar material, 4' x 8'.

(b) Paint with two (2) coats of enamel paint (or equivalent) prior to lettering.

(c) Background color white, lettering black.

(d) Lettering may be painted or vinyl. All lettering sizes to be proportionate to sign layout.

(e) Sign shall be attached to 4" x 4" x 8' treated posts.

(f) Sign shall be placed in prominent location near the project area, easily readable from existing street or roadway.

(g) Sign shall be maintained in good condition until completion of project.

(h) Sign shall follow the format below and include the following information only:

ADEM
Alabama Department of Environmental Management

STATE OF ALABAMA
Honorable (Name), Governor

ALABAMA AMERICAN RECOVERY PLAN ACT (ARPA)
DRINKING WATER / WASTEWATER PROJECT INFRASTRUCTURE

(NAME OF OWNER)
(NAME OF PROJECT)

$(amount) ARPA Funds
$(amount) State Revolving Fund Loan (if applicable)

(NAME OF CONTRACTOR) • CONTRACTOR
(NAME OF ENGINEER) • CONSULTING ENGINEER

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY

STANDARD SPECIFICATIONS

STANDARD SPECIFICATIONS

SITEWORK

STANDARD SPECIFICATION
FOR
SITEWORK, EXCAVATION, AND EARTHWORK

SECTION 1-1

1.0 PREPARATION OF SITE

Preparation of the site shall consist of the relocating, maintaining and/or removal of all fences, railings, poles, pipelines, culverts, structures, walkways, etc., located within the areas to be graded or to be occupied by new structures, pipelines, or other components of the project. Such relocations, maintenance, and/or removal may be required when the permanent use of such facilities will be required during construction or after construction, or when the temporary use of such facilities will be required. Site preparation work shall also include the provision of such drainage ditches, banks, travelways, etc., as may be required for proper prosecution and protection of the work.

Topsoil shall be stripped to a depth of not less than 12 inches from areas to be affected by the work, excavated or filled, and stockpiled for final distribution. If stored onsite for reuse, topsoil shall be placed on the site at locations acceptable to the Owner and Engineer. The Contractor shall consult with the Engineer regarding use of the site for fill areas, material storage areas, and spoil areas. The Contractor shall conserve the maximum amount of topsoil for use in final grading; avoid rendering any part of the work site unfit for future use; and maintain maximum access to the construction work, existing facilities, or new facilities. Soils testing and compaction testing shall be paid for by the Owner.

2.0 CLEARING AND GRUBBING

Clearing and grubbing shall consist of cutting, removing, burning and disposal of all trees, brush, stumps, grass, woods, roots, etc., within areas indicated to be graded, cut, filled, or occupied by structures, pipelines, or other facilities. All roots projecting from walls of excavation shall be either cut or removed so that minimum clearances of three feet from outside line of all structures, pipelines, etc., will be secured. No vegetation or other perishable material shall be left within areas of fill.

It shall be the responsibility of the Contractor to dispose of all debris resulting from clearing and grubbing operations. No materials resulting from the clearing and grubbing operations shall be left on the site unless required otherwise. Materials temporarily used to form silt barriers for erosion control shall be removed from the site after permanent erosion prevention cover is established by the Contractor.

All holes and/or depressions caused by the removal of stumps, roots, snags, etc., shall be backfilled, finish graded, and grassed. Disposal of debris shall be accomplished in such a manner as too fully comply with all applicable laws, codes, ordinances, etc.

All burning of material on the work site, when permitted, shall be performed in accordance with the "Air Pollution Control Rules and Regulations" of the Alabama Department of Environmental Management (ADEM) and with the air pollution control rules and regulations of the local authority or County Department of Health having jurisdiction over the construction site.

The burning of stumps, timber, logs, trimmings, brush, or other combustible materials where allowed shall be accomplished in such a manner that there will be no smoke or flyash nuisance. Burning shall not be initiated when atmospheric conditions are such as would cause a static cover in the area. Burning shall be strictly controlled. Quantities of materials being burned shall be limited so as to prevent damage to trees and/or growth adjacent to the cleared area, or to facilities or structures located in the surrounding area.

Trees, undergrowth, and ground cover outside of the construction areas or limits shall not be damaged or disturbed. Any tree scarred by equipment shall be immediately repaired and painted with approved asphaltic coating material. All damaged limbs shall be pruned by a clean cut and cut shall be painted with approved asphaltic coating material. Damaged undergrowth shall be pruned and treated. All areas disturbed or damaged by the Contractor's operations shall be restored to their original condition or as a minimum as specified.

3.0 SITE GRADING

All excess material or material which is unacceptable for use as fill or backfill shall be removed from the site and disposed of at the Contractor's expense. Final grading on the site, except over areas to be occupied by structures, walks, roadways, paved areas, etc., shall be of such material as will support vegetation. The entire area disturbed by the construction operations shall be finish graded, restored, and grassed. All fill material, not specified to be crushed stone, placed in areas to be occupied by roadways, walks, embankments, dikes, or other earth structures shall be compacted to 98 percent of maximum density unless otherwise indicated on the Drawings.

4.0 EROSION AND SILTING

The Contractor shall plan his site work and construction operations in such a manner as to effectively control soil erosion and runoff. The Contractor shall prevent pollution of streams and/or storm drains as would result from silt or soil runoff, or as would result from any material used in the construction operations such as oil, grease, paints, chemicals, fuels, solvents, or any construction debris. The Contractor shall obtain and comply with any permits and regulations required by ADEM or other agencies.

The Contractor shall intercept and block drainage from the construction site by means of silt fences, silt barriers, and sedimentation pools as required. Silt fences, wherever used on the site, shall consist of hay bales securely fastened in place or of suitable permeable barrier fabric designed to filter water and retain silt. Fabric shall be securely set in the ground and firmly held in place.

The Contractor shall be responsible for obtaining necessary NPDES Permits for stormwater discharge from the construction site(s) for all work described in these Specifications and shown on the Drawings. It shall be the Contractor's responsibility to meet all requirements and obligations of the Permit. All costs associated with making the application for the permit and for meeting the requirements of the Permit shall be borne by the Contractor.

5.0 CLEANING UP AND RESTORATION OF SURFACE FOR GRASSING

The Contractor shall maintain the construction and disturbed areas. All disturbed areas shall be restored to their original condition. Traveled areas shall be maintained in a passable condition by crushed stone or temporary paving as required at the Contractor's expense. All construction work shall be performed within reasonable limits around the areas of the work. All ground surface areas within the project construction limits shall be finished graded and grassed. All cut banks, slopes, or other areas outside of the construction limit that have been disturbed by the Contractor's construction operations shall also be graded and grassed.

The Contractor shall dispose of excess material as specified herein, and shall remove all rubbish, trash, and surplus construction materials from the site. Areas, sections, or portions of the work site within which construction work has been completed prior to beginning of final grading and grassing, shall be protected from erosion by employment of temporary control measures such as seeding and mulching or seeding and netting. All temporary erosion control and pollution control features installed by the Contractor shall be maintained by the Contractor prior to and following final grading and grassing.

Where trenches are excavated across raw land, undeveloped areas, pastureland, grassed areas, etc., the material placed in the top foot of backfill for such trenches shall be selected so as to be suitable for support of vegetation as found or as hereinafter specified. Where trenches are cut through finished lawns of bermuda, zoysia, centipede, or other types of lawn grasses, the top soil shall be dressed and fertilized, and the top of the trench adequately prepared for placement of sod matching the type grass removed.

Before placement of topsoil, the subsoil shall be loosened to a depth of not less than four inches but not greater than eight inches, the surfaces shall be cleared of all rock one inch or larger in size, all construction debris, or other objectionable material. The topsoil, previously removed and stored, shall then be placed over the prepared subsoil. The depth of the topsoil shall be sufficient to allow for natural settlement, so that after such settlement has taken place the surface of the topsoil layer will conform to the finished elevations and contours shown on the Drawings.

Should the stockpile of topsoil accumulated from the trenching operations not be adequate for supplying the quantities of topsoil required for preparation of the areas described hereinabove, the Contractor shall furnish, at his expense, topsoil from other sources to meet any deficiencies. Topsoil preparation shall consist of loosening the soil by discing, harrowing, or other approved methods. On areas having a slop of 3:1 or flatter, the soil shall be loosened to a depth of approximately three inches; and on slopes steeper than 3:1, the soil shall be merely roughened to a depth of approximately one inch. All clods, loose stones, and other foreign materials which are larger than one inch in any dimensions shall be removed. All gullies and washes that develop in the loosened soil prior to seeding shall be repaired. Seeding shall immediately follow soil preparation so as to avoid both compaction and/or wash by heavy rainfall and crust formation by sunbaking. Seeding will not be permitted on hard or crusted soil surfaces.

After preparation of topsoil, the Contractor shall immediately proceed with the grassing work. All materials used shall conform to the requirements in these Specifications under "Grassing".

If the construction work in any areas or portions of the work site should have been completed prior to completion of other construction work on the site, and the surface of the ground over and around such completed construction work will not be disturbed by the continued prosecution of other construction work within the project site, the Contractor may elect to perform the finish grading, ground preparation, and permanent grassing over such areas. The Contractor shall understand, however, that all permanent grassing work done prior to the undertaking of the final grading, ground preparation, and permanent grassing of the project site after all construction work has been completed shall be at this own risk. The Contractor shall be responsible for maintenance of temporary grassing or any permanent grassing installed prior to the undertaking of final grading and permanent grassing.

6.0 RIP RAP

Rip rap shall be placed in the locations shown on the Drawings. The areas, widths, and lengths shown for rip rap coverage are the minimums required. Field conditions or changes in field conditions may dictate that the coverage at a particular location be decreased or increased.

Rip rap shall be stone conforming to the requirements of AHD Specifications Section 814.01, Class 2 rip rap. Rip rap material shall consist of reasonably well-graded stones ranging in weight from approximately 10 pounds to approximately 200 pounds, with not over 10 percent weighing over 200 pounds, at least 50 percent over 80 pounds, and not more than 10 percent weighing less than 10 pounds. Rip rap bedding, where shown to be required, shall consist of gravel or crushed stone AHD Size #467. Thickness of bedding shall be as shown on the Drawings.

Rip rap shall be placed in accordance with AHD Specifications Section 610 for placement of Class 2 rip rap. Rip rap shall be placed in such a manner as to produce a reasonably well-graded mass of rock having the minimum practical percentage of voids. Rip rap shall be placed to its full course thickness in one operation in a manner that avoids displacement of the bedding material. The finished rip rap shall be free from objectionable pockets of small stones and clusters of large stones. Dumping of rip rap will be allowed provided mechanical equipment is used to dress the stones to a reasonably uniform slope.

No extra payment for rip rap deposited contrary to the locations shown on the Drawings will be made unless requested in writing by the Owner and/or Engineer. The Contractor shall maintain the rip rap protection until the project is accepted and any material displaced by any cause prior to acceptance of the project shall be replaced at the Contractor's expense.

If shown on the drawings, the Contractor shall furnish and install a geotextile fabric in the locations shown on the Drawings prior to the placement of the rip rap. The geotextile shall be of nonwoven construction. The fabric shall be mildew, insect, and rodent resistant and shall be inert to chemicals commonly found in soil. The geotextile shall be furnished in a protective wrapping which shall protect the fabric from ultraviolet radiation and from abrasion due to shipping and handling. The fabric shall be ultraviolet stabilized.

The embankment stabilization fabric shall be placed in the manner described and in accordance with the manufacturer's recommendations. The surface to receive the geotextile shall be prepared to a smooth condition free of obstructions, depressions, and debris. The

fabric shall be placed loosely, not in a stretched condition. The rip rap shall be placed so that the geotextile is not punctured. The rip rap shall completely cover the fabric.

The fabric shall be placed on the slopes so as to provide a minimum overlap of 18 inches. The geotextile shall be placed either parallel or vertical to the direction of the flow. If placed parallel, the upstream or higher panel shall overlap the downstream or lower panel. At the top of the embankment the fabric shall be keyed into the ground a minimum of 18 inches. If a cushion layer is placed, the bottom toe shall be finished by lapping the fabric back onto the cushion layer and securing with rip rap. The cost of furnishing and installing the geotextile fabric in accordance with the Plans and Specifications shall be included with the rip rap.

7.0 EXCAVATION - GENERAL

Excavated materials which are suitable for incorporation in the embankment and berms or other fills or ditches shall be placed directly therein, or stockpiled and subsequently used in the embankment, or other fills. The Contractor shall conduct grading operations in such a manner as to allow ample quantities of "Selected Soils" to be held in reserve or stockpiled, as necessary, to provide the required materials for backfilling or filling where allowed. No direct payment will be made for such necessary manipulation as doubled handling or hauling. Excess or unsuitable material which is not needed or inadequate for construction shall be disposed of as approved by the Engineer. All costs associated with the removal and disposal of materials and all costs associated with the restoration of surfaces of disposal areas shall be included in the unit prices and/or lump sum prices bid for the work under the Contract. There shall be no extra cost to the Owner for such removal, disposal and surface restoration work. There is no pay item for backfill and the Contractor shall include the cost of backfill in the cost of the structure.

All excavated materials shall be stored in a manner that will not cause damage to adjacent properties or environment nor obstruct access to any new or existing facilities. Drainage lines shall not be obstructed nor shall natural drainage of the surrounding ground be altered or obstructed.

8.0 EARTH EXCAVATION - DEFINITION AND GENERAL REQUIREMENTS

"Earth Excavation" shall include the removal, reuse and/or disposal of all materials, excluding those specified under "Clearing and Grubbing" and "Rock Excavation - Definition and General Requirements." Rocks and boulders one cubic yard or less in volume shall be classified as earth. Excavated materials which are suitable for incorporation in fills, embankments, backfills, berms, etc., shall be placed directly therein, or stockpiled and subsequently used. Excess or unsuitable materials shall be disposed of by the Contractor.

Earth excavation for structures shall be completed such that all footings, foundations, floor slabs, etc., bear on firm undisturbed soil, rock, or engineered/compacted fill. If, at the elevations shown on the Drawings, soil over the area to be occupied by a structure is found to be unsuitable for supporting the design load, the Contractor shall remove such soil and replace it with material placed and compacted in accordance with the Plans and these Specifications.

Earth excavation in trenches for pipe shall be open cut, unless otherwise shown in the Plans. Trenches shall be excavated to the depths shown in the Plans or as required to secure the specified minimum cover over the pipe. Boulders, large stones, rock or shale meeting the definition of "Earth," shall be removed from around all pipe to provide bedding, backfill, and compaction clearances indicated in the Plans and these Specifications.

9.0 ROCK EXCAVATION - DEFINITION AND GENERAL REQUIREMENTS

Rock excavation shall consist of the loosening, removing, and disposing of all rock, solid limestone or sandstone in original bed, in well-defined ledges, or in boulder form. It shall include all solid rock which cannot be removed until loosened by blasting or use of a track excavator mounted ram hoe. Boulders having a volume of more than one cubic yard shall be classified as rock. Material that can be loosened, separated, or ripped by means of heavy duty power tools or excavating equipment shall not be classified as rock. Unless identified in the Plans for use in the work or disposal on the site, all excavated rock shall be disposed of by the Contractor.

Where rock is the supporting material for structures, the Contractor shall expose and clean all foundation areas as required for inspection and evaluation of bearing conditions. All rock seams, voids, or fissures in the exposed areas shall be filled with crushed stone of suitable gradation.

Rock excavations in trenches for pipe shall be open cut unless otherwise shown in the Plans. Trenches shall be excavated to the depths shown in the Plans or as required to secure the specified minimum cover over the pipe. Rock shall be removed from around all pipe to provide bedding and compaction clearances indicated in the Plans and these Specifications.

10.0 BACKFILL FOR STRUCTURES

Lumber, rubbish, debris, braces, etc., shall be removed from all excavations prior to backfilling. Suitable backfill shall be free of topsoil and organics, reasonably dry (within limits necessary for compaction), and free of large stones or rocks. Backfilling shall not begin without prior approval of the Engineer. Backfill containing rock larger than three inches in any dimension shall not be used within three feet of structures. Backfill containing rock too large to be placed in eight inch lifts, shall not be used for backfill or embankments except upon approval of the Engineer. If materials excavated onsite are unsuitable at the time they are required for backfilling, or the quantity of material is insufficient, the Contractor shall provide suitable backfill materials.

Contractor shall, when necessary, provide adjustments to the natural moisture of soils before compacting. In general, backfill soils should be aerated or moisture conditioned to maintain the moisture content within two percent of the optimum moisture content. Backfill shall be placed in thin loose lifts and mechanically compacted to prevent settlement to a minimum of 95% standard proctor (ASTM D-698, latest revision) 100% compaction shall be required under structures or when shown on Drawings. For compacted material that does not pass required testing, the Contractor shall remove the fill or backfill to the last layer which passed compaction test.

The need for aeration and drying of some of the soils may be required before they can be placed and satisfactorily compacted. The Contractor will be required to have adequate equipment to manipulate and aerate soils with excessive moisture so that placement and compaction can be expedited. No direct or separate payment will be allowed for special handling of these soils.

The Contractor shall be responsible for maintenance of backfill. The Contractor shall promptly refill areas where settlement of backfill has occurred. Backfill shall be placed with the approval of the Engineer and only after all adjacent structures have gained sufficient strength to support the backfill loads.

11.0 BACKFILL FOR TRENCHES

Backfill for pipe trenches shall be as described in the Gravity Sewer Installation specification, Installation of Pressure Pipe specification, details in the Plans and as generally specified herein. Backfilling shall not begin without prior approval of the Engineer. Lumber, rubbish, debris, braces, etc. shall be removed from all trenches prior to backfilling. Suitable backfill shall be free of topsoil and organics, reasonably dry (within limits necessary for compaction), and free of large stones or rock. Backfill containing rock larger than one cubic foot shall not be used for backfill except upon approval of the Engineer. If materials excavated onsite are unsuitable at the time they are required for backfilling, or the quantity of suitable materials is insufficient, the Contractor shall provide backfill materials. Backfill shall be placed in thin loose lifts and mechanically compacted to prevent settlement to a minimum of 95 percent standard proctor (ASTM D-698, latest revision). Provide greater compaction where required elsewhere or called for by the Drawings.

The Contractor shall be responsible for maintenance of backfill. The Contractor shall promptly refill and restore areas where settlement of backfill has occurred. Backfill shall be placed with the approval of the Engineer and only after all adjacent structures have gained sufficient strength to support the backfill loads.

12.0 EMBANKMENT AND FILL WORK

Embankments and fills shall not be started without the concurrence of the Engineer. The material used in embankments and fills shall be free from frost, stumps, trees, roots, sod, muck, or debris of any kind. Only materials as specified herein shall be used. Fill and embankment material shall not be placed on frozen ground. Wet ground to be covered by fill shall be drained. If embankment or fill is to be placed on a surface which slopes more than 4:1, the surface shall be scarified and compacted to bond with the new material.

Compacted fills shall be constructed by depositing fill materials in successive, uniform layers of not more than eight inches in depth, loose measurement. Lifts shall be placed over the entire fill area keeping the surface of each layer parallel to the elevation of finished grade by use of blade graders. In close proximity to existing structures, leveling shall be accomplished by use of small spreaders, bulldozers, or hand methods. Each layer shall be rolled and compacted by tamping, rolling, or other suitable equipment depending upon character of material to the specified density before the succeeding layer is placed. The final layer shall be brought to elevation of finished compacted fill before topsoil is placed to conform to finished contours, cross sections or details shown on the Drawings.

Contractor shall, when necessary, provide adjustments to the natural moisture of soils before compacting. In general, backfill soils should be aerated or moisture conditioned to maintain the moisture content within two percent of the optimum moisture content. Backfill shall be placed in thin loose lifts and mechanically compacted to prevent settlement as follows: (1) areas beneath future slabs, sidewalks, structures, roads, pipelines, embankments etc. - minimum of 98% standard proctor (ASTM D-698, latest revision) (2) all areas denoted as "Spoil Areas" shall be compacted to 85% Standard Proctor Density minimum unless called to be higher elsewhere. Compacted material that does not pass required testing, the Contractor shall remove the fill or backfill to the last layer which passed compaction tests.

The need for aeration and drying of some of the soils may be required before they can be placed and satisfactorily compacted. The Contractor will be required to have adequate equipment to manipulate and aerate soils with excessive moisture so that placement and compaction can be expedited. No direct or separate payment will be allowed for special handling of these soils.

Rock large enough to prevent fill work from proceeding in eight inch lifts shall not be placed in compacted fills in areas to be occupied by structures, bearing slabs, footings, roadways, walks, etc. Rock of permissible size deposited in such fills shall be dispersed and well separated in all directions by acceptable fill material.

All sampling and testing work shall be performed by an independent testing laboratory selected by the Owner. The cost of initial sampling and testing shall be borne by the Owner. Subsequent re-testing of any samples or locations failing the initial test shall be performed at the expense of the Contractor.

13.0 UNAUTHORIZED EXCAVATION AND BACKFILLING

Whenever unauthorized excavation is beyond the lines and grades established, the Contractor shall, at his own expense, refill with suitable material, tamped and settled, to ensure the stability of the structure. The area of overexcavation shall be replaced at the Contractor's expense with select material as described in the Undercut and Foundation Construction subsection. Unauthorized excavation beneath structures shall be refilled with concrete at the Contractor's expense, if this is necessary in the opinion of the Engineer to protect the structure.

14.0 SHORING

The Contractor shall provide all necessary sheeting, shoring and bracing when soil conditions, rock conditions, or the Plans require them. Damage to existing and/or proposed structures, pipelines, utilities, etc., due to water, earth pressures, or other causes shall be repaired or replaced promptly by the Contractor at his own expense.

The Contractor is reminded that all excavation for structures, trench excavation, rock excavation and sheeting, and shoring shall be prosecuted in accordance with the protective guidelines and requirements of OSHA "Safety and Health Regulations for Construction," as set forth in the Federal Register, latest revision, and that the employment of all protective measures is at the Contractor's expense. Sheeting, shoring, bracing and sloping are methods of accomplishing the work, and such methods may vary according to the Contractor's methods

of dewatering, excavating, and installing the work. All such methods of accomplishing the work are the sole responsibility of the Contractor, in accordance with the OSHA guidelines.

Should the plans or specifications require the Contractor to submit a shoring plan or equivalent, it will not be reviewed by the Engineer. Submittal of such documents is solely for record purposes that the plan was prepared by others. The Contractor is solely responsible for the safety of all shoring and excavation.

15.0 UNDERCUT AND FOUNDATION CONSTRUCTION (SELECT MATERIAL)

Where the Engineer required the earth to be undercut to a depth below the bottom of the crushed stone cushion immediately beneath structures, the undercut material shall be replaced by a foundation constructed from select material. This material will consist of (1) previously excavated earth that was selected by the Engineer and stored separately by the Contractor until used for foundation construction, and/or (2) select materials imported from off site. The Engineer shall select which of these materials will be utilized. The select material shall be adjusted, if necessary, by the Contractor to achieve a moisture content within -2 to -3 percentage points of the optimum moisture content determined from compaction tests. The foundation material shall be placed in six inch or less lifts which each lift compacted to a minimum of 100 percent or as shown on Drawings of its maximum dry density as determined by ASTM D698 (Standard Proctor). The foundation will be constructed up to the elevation of the crushed stone cushion beneath the structure.

16.0 REMOVAL OF WATER

The Contractor shall, at all times during construction, provide and maintain ample means and devices with which to promptly remove and properly dispose of all water entering the excavation or other parts of the work. The Contractor shall keep excavations and work dry until the structures or facilities to be constructed are completed and the Engineers are in agreement with the Contractor to discontinue dewatering operations. No claims for an amount of money in excess of the bid prices for the work will be entertained or allowed on account of the character of the ground in which the trench or other excavations are made, dewatering requirements or water management.

The Contractor shall complete all dewatering operations and dispose of the water from the work in a manner that will not cause damage to adjacent properties or environment, nor restrict access to any new or existing facilities. No water shall be drained into work under construction.

17.0 DISPOSAL OF EXCESS MATERIALS

The Contractor shall, unless required otherwise by the Plans, Specifications, and/or the Engineer, remove from the construction site all materials and debris resulting from the construction operations, and all material unsuitable for use as backfill or for use in restoration of the surface of the construction.

The Contractor shall make all necessary arrangements for disposal of the materials and debris described hereinabove. It shall be the Contractor's responsibility to fully

satisfy the requirements of the landowners whose property he has used as disposal sites for materials and debris removed from the project site. Should such properties or disposal locations be adjacent to the project site and not of remote location, the surfaces of such adjacent lands shall be restored in accordance with the provisions of these Specifications as well as in accordance with requirements of the owner of such adjacent lands.

The provisions of these Specifications may be waived in the event that the Contractor should elect to dispose of materials and debris removed from the project site at a landfill meeting the requirements of the Alabama Department of Environmental Management and/or the local Authority having jurisdiction. In such case, it shall be the responsibility of the Contractor to dispose of the materials at the landfill in accordance with the Rules and Regulations established by the Authorities and/or Agencies mentioned hereinabove for operation of the landfill.

18.0 EXPLOSIVES

It shall be the sole responsibility of the Contractor to observe all laws, regulations, ordinances, etc., relating to explosives, including but not limited to all Federal, OSHA, State, and Local. The Contractor's attention is further directed to the General Specifications sections relating to safety, explosives, and the Contractor's responsibilities. Heavy blasting in rock which is to form a foundation shall not be permitted.

The Contractor shall ensure all persons supervising, participating, observing, or near the area of blasting operations are informed of proper procedures and properly trained. Contractor's responsible personnel shall be present and supervise all blast design, loading, and shot firing. The Contractor shall be solely responsible for following all laws, regulations, local ordinances, etc., pertaining to blasting. If more stringent than specified, these requirements shall become the minimum standards. The Contractor shall be solely responsible for all damages to properties or persons resulting from his blasting operations.

The Contractor shall be solely responsible for all safety associated with blasting. This responsibility of the Contractor shall also include but not be limited to, all work by subcontractors, suppliers, agents, and employees, etc.

19.0 PAYMENT

The costs of all necessary, Sitework, Excavation, and Earthwork shall be included in the appropriate lump sum and/or unit prices set forth in the Items of Work - Bid Schedule.

When any individual tasks of Sitework, Earth Excavation, and/or Earthwork are listed separately in the Items of Work - Bid Schedule, they shall be bid, defined and paid as outlined below and/or described in the Basis of Payment. The Basis of Payment and plans will prevail over any discrepancies herein. All other required Sitework, Excavation, and Earthwork not listed as separate bid items shall be included in the remaining lump sum and/or unit prices set forth in the Items of Work - Bid Schedule. No payments for double hauling or handling will be made.

Unless rock excavation is clearly and specifically listed as a separate pay item in the Items of Work – Bid Schedule, it shall be considered as unclassified excavation and included in the cost of other work items. No additional payment shall be made.

Earth Excavation

When earth excavation is to be paid for on the basis of unit price bid, the limits of pay excavation shall be as follows:

Structures - Established by unit price (per cubic yard) measured having vertical sides extending one foot beyond the outside of the structure's footings with depths measured from the surface of natural grade following clearing and grubbing to the grade lines as established by elevations shown on the Drawings for underside of structures, stone cushions, foundations, footings, bearing slabs, etc. No payments will be made for earth excavations beyond these limits unless authorized by the Engineer.

Trenches - Earth excavation in trenches shall be included in the price bid on pipe, manholes, inlets or headwalls, etc. or included in other prices if the "Bid Schedule - Items of Work" form does not contain specific unit prices for the same.

Others - Established by unit price (per cubic yard) measured by survey cross-section methods (following clearing and grubbing if necessary). All measurements for payment of excavation will be based on the said cross-sections or original grades regardless of any subsequent changes occurring during the work.

These same limits shall apply for estimating all earth excavation quantities whether included in the original Contract Documents or negotiated as additional work. They shall also apply for estimating quantities for Undercut and Foundation Construction when it appears as a separate bid item(s) in the Items of Work - Bid Schedule.

Rock Excavation

When rock excavations are to be paid for on the basis of unit price bid, actual rock measurements shall be made and the limits of pay excavation shall be as follows:

Structures - Established by unit price (per cubic yard) measured having vertical sides extending one foot beyond the outside of the structure's footings with depths measured from the top surfaces of the uncovered rock to the bottom of the rock or grade lines as established by elevations shown on the Drawings for underside of structures, stone cushions, foundations, footings, bearing slabs, etc., as applicable. No payments will be made for rock excavations beyond these limits.

Trenches - Established by unit price (per cubic yard) calculated as follows; per linear foot of pipe installed, measured with a width of the pipe outside diameter plus 12 inches each side of pipe (i.e. pipe outside diameter plus 24 inches), and depths measured from the top of the uncovered rock to the bottom of the rock if above pipe or minimum required bedding depth of 6 inches or as required by the

engineer or drawings as applicable. No payments will be made for rock excavations beyond these limits. Trench section not less than 50 feet shall be stripped for measurement.

Others - Established by unit price (per cubic yard) measured by survey cross-section methods. Contractor shall be responsible for uncovering areas of rock for survey. All measurements for payment of excavation will be based on the said cross-sections regardless of any subsequent changes occurring during the work.

Unit prices bid shall include, but not limited to, drilling, blasting, removal and disposal. There shall be no extra payments for removal of rock with no overburden or "high rock". These same limits shall apply for estimating all rock excavation quantities whether included in the original Contract Documents or negotiated as additional work. When unusual conditions are discovered during excavation, typically indicated by the presence of seams, fissures or voids, additional excavations will be required in order that proper inspection of the foundation conditions may be made.

Undercut and Foundation Construction

Foundation Construction will be measured from the final surface required by the Engineer up to the crushed stone cushion below the footing of the structure. The measurement will extend to 1.0 foot outside the footing. Where a "Foundation Construction from Select Material" bid item is included in the Bid Schedule - Items of Work, the Contractor shall include all cost of the work described in this section in that item. Where no separate bid item is included, the cost of this work shall be included elsewhere in this bid.

20.0 GENERAL

The Contractor shall be solely and fully responsible for safety associated with blasting, excavation, and all other aspects of the construction. This responsibility of the Contractor shall also include but not be limited to, all work by Contractor, subcontractors, suppliers, agents, and employees, etc.

STANDARD SPECIFICATION
FOR
PAVEMENT, GRAVEL, AND CONCRETE SURFACES

SECTION 1-2

1.0 REMOVING AND REPLACING EXISTING PAVEMENT AND CONCRETE

No hard surface (pavement, concrete, etc.) shall be cut unless authorized. These surfaces shall be cut to a neat continuous line and replaced with same type material and thickness. Base course to be of same type material removed. Removal and replacing surfaced areas shall meet the requirements of the governing body. Should requirements not be in effect, the Contractor will replace these areas as indicated on the Plans or as required by the Engineer or the Owner. These surfaces shall not be replaced until authorized. All damaged hard surfaces shall be restored to its original condition and shall be replaced as soon as possible. If any inconvenience or potential inconvenience to the public is noted, the hard surfaces will be replaced immediately. Any repair after completion of the project or settlement under the replaced sections of hard surfaces will be at the expense of the Contractor. Unless otherwise noted, pavement replaced shall be included in the Unit Price Bid of Items except for repairs.

2.0 PAVEMENT

Construction and types of finished paving for roads, parking areas, and service areas shall be as shown on the Drawings or as specified below. All subgrade and base courses shall be in accordance with AHD Specification Section 301. The subgrade shall be prepared using materials in place. All depressions shall be filled with approved material compacted to same density as the remainder of the subgrade. Soft places in the subgrade shall be excavated and refilled with approved material or crushed stone so as to achieve the density specified for compacted fill. The base shall have a compacted thickness of base course under pavement of not less than 6 inches, and materials for base course shall be in accordance with AHD Specifications Sections, 823.02(d) and 826.02(d), or compacted pug mix. Subgrade and base shall be compacted to a minimum of 98% SPD. Surface of crushed stone finish shall be 2" of No. 4 gradation, compacted. Asphalt paving shall be pre-mixed bituminous pavement meeting the requirements of AHD Specifications Section 411. Base course shall be primed and pavement constructed in accordance with the provisions of AHD Specifications Section 410 except asphalt will be compacted. The pavement shall consist of binder course and wearing course. Binder course shall be Mix B (AHD Section 411.02) placed at the rate of 150 pounds per square yard, and wearing course shall be Mix A (AHD Section 411.02) placed at the rate of 110 pounds per square yard. Apply binder and wearing course at higher rates if called out on Plans. Pavement shall be installed smooth and level. Sufficient time shall lapse before the wearing course is installed on the binder course. The wearing course will be the last work on the job after all “punch” list items are completed. All dirt, mud, and other undesirable material shall be completely cleaned from the binder prior to placing the wearing course. Unless specifically requested by the Owner, the wearing course shall not be installed until after all site work is complete and after all activities that potentially damaged the asphalt are

complete.

When asphalting in cold, an ADOT Certified Testing Lab will be made available by the Owner to measure surface temperature on which asphalt is to be placed as well as air and asphalt temperatures. As a minimum, air temperature shall be 40E and rising as well as the surface the asphalt is to be placed. The contractor will bear the cost of the laboratory testing for this situation.

If any settlement occurs under roadway, the entire roadway shall be resurfaced for at least 50 feet on both sides (100 feet total) of the settled trench. Where resurfaced segments approach within 50 feet of each other, the segment between resurfaced segments shall also be resurfaced, even though outside the 50 feet segment.

Prior to placing curb, gutter, concrete, or asphalt, etc., use survey equipment to check that all paving will properly drain to prevent puddle formation. Coordinate with Engineer and adjust grades as required to prevent ponding during rain or washdown.

3.0 CONCRETE WALKS AND OTHER SURFACES

All concrete walks shall be constructed on firm compacted subgrade or a crushed stone base of compacted thickness not less than 4 inches. The subgrade shall be damp when concrete is placed. Expansion joints shall be located where the walk changes direction, abuts a structure, top and bottom of steps, and not farther apart than 30 feet on a straight run. The expansion joint and filler shall be 3/8 inch thick asphaltic fiberboard with edges of the concrete rounded. Contraction joints 1 inch deep shall be cut across the walk not farther than 6 feet apart. Final finish will be lightly cross broomed.

Concrete parking areas and drives will be finished as described above with #5 rebar @ 10" o.c., e.w. added for reinforcing or as shown on the plans.

4.0 CURB, GUTTER, AND COMBINATION CURB AND GUTTER

This Sub-section shall cover the work of constructing Portland cement concrete gutter, curb, or combination curb and gutter, constructed with or without metal reinforcement. Curb and gutter shall be constructed in accordance with the plan details and these specifications at the locations shown on the plans or established in conformity with the lines, grades, dimensions, and cross sections shown on the plans or designated.

All materials shall conform to the requirements of Concrete Standard Specifications herein. The foundation shall be constructed or excavated to the required depth below the finished surface in accordance with the cross section shown on the plans or as designated. All soft or other unsuitable material shall be removed and replaced with suitable material, in layers not to exceed 4 inches compacted. The foundation shall be compacted as provided for the applicable types of material involved.

The Contractor shall use standard type metal forms or wood forms or if requested in writing and approved by the Engineer, an approved automatic extrusion type curb and/or gutter machine. These forms shall be straight except for radial sections, and free from warps and of sufficient strength, when staked, to hold the concrete true to line and grade without distortion. They shall provide the approved typical section and depth of the section shown on the plans. Radial or curved forms may be of flexible metal or a wood form of approved design. Bent or damaged forms shall not be used. All forms shall be securely

staked, braced, and held together to the exact lines and grades established and shall be kept sufficiently tight to prevent leakage of mortar. All forms shall be cleaned and oiled with a suitable form oil immediately before concrete is placed against them.

Any automatic extrusion type curb and/or gutter machine considered for approval must be demonstrated to produce a section conforming to the dimensions, cross-section, lines, and grades shown on the plans. Failure to consistently produce an acceptable product shall be cause to withdraw approval of the machine and order the use of standard forms. All types of curbs, gutter, and combinations shall be placed in one operation, to the depth of cross section specified on the plans. The use of a two stage operation will not be permitted.

Gutter, curb, and combination curb and gutter shall be constructed in sections of the lengths shown on the plans. The length of section may be reduced where necessary to form closure. The handling, storage, proportioning, and mixing of concrete shall conform to the Concrete Standard Specification herein.

All expansion, contraction, and construction joints shall be constructed as shown on the plans. If not shown on the plans, joints shall be placed as follows:

1. Expansion joints shall be placed in curb and/or gutter to match those in concrete pavement where the two are adjacent.
2. Expansion joints shall be 3/4 of an inch wide. They shall be placed where curb, gutter or combined curb and gutter terminate against concrete driveways and other concrete structures except inlets. The joints shall be placed at least 20 feet from the location of the termination of the curb, gutter or combined curb and gutter at inlets.
3. Expansion joint filler and sealer shall be one of the materials provided by AASHTO M 153 or AASHTO M 213 with the latter being modified to allow a maximum of 25% water absorption. Expansion joint filler shall extend from the bottom of the curb and/or gutter to within 1 inch of the top; the sealer shall be 3/4 of an inch thick and shall be recessed 1/4 of an inch from the top. Hot Applied Joint and Crack Sealant shall meet the requirements of AASHTO M 324 (ASTM D 6690) for Type I Sealant or Type II Sealant. Cold Applied Joint and Crack Sealant shall be a resilient adhesive compound capable of effectively sealing joints from infiltration of incompressible materials and water throughout repeated contraction and expansion cycles. The sealant shall be a homogeneous blend of materials, which may or may not require a primer. The sealant shall meet the requirements given in ASTM D 5893.
4. Contraction joints shall be placed in curb and/or gutter to match those in concrete pavement where the two are adjacent, but in no instance more than 20 feet between joints. The contraction joints shall be sawed or otherwise cut 2 inches deep by 1/8 of an inch wide and shall extend 2 inches below the pavement surface.

The subgrade and forms shall be checked and approved just prior to placing concrete against them. All debris or other foreign material shall have been removed from the space to be occupied by the concrete. The subgrade shall be moist but not wet or muddy. After mixing, the concrete shall be placed in the forms and shall be tamped, spaded, or vibrated sufficiently to produce a dense homogeneous mass and to bring the mortar to the surface. Particular attention shall be given to spading the concrete along and against the surface of the forms to prevent honeycombing and secure a smooth, uniform surface.

When the forms are filled, the concrete shall be struck off with a template, cut to the curb edge design. The exposed concrete surface shall then be finished smooth with a wooden float in a manner that will compact the mass and produce a true, even top surface. Plastering with mortar to build up or finish will not be permitted. The surface of the gutter and the face and top of the curb shall be checked with a 10 foot straightedge and any irregularities more than 1/4 of an inch in 10 feet corrected. The alignment and grade shall not at any point vary more than 1/2 of an inch from that established by the elevation control stakes. Excessive troweling with a steel trowel will not be permitted. A textured finish shall be provided on the exposed surface just before the concrete becomes nonplastic by the use of a burlap or cotton fabric drag, brush, or broom which will produce a uniform gritty texture along the length of the curb, gutter, or combination curb and gutter. The upper edges of curb and gutter shall be rounded with an approved edging tool to the radius shown on the plans. The joint templates shall be set during the placing of the concrete and allowed to remain in place until the concrete has set sufficiently to hold its shape, but shall be removed while the forms are still in place.

The forms shall be left in place until the concrete has set sufficiently so that they can be removed without damage to the work, but, unless otherwise directed, they shall be removed within 24 hours after the concrete has been placed. Immediately after the removal of the forms, the repair of any minor defective areas shall be accomplished.

Immediately after the finishing operation is completed, the concrete shall be cured. If mats are used, they shall be kept continuously moist for a period of at least 72 hours. During this period, and until completion and acceptance of the work, it shall be protected from damage by the elements or other cause. After the concrete has set sufficiently, spaces along the front and back sides of the gutter, curb, or combination curb and gutter, shall be backfilled to the required elevation with suitable material which shall be compacted.

STANDARD SPECIFICATION
FOR
GRASSING

SECTION 1-3

1.0 GENERAL

This work shall consist of furnishing, planting and establishing an acceptable stand of grass or other vegetative cover for use and protection of the project. Work includes, but is not limited to temporary seeding as required, furnishing and placement of fertilizers and soil treatments, furnishing, inoculation, and planting of seeds, and the covering, compaction and maintenance of seeded areas. On all work on and adjacent to private property, the Contractor shall replace the disturbed materials with materials identical to those on the site. Sod shall be provided and installed wherever needed to match existing grass. In sensitive areas and when required by Owner during construction, grass and landscaping will be replaced immediately after primary construction (i.e. pipeline installation, etc.) is complete with Contractor accepting the risk of further disturbance due to testing, other clean-up, etc.

2.0 MATERIALS

Sodding and Seeding. The sod shall be native to the area with well matted roots. Sod containing weeds, other grasses, or fire ants shall not be accepted. The seed mixture, fertilizer, lime and rates of application of all these items shall be as specified herein as a minimum and as required to achieve full coverage. Topsoil shall be placed over the area to be seeded or sodded to a depth of 4 inches. Topsoil will be obtained from the original excavation stockpile. If sufficient topsoil is unavailable, the Contractor will obtain and deliver topsoil from another site at his expense. Topsoil shall be free from all rock or gravel.

2.1 SEED MIXTURES

Seeds and seed mixtures shall conform to the Alabama Department of Transportation Standard Specifications for Highway Construction, Section 860.01, latest edition. Permanent seed mixtures in areas subject to frequent mowing for planting zones 1 and 2 shall be 1A or 2A with mix adjusted as required for the season. All areas at treatment plants, pump stations, wells, and tanks, as well as all areas inside fencing, shall be considered frequently mowed areas. Seasonal temporary mixes shall be as specified for their respective permanent mix. Temporary grassing may be modified by the contractor as required for erosion control or to comply with his BMP plan. In areas not subject to frequent mowing, mix shall be 1E or 2E depending on the planting zone. Seed mixtures shall be modified when required to match adjacent grassing. No bahiagrass shall be seeded.

3.0 PROCURING AND HANDLING SOD

Sod shall be kept moist and planted within three (3) days. Sod will not be allowed to dry out or freeze. Sod shall be machine-stripped at a uniform soil thickness with a

minimum of two (2) inches of soil adhering to the roots when placed. Sod shall be live, fresh, uninjured, and growing grass at the time of planting. Sod shall be handled in a manner that will prevent tearing, breaking, drying, or other damage. Sod shall be healthy when placed.

4.0 GROUND PREPARATION

The ground shall be plowed to a depth of not less than four (4) inches but not greater than eight (8) inches. The ground shall be cleared of all rock 3/4 inch (.75") or larger in size of any dimension, all construction debris, or other objectionable material by hand raking. After plowing and clearing, the ground shall be pulverized. Then, rock and debris-free topsoil shall be placed over the prepared area to a depth of four (4) inches, and mixed with the fertilizer and lime. After placement of topsoil, the ground shall be cleared of clods, all stones, rocks brush, roots, construction debris, or other objectionable material. In areas subject to frequent mowing, the ground shall be fine raked and hand picked to remove all gravel and rocks. Remove all other objects that may cause damage to mower blades. The Contractor shall supply water, and additional fertilizer if needed, for planting and growth without additional expense to the Owner.

5.0 PLANTING

Sod shall be placed on level, prepared soil at any time when ground is not wet or frozen. Sod shall be placed by butting edges of sod block and with alternating joints. Sod shall be used to fill in all voids after the sod has been laid. Roll sodded areas with hand-held roller to bond sod to soil and to smooth out rough spots. Completed sod shall be smooth, and free from irregularities. The Contractor shall maintain the planting until the final approval of the project which includes watering when necessary. Water shall be applied by the use of hose sprinklers, soaker hose, water truck with irrigation attachments or other watering equipment that will apply water in such as fashion as to avoid damaging areas. Seeded areas will have mulch applied at approximately two tons per acre to lessen the impact of erosion. All gullies and washes created shall be repaired and reseeded.

6.0 FERTILIZER AND SEED

When area is to be seeded, apply fertilizer in accordance with manufacturer's instructions at 500 lbs. per acre of 8-8-8 fertilizer or 300 lbs per acre of 13-13-13 fertilizer. Apply fertilizer after smooth raking of topsoil and prior to roller compaction. Do not apply fertilizer at same time or with same machine as will be used to apply seed. Mix thoroughly into upper 2 inches of topsoil. When growth has emerged and is growing normally, a second application of an approved nitrogen fertilizer shall be applied. Fertilizer shall be applied uniformly at a rate of 67 pounds of nitrogen per acre unless a higher rate is desired to enhance growth.

Apply seed at rates specified evenly into intersecting directions and rake in lightly. Exercise care in covering to preserve the grade so that areas adjacent to pavement are not left higher than paved surface. After sowing, seed bed shall be compacted immediately with a cultipacker, roller or approved drag. Compacting of seeding is not required when seed has been applied hydraulically or mulched.

Do not seed areas in excess of that which can be mulched on same day. Mulching material shall be oat or wheat straw, free from weeds, foreign matter detrimental to plant life. It shall be spread over all seeded areas at a minimum rate of approximately 2 tons per acre, and shall be applied to a uniform depth in such a manner that not more than 10 percent of the soil surface is exposed. The use of wet hay or straw will not be permitted. Bailing twin shall be removed from mulch prior to placement.

Where temporary grass has been planted, the contractor shall establish the permanent grassing specified when weather and soil conditions are within the agronomic practice limits for the intended permanent species. Existing temporary vegetation shall be mowed to a height of approximately 3 inches or sprayed with an approved herbicide to retard future growth. The area shall be lightly scarified to prepare a suitable seed bed for permanent vegetation. Fertilize and permanent species shall be applied in the manner specified. Seed shall be covered by a second scarification followed by rolling. Scarification and rolling may be omitted when seed is spread by hydraulic equipment provided existing growth is 3 inches to 6 inches in height.

Erosion fabric shall be used when shown on the drawings, on all slopes greater than 3:1 and/or when the terrain requires use of erosion fabric. Fabric shall be woven jute fabric, open mesh construction smolder-resistant treated fabric shall be used and equal to Belton Anti-Wash/Geojute. Install fabric according to manufacturer's instruction.

Hydroseeding, when indicated in the plans to be provided, shall be accomplished with approved equipment, and all mixtures shall be constantly agitated from the time that they are mixed until they are finally applied to the seed bed. All such mixtures shall be used within eight hours from time of mixing. Nozzles or sprays shall not be directed toward the ground in such a manner as to cause erosion or runoff.

7.0 ACCEPTANCE

Acceptance of the planting shall be the satisfactory placement and growing of the material as determined by the Engineer. As a minimum, satisfactory stand for seeded grass must be a growing complete cover of grass, uniform in height, color, and density, in which gaps do not exceed the following:

1. Bare areas shall be scattered and not comprise more than 1/100 of any given area.
2. For frequently mowed areas, bare spots shall not exceed 4 square inches.
3. For infrequently mowed areas, bare spots shall not exceed 6 square inches.

Provide, at no additional cost to the Owner, watering, additional seed, additional fertilizer, and/or lime, etc., as required to achieve acceptance. It shall be the responsibility of the Contractor to secure a stand of grass such as will minimize loss of soil by erosion; to maintain all seeded areas until final acceptance of the work; and to restore or replace any portion of the grassing work that is found to be defective, or which results in an unsatisfactory stand of grass, or which becomes damaged prior to acceptance of the work. However, all grassing and coverage (whether seeded or sodded) through developed areas or in easements must match that existing prior to construction. Sod shall be level, well knitted and growing, covering the entire designated area.

If a satisfactory stand of grass or sod is not established then the area shall be re-seeded or re-sodded without any additional cost to the Owner. The responsibility of the Contractor shall continue to the following extent; should all other work at the site have been competed and accepted and should the Contractor have removed all forces and equipment from the plant site, he shall nevertheless, in the event of failure or partial failure of the grassing work, be obliged under the terms of the Bond given to the Owner to return such forces and equipment to the plant site as are necessary to ensure the satisfactory completion of this portion of work under the Contract.

The Contractor shall mow all sites a minimum of two (2) times, a minimum of two weeks apart after the permanent species has been established, with a finish type mower to demonstrate that the site can be readily maintained by the Owner without difficulty and without damaging equipment. Repeat the mowings a minimum of two additional times if portions of the site are disturbed, regraded, or any work is performed or equipment moved off the site, or any other activity is performed that may affect the acceptance of the grassing. The mowings shall be at a close setting (i.e., low grass height) that will reveal any deficiencies from these Specifications and any debris or potentially damaging items.

The Owner shall not obligated to make any payment for grassing until an acceptable stand of grass meeting all the requirements of these specifications is achieved.

STANDARD SPECIFICATIONS

BUILDING

STANDARD SPECIFICATION
FOR
CONCRETE

SECTION 2-1

1.0 DESCRIPTION

Concrete shall be comprised of cement, fine aggregates, coarse aggregate, and water, and shall be so proportioned and mixed as to produce a plastic, workable mixture. The relative stiffness of the mix may be varied within the limits hereinafter specified so as to secure the mix most suitable for the particular location and/or condition of placement. Concrete shall be Class “A” or Class “B” as defined below and required under Composition:

(a) Class "A". All reinforced concrete shall be Class "A". If the structure is to contain liquid, the concrete shall be watertight.

(b) Class "B". Concrete not requiring reinforcing. In general, the use of Class “B” concrete shall be limited to plain underground, unreinforced concrete for pipe bracing, skin coats, and concrete fill.

2.0 COMPOSITION

Concrete shall be "ready mixed" apportioned by the approved design mix. Concrete shall contain not less than 6-1/2 bags of approved cement per cubic yard. The slump shall indicate "the mix" is workable and not be less than 3-1/2 inches nor greater than 5. The Engineer may require additives to provide a workable mix. Concrete shall be inspected by a laboratory designated by the Engineer who will test the mix and make test cylinders. Method of measuring the materials shall be approved by the Engineer.

3.0 MATERIALS

(a) Cement. Cement used shall be Portland Cement of an approved brand. The cement shall meet Type II requirements. The Engineer shall designate a retarder, if required. Certificate of test showing the cement meets the Standard Specification of A.S.T.M. Designation C-150 with latest revisions will be required. In order to ensure uniformity of color and appearance, the same brand of cement shall be used in the mixes for all concrete on the project. Portland Cement shall be of color acceptable to the Engineer.

(b) Fine Aggregates. Fine aggregates used shall be clean, sharp and conform to the Standard Specification of A.S.T.M. Designation C-33. No screening or crushed slag will be permitted as substitute for sand in concrete or mortar work. Fine aggregate shall be graded to the following limits:

Passing 3/8" Sieve	100%
Passing #4	95 to 100%
Passing #6	45 to 80%
Passing #50	10 to 30%
Passing #100	2 to 10%

(c) Coarse Aggregates. Coarse aggregate shall consist of either crushed stone, or gravel, and the aggregate shall be clean, hard, durable, and free from foreign matter. The aggregate shall conform to the Standard Specification A.S.T.M. Designation C-33. Coarse aggregate shall be graded as indicated below. The design mix shall set the gradations of the coarse aggregate for the particular project. Unless stated differently, the gradation shall be 1-inch maximum except where smaller gradation may be needed, such as in beams with congested steel.

Percentages Passing Square Openings

Designated Size	2-1/2 Inch	2 Inch	1-1/2 Inch	1 Inch
2" to #4	100	95 to 100	---	35 to 70
1-1/2" to #4	---	100	95 to 100	---
1" to #4	---	---	100	90 to 100
3/4" to #4	---	---	---	100
1/2" to #4	---	---	---	---

Designated Size	3/4 Inch	1/2 Inch	3/8 Inch	#4
2" to #4	---	10 to 30	---	0 to 5
1-1/2" to #3	35 to 70	---	10 to 30	0 to 5
1" to #4	---	25 to 60	---	0 to 10
3/4" to #4	90 to 100	---	20 to 25	0 to 10
1/2" to #4	100	90 to 100	---	0 to 15

(d) Water. Water used shall be clean, potable and free from harmful amounts of acids, alkalies or organic materials. No water shall be added at the job site unless approved by the Engineer.

4.0 AIR ENTRAINED CONCRETE

Concrete used shall be air entrained. When required or directed by the Engineer, concrete shall contain an admixture for controlling the setting rate. The addition of air will be by approved admixtures or by approved Portland Cement containing admixture, conforming to A.S.T.M. C-260 or latest revision. Testing shall be in accordance with A.S.T.M. Standards.

In general, the air content shall conform to the following except when changed by the Engineer or the Testing Laboratory responsible for the design mix and plant inspection.

Coarse Aggregate in Inches	Air Content Percent by Volume
1-1/2, 2 or 2-1/2	5% +/- 1%
3/4 or 1	6% +/- 1%
3/8 or 1/2	7-1/2% +/- 1%

If the air content is not satisfactory, the Contractor may be required to remove and replace the concrete without extra compensation or the concrete may be refused to be poured. Concrete refused at the site cannot be used and must be permanently removed from the job site.

5.0 MIXING AND PLACING

Ready mixed concrete shall be in accordance with ASTM Specification C-94. Concrete will be conveyed to the place of deposit by methods which prevent the separation of materials. Concreting shall be carried on as a continuous operation until a section is completed. No dry to set joints will be allowed.

Concrete will be compacted during placing and shall be thoroughly worked around reinforcement, embedded fixtures, and into the corners of the forms. The number and types of the tools or equipment utilized in the compaction process shall be such that compaction can keep pace with the pouring and that compaction can be completed while the concrete is still fresh and plastic. Before beginning any pour, the Contractor shall have on hand and readily available at the location of the pour, spare tools and equipment, in good working condition that can be immediately utilized in case of the malfunction of any tools or equipment being used. Mechanical vibrators will be required with backup vibrators onsite.

Before placing concrete, debris, ice, frost, and water shall be removed from the reinforcement and forms. Forms shall be thoroughly wetted immediately prior to placing concrete, except when freezing. Concrete shall not be poured when the temperature is below 40°F or 45°F and falling unless measures and facilities for protection of the concrete have been provided. Such measures and facilities shall be subject to concurrence of the Engineer and may include insulation of the poured structure, protective covers, and heat source capable of maintaining temperature of the poured structure (forms and rebar) at 50°F or above. Concrete, at the time when deposited in forms or slabs when protection is required, shall not have a temperature lower than 65°F. At no time shall concrete reach a temperature lower than 50°F. The maximum temperature of concrete, at any time during its production, transportation, and placement, shall not exceed 90°F. During cold weather the finished concrete shall be protected for an adequate length of time following the pouring by maintaining the temperature at a level not lower than 50°F.

After concrete has been placed, it shall be protected against loss of moisture and against damage from succeeding construction operations. Water curing methods shall be employed for all concrete unless other methods are specified herein, shown on the drawings, or concurred with in writing by the Engineer. Water used for curing shall be potable water meeting the requirement of ASTM C 94 with no properties that would stain concrete. Concrete curing methods shall be in accordance with ACI 308. Curing shall be achieved through immersion, ponding, or continuous sprinkling through soaker hoses or lawn sprinklers as required by the type of structure. Concrete surfaces shall be kept continuously wet throughout the curing period. Alternate wetting and drying of concrete surfaces shall not be allowed. Curing shall be continuous for a minimum of 7 days.

Concrete poured in beams, columns, and walls shall be kept wet by continuously sprinkling concrete with water until forms have been removed. After forms have been removed, concrete shall be wetted continuously by one of the above methods for a minimum of 7 additional days. Additional water curing time may be required by the Engineer

when environmental conditions are adverse or when daytime temperatures exceed 95°. Concrete for slabs and footings shall be kept continuously wet through sprinkling, ponding, or immersion for a minimum of 7 days. Additional water curing time may be required by the Engineer when environmental conditions are adverse or when daytime temperatures exceed 95°.

In locations where concrete surfaces are specified to be rubbed, concrete shall be kept wet by continuous sprinkling until rubbing has been completed and then shall be covered after rubbing has been completed. Covering shall be by the application of polyethylene sheeting. In addition to walls and other surfaces to be rubbed, the above shall also apply to exposed beams and columns.

Liquid membrane-forming curing compounds may be used in some cases after completion of the above-stated periods of wet curing, if concurred with in writing by the Engineer. Curing compounds are not permitted on surfaces receiving surface treatments or coatings or on any surface in contact with potable water treatment structures. Curing compounds shall conform to the requirements of ASTM C309, Type 2. The compound should be applied at a uniform rate as specifically recommended by the manufacturer. The method of application shall be as recommended by the manufacturer. Application of the curing compound shall follow the recommendations of the manufacturer and ACI 308. The use of curing compounds, if allowed, shall not be a substitute for the wet curing described above.

Liquid "Cure and Seal" compounds shall be used on all floor slabs in operations buildings, pump rooms, chemical rooms, maintenance buildings, filter galleries (both upstairs and downstairs), electrical buildings or rooms, valve rooms, control rooms, laboratories, offices, and other buildings, except such compounds shall not be used on slabs or portions of slabs that will receive carpet, tile, or other type of surface treatment. All slabs, whether receiving the "Cure and Seal" or not, shall be water cured. Apply compounds in accordance with manufactures recommendations and ACI 308. "Cure and Seal" compounds shall be Diamond Clear VOX by Euclid Chemical Company, or equal.

When placing concrete in walls, the concrete shall be deposited in tremies or by other approved methods to prevent segregation and the accumulation of hardened concrete on the reinforcement above the level of the concrete. The lower end of the tremie or spout shall be not more than six feet above the surface of the concrete.

All concrete shall be placed in continuous horizontal layers of such depth that no dry to set (cold) joints are formed, however not more than 30 minutes shall elapse between placing of successive layers. The depth of any layer shall not exceed two feet.

The concrete mix shall be so placed (without segregation) and compacted (without excessive vibration) that there will be no water on the surface of the finished layer or on the surface of the finished pour. Should water appear on the surface of any layer the pour shall be stopped, the water shall be removed, and the pour shall not be continued until corrective measures satisfactory to the Engineer are employed.

5.1 MIXING AND PLACING – SIDEWALKS, DRIVEWAYS AND PATHWAYS

For sidewalks, driveways and other miscellaneous pathways, concrete mix design and placement will conform to ALDOT Standard Specifications 501 and 618. Drawings may contain special requirements, for reinforcements, finishes, etc.

6.0 TEST

Certification of mill test from the manufacturer of cement and steel will be required. The Contractor shall submit a representative sample of aggregate to a laboratory approved by the Engineer for a design mix as follows:

100 Pounds Fine Aggregate
150 Pounds Course Aggregate
50 Pounds of Cement
3 Ounces of Additive

All concrete shall be designed to test a minimum of 4000 psi in 28 days, and shall break at or above 4000 psi in 28 days, but in no case will a mix of less than 6½ bags of cement be acceptable regardless of test break results. Cylinder testing as required by A.S.T.M. C-39 will be used for testing and be at the expense of the Owner. All concrete placed on the project, unless specifically otherwise noted, shall have all the cylinders represented by the pour break at a 28-day minimum strength of 4,000 psi in order for the pours to be considered acceptable. Provide higher strength concrete or grout where required by specifications or plans or by equipment manufacturers.

The specimens (cylinders) shall be carefully prepared, stored, and protected at the project site in a manner satisfactory to the Engineer until they are ready for transportation to the Testing Laboratory. The cylinders shall be stored on a level bed in a moist environment, and shall be protected against movement, surface water, ground water, rainfall, and cold weather. The furnishing of slump cones, screeds (knife edges), and containers for the specimens shall be the responsibility of the Contractor.

7.0 WATERTIGHT CONCRETE AND TESTING

Basins, tanks, or any structure built to contain liquid shall be watertight. As soon as possible, the Contractor shall fill structure with water and if leakage should develop, the contractor shall correct leakage in a manner acceptable to the Engineer. Duration of leakage test shall be not less than 72 hours with no leakage allowed for this period for approval. The tests shall be repeated until leakage has been stopped with the work not being accepted by the Engineer until it is watertight. Before testing watertight structures, the structure roof or other bracing shall first be poured and cured and all concrete must achieve its full strength. No backfill shall be added until structure has been accepted as watertight.

Minor concrete repairs for leaking walls shall be fixed by means to stop all leakage. Major concrete cracks in walls shall be repaired by flexible pressure injected sealant or material by a specialty contractor such as Barton Southern Company who has experience in such repairs. All exposed concrete shall be re-rubbed and finished such that the entire wall has a uniform pleasing appearance.

8.0 REINFORCING STEEL

Reinforcing steel used shall be Billet Steel, Grade 60. Steel shall comply with the latest revisions for the following:

Type	ASTM Designation
Billet Steel Bars	A-615, Grade 60
Welded Steel Wire Fabric	A-185, Grade 65
Dowels Across Expansion Joints	A-675, Grade 80

Reinforcing shall be properly bent and free from rust, mill scale, and other foreign substance. Reinforcing bars should not be bent or straightened in a manner that will injure the materials. Bars with kinks or improper bends should not be used. Bars shall not be bent in the field except for realignment of #7 through #18 rebar up to about a 30° bend and #3 through #6 rebar up to about a 45° bend. No bars partially embedded in concrete shall be field bent. Exposed reinforcement bars for future extensions shall be protected from corrosion and concrete splatter.

Reinforcing shall be in accordance with the Plans and approved Shop Drawings. The Contractor shall furnish reinforcing bar details and marking or erection diagrams to the Engineer for review. These shall be on the same size drawings as the Engineers' Plans, and shall be clear and legible. Any splicing, other than that shown in the Plans or Shop Drawings, shall be approved by the Engineer.

When it is necessary to splice reinforcement at points other than shown on the Drawings, the character and location of the splices shall be detailed through the submittal process for review by the Engineer. In such places the bars shall be placed in contact and securely wired. Wherever possible splices in adjacent bars shall be staggered. Lengths of splices or laps shall be a minimum 30 bar diameters unless indicated otherwise in the Drawings. In no case shall length of lap be less than that required by ACI 318 or the CRSI *Manual of Standard Practice*, latest edition.

Mechanical connections should be installed in accordance with the manufacturers' recommendations. A full mechanical connection is one in which the bars are connected to develop in tension or compression at least 125 percent of the specified yield strength of the bar. For welded splice, when required, the bars shall be butted and welded to develop in tension at least 125 percent of the specified yield strength of the bar. Welding shall conform to the current edition of "Structural Welding Code - Reinforcing Steel" (ANSI/AWS D1.4).

The clear distance between parallel reinforcing bars in a layer should not be less than the nominal diameter of the bars, 1 inch or 1-1/3 times the nominal maximum size of the coarse aggregate, whichever is greatest. Where parallel reinforcement is placed in two or more layers, the bars in the upper layers should be placed directly above those in the bottom layer with the clear distance between layers not less than one inch. All reinforcements shall be protected by a thickness of concrete as follows:

A. For concrete deposited against the ground without the use of forms, the steel shall have 3 inches cover, except a 4 inch slab shall have 2 inches of cover.

B. For concrete exposed to the weather or to the ground or to water or to the inside of wet wells, clearwells, etc., with the use of forms, the concrete cover over the steel shall be 2 inches.

C. For slabs and walls not exposed to the ground or to the weather or to the

ground or to water or to the inside of wet wells, clearwells, etc., the steel concrete cover shall not be less than 3/4 inch for #11 bars and smaller or 1-1/2 inch for #14 and #18 bars. Underside of slabs exposed to sewer and other harsh affects shall have 1 inch of cover for 6 inch slabs and 1-1/2 inches for 8 inch and greater slabs.

D. For beams, girders, and columns not exposed to the ground or to the weather, the steel concrete cover shall not be less than 1-1/2 inches.

The steel supplier shall provide bent spacers of #3 bars. Provide larger bars where needed for proper support. The Contractor shall coordinate the dimension and details, etc., with the method in which the rebars will be arranged and supported to insure proper clearance. These spacers shall be used in walls and slabs to ensure that the steel from the concrete surfaces has proper clearance as outlined above. Reinforcing shall be maintained at the required clearance from the forms during the pouring and hardening of the concrete. Chairs shall be used to maintain clearance on slabs. Concrete supports poured on jobsite may be acceptable for slabs poured against ground if the proposed method of producing and utilizing the supports is acceptable to the Owner. The use of stakes, stones, or brick to support reinforcing shall not be acceptable. Except as modified herein, or in the Plans, bar supports and spacing of same shall be per recommendations set forth in the CRSI *Manual of Standard Practice*, latest edition. Steel wire bar supports in concrete areas where soffits, slabs, or ceilings are exposed to view or are painted shall be Class 1 or Class 2, Types A or B; Class 3 shall be acceptable in other areas.

Pre-tieing of steel mats shall generally not be allowed. Where allowed, it shall be the responsibility solely of the contractor to coordinate all openings through the steel and all other details. Vertical and horizontal bars of pre-tied mats shall align exactly with adjoining steel and dowels, etc. If extra bars must be cut for openings through mats due to the pre-tie operation, the Contract shall field install full length bars to replace those extra bars cut. This shall be in addition to all other bars required by other details.

9.0 FORM WORK

The Contractor shall furnish, maintain, erect, and remove all forms, molds, centers, and bulkheads, templates or profiles, and shall furnish and maintain all screeds and bonding grooves, keyway materials or other forms necessary for construction of the concrete included in this Contract. Except as hereinafter specified otherwise, forms shall be of wood or metal, and of type and condition as approved by the Engineer. Only joints indicated in the Plans or approved in the Submittals will be permitted.

The Contractor shall be responsible for the design, erection, bracing, sealing, and finishing of the form work in such a manner as to contain and support the concrete during placement. All form work is to be well built, substantially unyielding, tight, properly spaced, set true to line and elevation, properly braced, and anchored. Forms shall be held by means of wall clamp ties. Wire ties will not be permitted. No tie shall be used which are removable and leaves a hole through the concrete section, or which leaves metal within one inch of the surface of the concrete. Form ties shall be equipped with integral waterstops.

Bevel strips shall be placed at all corners of walls, at all points where angles occur in walls and at all tops (both edges) of exposed walls. All such corners, angles, or

intersections exposed to view shall be chamfered.

The inside contact surfaces of forms shall be coated with non-staining mineral oil before being set in place. For potable water structures, oils shall be approved for use in potable water applications. Oil shall not be allowed to contact reinforcing steel or surfaces to which the concrete is to be bonded. Contact surfaces of forms shall have tight, flush, watertight joints, packed and taped where required so as to prevent loss of water or paste. Bottom edges of forms shall be set true and tight against footings or other receiving concrete surfaces, and shall be sealed to prevent loss of water or paste. Forms shall be wet before pouring concrete.

Temporary openings shall be provided at the base of wall forms, beam forms, and column forms to facilitate cleaning. All forms shall be thoroughly cleaned and washed immediately before beginning a pour, and all temporary openings shall be closed. In case of wall pours starting at the base slab or other levels below ground affected by the water tables, the Contractor shall provide pump sumps and pumps to completely remove all wash down water and any water containing silt or debris.

When forms have been erected for some time prior to a pour or have been exposed to changes in weather, the Contractor shall recheck all forms immediately before the pour, and shall make any adjustments necessary to bring the contact surfaces to true horizontal, vertical, or circular lines.

The Contractor shall provide special forms where required for openings in walls and floors for the installation of pipes, gates, flanges, and similar items. Where pipes are already in place, all pipe openings shall be securely blocked or bulkheaded to prevent entrance of concrete, paste, or laitance into the pipes. Where gates, such as flat frame sluice gates or other flat frame gates are to be installed, the wall plate in the area to be occupied by the gate shall be true and even, both horizontally and vertically in order that the gate may be installed watertight and not be warped by uneven drawdown on the gate anchor bolts.

10.0 REMOVAL OF FORMS

The removal of forms shall not be started until the concrete has attained sufficient strength to withstand any live loads that may be imposed by succeeding steps in the construction process. The length of time required between placement of concrete and removal of forms may vary with weather conditions, loading conditions, and particular construction activity in the vicinity of the recently poured concrete elements. In no case, however, shall forms be removed earlier than the following unless the concurrence of the Engineer is first secured.

Beams and Elevated Slabs	14 - 21 Days
Footings and Slabs	1 - 7 Days
Columns and Walls	3 - 7 Days

11.0 FINISHING

All concrete surfaces shall be finished to the elevation shown on the Drawings. Where surfaces of concrete pours are specified and/or indicated to have final finish other than the monolithic concrete, the monolithic pour shall be terminated at such level below the final finish elevation as is correct or suitable for the particular final finish. Those surfaces over

which grout is to be placed for setting or grouting-in of machinery, equipment, bed plate, foot plates, bearing plates, etc., shall be "green-cut" and cleaned prior to the placement of grout. Surfaces specified to receive special finishes shall be prepared as hereinafter specified, or required by the Plans.

Where surfaces to be finished are covered by forms, the forms shall be removed as soon as possible (following specified minimums) to permit finishing work. Immediately following removal of forms all imperfections in the surfaces of the concrete (such as form marks, projections, fins, rough areas, honeycombed areas, pits, mismatched joint marks, tie holes, etc.) shall be corrected by use of cutting tools, grinding tools, patching, plugging, and rubbing. Plastering shall not be permitted. Form tie holes and form bolt holes shall be immediately plugged. Where form ties or form bolts are left in the concrete, such accessories shall be equipped with integral waterstops, and the ends of such accessories shall not be closer than one inch to the surface of the concrete. The holes left in each face shall then be primed with a tack coat of grout mixed with an approved accelerator, a stiff mix of mortar with an approved accelerator tamped in the holes, and the surfaces finished flush with the concrete surfaces.

All interior and exterior concrete surfaces of walls, columns, beams, ceilings, etc., permanently exposed to view above ground, in galleries, rooms, tanks, basins, etc. (from 1'-0" below grade or the low water line upward), structures covered with grating shall have the walls rubbed to 1' below the minimum water level, and the ceiling of structures where the walls require rubbing, shall be rubbed while "green" with a carborundum stone to a smooth, consistent, and uniform even surface showing no marks, joints, pits, pockets, or form grain. All imperfections shall be corrected immediately after removal of forms. Rubbing of surfaces shall begin after imperfections have been corrected and shall be completed within five days after the removal of forms from such surfaces. All rubbing will leave concrete uniform, consistent, and pleasing appearance. If concrete is stained, etc., from subsequent operations such as repair or leaks, the entire area will be rerubbed to accomplish satisfactory results.

All interior floors shall be given a "steel trowel", monolithic cement top finish unless otherwise shown in the Plans or specified. Enough cement finishers shall be employed to complete the finishing work before the cement has taken its initial set. Where such floors are shown to be equipped with floor drains, the surfaces of the floors shall slope evenly to the floor drains. No water shall stand on the finished floors. Floors finished before completion of the work shall be protected from damage by boards, sisal kraft building paper, or other adequate means.

Floors of basins, except those where final grout finish is specified to be swept in by the operating mechanism, shall be screeded to a reasonably smooth and uniform finish with even slopes as indicated on the Drawings. The screeding work shall continue until sufficient paste is brought up to secure a uniform cement/sand (grout) appearance, free from any exposed aggregate. Grout shall be added if necessary to secure the desired appearance. Where floors of basins are indicated to be sloped to floor drains, no standing water shall remain. Floors shall be uniformly sloped as indicated on the Drawings.

Surface of exterior concrete walkways, suspended slabs, and other exterior concrete surfaces subject to foot-traffic, shall be wood float finished and then lightly crossed-broomed. Where these surfaces are indicated to be sloped for drainage, no standing water shall remain.

The Contractor shall construct all curbs, bases, and foundations required for

setting equipment called for in these Specifications or shown on the Drawings. Curbs, bases, and foundation pads shown on the Drawings are for equipment of a particular manufacturer. Should equipment of other manufacturers be furnished, the Contractor shall prepare drawings showing details of curbs, bases, and foundation pads to receive the equipment furnished. These drawings shall be submitted to the Engineer for review. No extra compensation will be allowed by reason of such changes in design of such concrete items.

The treads of all concrete steps and stairs shall be finished by trowel with 3/4 inch thickness, non-slip concrete, applied as dry as practicable at the time that steps are poured, and as an integral part of same. The aggregate for this concrete finish shall contain 33-1/3 percent abrasive aggregate (3/32 inch maximum size) manufactured by the compression and vibration process and 66-2/3 percent crushed stone (3/8 inch maximum size). This top finish shall cover the entire tread back of the non-skid nosing elsewhere specified, and shall be troweled to a smooth, even, level surface. Proportions: 2 cement, 1 sand, 3 aggregate by volume.

12.0 CONSTRUCTION JOINTS, EXPANSION JOINTS, AND WATERSTOPS

Construction joints, expansion joints, waterstops, and joint seals shall be provided at locations indicated or approved in advance by the Engineer. Changes shall be subject to the Engineer's approval. Before concrete is placed against previously poured concrete, the contact surfaces shall be cleaned until completely free of laitance, dirt, and debris. Contact surfaces shall be kept continuously moist between successive pours of concrete and shall be thoroughly wetted immediately before placement of fresh concrete.

Waterstops shall be placed at concrete joints in all structures built to contain water. Waterstops shall be PVC material, dumbbell configuration, 9 inches wide and not less than 3/8-inch thick, ribbed pattern unless shown otherwise in the drawings. Splices of waterstops will be by vulcanizing. All watertight joints, whether waterstop is required or not, will be sealed on the inside face by approved sealants similar and equal to these products: Duoflex by the Sika Corporation or SynthacalkGC2+by Pecora Corporation or equal. The joint shall be prepared (e.g., chamfered, grooved, primed, etc.) in accordance with the sealant manufacturer's recommendations. No nail or wires holes or any type of penetration will be allowed in waterstops.

All expansion joints shall be sealed with backer-rod, primer, and polyurethane sealant. In the case of slabs on grade, the complete sealing process shall be applied only to top surface of joint; in the case of vertical walls the complete sealing process shall apply to joints on both faces of the wall and joints over tops of walls; and in the case of elevated slabs and beams, the complete sealing process shall apply to joints on top surfaces, on edges, and on all exposed undersides. Backer-rod shall be of premium grade polyethylene foam or Rescor type filler material, unless specifically shown otherwise in the drawings. Primer shall be an underwater type primer suitable for the surface conditions to which the joint will be subjected. Primer will be allowed to dry throughly if required by the manufacturer's instructions prior to application of sealants.

All PVC waterstop shipped to the project shall be new and shall not have had a shelf-life (storage after date of manufacture) of greater than eight months. All PVC waterstop received on the job shall be used (closed in concrete on both sides of a joint) within eight months after date of manufacture. The waterstop shall be stored at the job site in an indoor

location and shall be protected against direct sunlight. After the waterstop is set in a concrete pour the exposed half of the waterstop shall be protected against damage resulting from the construction operations and against sunlight. The Contractor shall so schedule his pours that the joint material (waterstop) will be completely enclosed in concrete within eight months after date of manufacture.

Expansion joints for sidewalk or paving slabs abutting structures, for floor slabs meeting columns where columns pass through floor and for concrete aprons meeting ground floor slabs shall, unless indicated otherwise in the Plans, be filled with material meeting the requirements of ASTM Specification D 1751-73 and shall consist of preformed strips of cellular fibers saturated with asphalt.

13.0 GROUT AND CONCRETE ANCHORS

Grout to be swept in as topping for floors of structures equipped with collecting equipment shall be a cement/sand mix in proportion 1:3 and having slump not exceeding 6 inches. Slump may vary according to practice of the representative of the particular equipment manufacturer. Construction grout used for closing in box-outs, filling holes in concrete, patching walls and similar applications shall be non-shrink, expanding type, and shall have a compressive strength of not less than 4500 psi. Machinery grout shall be used for setting all plates, pumps, compressors, engines, generators, and other machinery and equipment. It shall be non-shrink type, and shall have high flow at low water content, high density, and compressive strength not less than 7500 psi. All concrete anchors shall be stainless steel.

All anchors not placed in concrete before a pour will be chemically anchored or mechanically anchored in cured concrete and withstand 15,000-pound pull. The chemical adhesive anchors shall be C6+ By ITW/Red Head or equal. Mechanical anchors shall be Ramset or equal. Chemical anchors must be utilized when the anchored equipment is subject to vibration or if the anchor is subject to moisture.

14.0 FLOTATION

The Contractor shall prevent the flotation of concrete structures during construction.

15.0 FERRULES, OPENINGS, AND RECESSES IN CONCRETE

Suitable alloy-steel sleeves or wall pipe assemblies shall be set in concrete for all small piping of every kind where such piping passes through concrete walls or floors. Such sleeves or ferrules shall be set with reference to their position in the final finish. Where it is found impossible to exactly locate the position of small pipes, openings of sufficient size shall be left in the concrete to allow the necessary latitude for later locating the sleeves and pipes, and after insertion of sleeves and pipes, the holes shall be properly filled with concrete. Annular spaces between sleeves and piping in exterior walls shall be caulked with Link-Seal (or equal) assemblies.

16.0 SETTING FITTINGS, FLANGES, ANCHOR BOLTS, EQUIPMENT ETC.

Where necessary to set flanges for gates or valves, pipes, manhole frames or castings, sleeves, pipe hanger rod inserts, frames, etc., in concrete walls, floors or slabs, particular care shall be taken by the Contractor to insure that all these fittings etc. are properly set in forms, level, plumb, lined up, and properly oriented, etc., the Contractor shall use submittals and other Contractors' or special drawings. The Contractor shall set all anchors, bolts, or other steel work in the concrete forms for motors, or other machinery or equipment in accordance with installation drawings by the supplier of the equipment, or as indicated by the Engineer. Paint all aluminum such as gates, handrails, conduit where placed against concrete or dissimilar metals with approved coating for intended service to protect from corrosion.

A watertight installation shall be secured where piping passes through tank or basin walls. Wall sleeves, wall pieces, and pipe to be placed in concrete walls shall first have tar coating on outside of the pipe or fitting burned off before the pipe is grouted or monolithically cast in place. Such pipe pieces may be furnished with outside "bare".

17.0 SETTING ELECTRIC CONDUIT AND DEVICE BODIES

Electrical conduit shall be installed in the concrete work as indicated, and provision shall be made for their protection during the pouring of the concrete. Outlet boxes shall be located with reference to the final floor, wall, or ceiling finish. Device bodies shall be so secured to the forms before the concrete is poured. Any galvanized conduit in potentially wet areas require Roboy PVC coating. Aluminum conduit entering concrete shall receive a bitumastic coating.

Prior to placing conduit, the Contractor shall use approved manufacturer shop drawings to accurately determine the correct locations and dimension for all conduit stubups, electrical gear, control panels, and all other facilities requiring power, etc.

STANDARD SPECIFICATION
FOR
STRUCTURAL STEEL AND MISCELLANEOUS METAL

SECTION 2-2

1.0 MATERIALS

All materials shall be furnished complete with all accessories required for final erection and setting. All steel items shall be furnished with shop coat of rust-inhibitive primer unless specified to be hot-dipped galvanized or to receive protective coating requiring surface preparation by sandblasting on the site immediately prior to application of final coating. Aluminum shall be Alloy 6061-T6 except where specified or shown otherwise. Structural steel shall be new and conform to ASTM Specification A36. Cast Iron shall be cast from high strength, fine grain cast iron conforming to the requirements of ASTM Specification A48. All irregularities shall be ground smooth to secure uniform surface. All materials, except cast iron, shall be stored in such a manner as to prevent contact with the ground. All shop connections shall be welded. All welding shall be shielded arc welding meeting latest standards of the American Welding Society (AWS). All welding work shall be performed by welders qualified by procedures, tests and documentation as prescribed in AWS D1.1, AWS B2.1 and the AWS Certified Welders Program.

2.0 SHOP DRAWINGS

For dimensions and general arrangement of structural steel and miscellaneous metals, reference shall be made to the Drawings. The Contractor, before commencing work, shall check all governing measurements at the site and the elevations of all structures on which work is to be set. If any inconsistencies in measurement are found, they shall be referred to the Engineer. The Contractor will be held responsible for the working out of details, and no extras will be allowed because of his failure to inform himself in regard to site conditions. Where no details are indicated, the Contractor shall submit details prepared in a workmanlike manner from measurements taken at the site in order to insure proper fit. Measurement taken for the fabrication and installation of grating, plates, railings and stairways shall be taken at the site subsequent to the placing of piping, valves, machinery and other items that may affect the details of construction. The Contractor shall carefully coordinate all aspects of the work prior to making the submittal. The Contractor shall submit to the Engineer before beginning the work the necessary Shop Drawings. The checking of the Drawings by the Engineer does not relieve the Contractor of any responsibility regarding measurements and correct amount of material.

3.0 HANDRAILS

All handrails and posts shall be aluminum Alloy 6063-T6, nominal 1-1/2 inch diameter, Schedule 40. Post extensions below floor concrete surfaces shall be grouted in ferrules provided in concrete. All aluminum shall have a clear anodized finish. Flanges and

stainless steel anchor bolts shall be provided for anchoring railings to walls. All railings installed shall fully comply with OSHA requirements.

Handrails shall be designed to withstand a 200# concentrated load applied in any direction to the top rail. The handrail shall be made of pipes joined together with component fittings. Samples of all components, bases, toe plate and pipe must be submitted for approval. Components that are glued or pop riveted at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware. Aluminum surfaces in contact with concrete, grout or dissimilar metals will be protected with a coat of bituminous paint, mylar isolators or other approved material.

Posts shall not interrupt the continuation of the top rail at any point along the railing including corners and the end terminations (OSHA 1910.23). The top surface of the top railing shall be smooth and shall not be interrupted by projecting fittings. Toe plate shall conform to OSHA standards. Toe plate shall be a minimum of 4" high and shall be an extrusion that attaches to the posts with clamps which allow for expansion and contraction between posts. Toe plates shall be set 1/4" above the walking surface. Toe plates shall be provided on handrails as required by OSHA and/or as shown on drawings. Toe plates shall be shipped loose in stock lengths with pre-manufactured corners for field installation. After installation, railings shall be checked for final alignment, using a tightly drawn wire for reference. The maximum misalignment tolerance for railings shall be 1/8 inch in 12 feet. Bent, deformed, or otherwise damaged railings shall be replaced.

All removable handrails and posts, etc., shall have drain holes to remove water in the receiver bracket or pipe sleeve port or concrete in which removable posts or handrails are inserted. Where the handrail must be interrupted (such as at slide or sluice gate frames or operators, etc.) carefully coordinate the handrail with the equipment necessitating the interruption such that the opening (and guard chain if appropriate) is as short as practical.

4.0 BRACKETS, SUPPORTS, AND HANGERS

The Contractor shall furnish and install hangers, brackets, supports, stem guides, and items as required for pipe installation. Brackets shall be fabricated steel or cast iron. Steel brackets and supports shall be hot-dipped galvanized after fabrication or primed according to the Specifications. Anchor bolts shall be stainless steel.

All piping shall be securely supported when hangers are required and conform to the ANSI Code for Pressure Piping B31.1.0, and MSS Standard Practice SP-58. All rigid hangers shall provide a means of vertical adjustment after erection. Maximum spacing between pipe supports shall be in accordance with the following with a minimum of 1 hanger per adjacent pipe joint.

Pipe Size (Inches)											
1/2	3/4	1	1-1/2	2	2-1/2	3	3-1/2	4	5	6	8
Maximum Span (Feet)											
5	6	7	9	10	11	12	13	14	16	17	18

For pipe of sizes greater than 8 inches, two hangers or supports shall be provided for each full length section of pipe. Hanger rods shall be hot rolled steel rod meeting

the requirements of ASTM Specification A36. Size and spacing of rods shall be such that load carrying capacities of rods based upon root area of thread will not be less than 2.0 times the actual load on the hanger. Structural attachments shall be beam clamps. Where piping is supported from concrete slabs, the Contractor shall install concrete inserts for attachment of hanger rods. Ceiling flanges and anchor bolts may be used for attachment of hanger rods for smaller piping subject to the approval of the Engineer. All pressure piping shall be adequately braced at all points of change in direction of piping runs.

Pipe hangers shall be capable of supporting the pipe under all operating conditions; shall allow free expansion and contraction of the piping, shall prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment; and shall be so designed that they cannot become disengaged by movements of the supported pipe.

5.0 GENERAL – ANCHORS, BRACKETS, AND SUPPORTS

The Contractor and/or manufacturer shall provide size, type, and material for anchors for all equipment and other components used on the project. The Contractor shall properly install all anchors, brackets, supports, etc. and manufacturer's representative shall assure itself that all of these were installed properly. Anchor bolts shall be stainless steel unless noted otherwise. Brackets, supports, etc. shall not protrude into walkways or walkspaces, or any thoroughfare or work area where they may produce a tripping hazard or any bodily injury hazard.

When allowed, galvanized threads, bolts, and nuts are used, spray paint nicked areas with galvanizing paint. Also, all pipe wrench marks and other scratches will be spray painted to prevent rusting. Clean off threading compound rust stains, splatter from whatever sources, lettering, or any source or foreign substance on all exposed metal.

In areas conducive to corrosion, all fasteners, nuts, bolts and washers shall be stainless steel. Equipment in such areas will also use stainless steel fasteners on all appurtenance and components.

Where required to avoid spalling and approved by Engineer, use epoxy anchors (in strict accordance with the epoxy manufacturer's recommendations) to mount handrail or equipment. Epoxy anchors shall be used where there is a potential for vibration or potential for spalling of concrete. Epoxy and anchoring chemicals shall be carefully selected by the Contractor to handle the conditions and type loading that may be encountered by the anchors. Install all anchor systems in strict accordance with the manufacturer recommendations.

6.0 METAL STAIR ASSEMBLIES

Metal stair assemblies shall be furnished and installed where indicated on the Drawings and at the angles indicated with handrailings and nonslip treads. Handrails shall be welded on job site and reprimed. Steel steps will be primed before shipment in accordance with the Specifications.

Stair assemblies shall be fabricated from aluminum shapes and extrusions in accordance with details shown on the Drawings. Aluminum shall be Alloy 6063-T5 or Alloy 6063-T6. Stair assemblies shall be complete with channel stringers, foot plates or angles,

hanger plates or angles, safety treads, carrier angles and handrailing. Handrailing shall be as specified. Stair assemblies shall be anchored to concrete floors (top and bottom landings) by means of stainless steel anchor bolts. Standard stair assemblies shall be similar and equivalent to assemblies as fabricated by Thompson Fabricating Company, Inc.

Stair assemblies (including their supports and attachments, etc.) shall as a minimum be designed by the metal fabricator for the loads required by the Standard Specifications. Design for heavier loading if indicated or required elsewhere.

7.0 SKYLIGHTS

Skylights shall be factory assembled units, self curbing with acrylic plastic translucent domes, aluminum retaining frame, aluminum curb frame with integral condensation and seepage gutter, and closure between curb frame, dome, and retaining frame shall be one piece extruded vinyl gasket. All screws and screw nails shall be stainless steel. Curb frame shall be bedded on mastic seal on top of curb. Where skylights are set on roof curbs, roof flashing shall extend up behind curb frame lip to base of curb frame. Where skylights are set on top slabs, the space between lip of curb frame and outside face of curb shall be closed with approved sealant. Skylights shall be equal to Duro Last.

8.0 FLOOR GRATINGS

Floor gratings shall be furnished as panels and shall be furnished and installed as indicated on the Drawings. All gratings shall be held firmly in place by removable non-corrodible metal clips. Clips shall not project above surface of grating or walkway. Openings cut in floor gratings shall be framed with 1/8" bar stock of same depth as grating. Floor grating shall be fabricated from straight extruded aluminum I-bars laced together by interlocking cross-bridges or spacers, securely fastened to the bearing bars. Ends of spans shall be closed with flat bars to form box panels. Tread surfaces shall be slip resistance with longitudinal grooves performed by the extrusion process. Grating shall be designed by the grating fabricator to safely support 250 psf with a deflection not exceeding 1/240 of the span or 1/4 inch. Grating shall be two (2) inches deep. Grating shall be Bordens I-bar or equal.

Where grating spans exceed 5'-0", and at other location where needed, the grating Fabricator shall design and provide aluminum support beams and all appurtenances to carry the maximum load of the grating as stated above. The beams shall be furnished with appropriate adjustable aluminum supporting clips, attachments, and stainless steel nuts and bolts. The support beam systems are not necessarily shown on the drawings. Provide supports (not shown in drawings) on either side of all valve operators and floorstands, etc., that are supported by or adjacent to grating. Where access to areas beneath grating may be needed, provide narrow sections of grating to facilitate its removal.

All grating, frames, supports, and all appurtenances shall be properly embedded and installed such that no uneven surfaces or potential tripping hazards are created.

The Contractor shall install embedded grating supports, surface mounted grating supports, and any other types of grating supports in a manner such that the grating will be properly, fully, and securely supported. The grating shall be provided by the Contractor in sufficient length and width that it cannot slip off the supports even if no attachment (hold-down) clips are provided when it is installed in the worst possible configuration. Even when

one end of the grating is installed such that it occupies the maximum possible amount of bearing surface, there shall be sufficient grating resting on the opposite support to safely carry the full design loading of the grating. With the grating flush against one end, the minimum seat at the opposite end (i.e. the end with the least bearing surface) shall not be less than 1.5 inches.

Grating supports and grating shall be installed such that the top of grating and embedded frames is exactly flush with adjacent concrete or other adjacent surface. The grating must not be installed in a manner that creates any potential tripping hazard such as may occur if the grating and adjacent surface were not at the same elevation.

The Contractor shall take whatever measures are necessary to correct non-conforming grating to the satisfaction of the Owner.

If the grating must be removed during the startup, final inspection, or punch list correction or similar periods, the Contractor shall replace and reinstall all attachment (hold-down) clips such that all clips are secure when all work has been finally completed.

If hinged sections of grating are used, they shall be designed by the Contractor and installed such that the failure of the hinge or its attachment shall not allow the hinged section to fail. If the hinge fails, the grating shall remain supported by beams that span the complete opening covered by the grating or other satisfactory supports.

If removable sections of grating cutouts (within a larger section of grating) are used, they shall be supported by beams that span the complete opening covered by the grating and that are mounted below the stationary grating. It shall not be acceptable to weld supports to the stationary grating or use other methods less dependable than fixed beams.

9.0 FLOOR PLATES

Metal floor plates shall be cast iron, steel or aluminum as indicated on the Drawings, non-slip type of either diamond or checkered pattern, and set in frames so that top of plate is flush with floor. Frames shall match floor plates and be integrally set in monolithic concrete, anchored by means of embedment clips or anchor bolts. Floor plates shall be accurately fitted to frames. Cast iron floor plates and frames shall be machined to provide even bearing. Steel and aluminum floor plates shall be reinforced where necessary because of span so as to meet load requirements of 250 psf.

10.0 FLOOR VAULT ACCESS DOORS

Floor doors or vault doors shall be of aluminum construction and shall be of size and dimensions as shown on the Drawings. Frames shall be fabricated from extruded aluminum channel metal thickness of not less than 1/4" thickness, and shall be equipped with anchor flange around perimeter for embedment in monolithic concrete. Drainage coupling; 1-1/2", shall be located in bottom of channel frame; and drain piping shall be furnished and installed to a location shown in the drawings or, if no location is shown, to a location (sump in structure or gravel bed in ground, etc.) as determined by the Engineer during construction. Doors shall be single-leaf or double-leaf as indicated with diamond patterned plate not less than 1/4" thickness, reinforced to withstand a live load of 300 psf and be watertight construction. Door (each leaf) shall be equipped with heavy forged brass hinges, stainless steel pins, spring operators, automatic hold-open arm with release handle, and snap lock with removable handle.

Finish of aluminum shall be "mill finish" with bituminous coating applied to exterior of frame. All hardware shall be stainless steel. Floor doors shall be as manufactured by Thompson Fabricating Company or Bilco.

11.0 GUARD CHAINS

Guard chains shall be furnished and installed for closing between terminations of pipe railing, at ladders, and elsewhere when shown on the Drawings or required by gates or other appurtenances that interrupt handrail. Guard chains shall be welded steel link 3/16" round stock, weighing not less than 43#/100 LF. Each end of each chain length shall be equipped with stainless steel snap hooks to fasten in eyes of 5/16" eye-bolts. Chain and accessories shall be stainless steel. Eye-bolts shall be stainless steel, shouldered type, bolted through terminal posts of railing or anchored at other terminations, with adapter blocks (aluminum) each side of post. Guard chains shall be double drape for 2-level railing system. Terminal posts shall be stiffened by reinforcing bars.

12.0 LADDERS, RUNGS, AND STEPS

The Contractor shall furnish and set all metal ladders, ladder rungs, and steps as shown on the Drawings. Suitable wall plates or legs and anchor bolts shall be provided as anchorage fittings to set the items securely against concrete, masonry walls, or on floors. All anchor bolts shall be stainless steel.

Safety cages and extension side members shall be provided with ladder assemblies where indicated on the Drawings. All ladder/assemblies and accessories shall be aluminum Alloy 6063 unless otherwise noted or indicated on the Drawings. Steel ladders, where indicated, shall be hot-dipped galvanized after fabrication. Ladder rungs shall be flat topped. Single ladder rungs or steps (individually set in concrete) shall be aluminum Alloy 6063, and shall terminate in walls or anchorage with 3" hook (L). Lengths of ladder rung anchors encased in concrete shall be shop coated with coal tar (bitumastic) or zinc chromate primer. Rungs shall be similar and equal to Neenah R-1982-W.

Cast iron manhole steps, where called for or indicated on the Drawings, shall be 17" wide x 13-1/2" deep, 2-bar step, plastic coated, insert depth not less than 7-1/2". Cast iron shall be ASTM A48, not less than Class 30.

Man-assisting grabs shall be furnished and installed at all ladders. Grabs shall be fabricated from 2" aluminum pipe and aluminum bars. Aluminum pipe shall be stiffened by reinforcing bars.

13.0 LINTELS

Lintels of standard rolled structured steel shapes shall be provided for all openings through or in masonry walls. Lintels shall be of sizes and lengths shown below unless otherwise noted in the plans. Miscellaneous loose lintels, such as required over heating and ventilating grilles, electrical panel boxes, and other similar miscellaneous openings not specifically shown on the Drawings, shall be 3-1/2 inches x 4 inches x 5/16 inch angles for each 4 inch thickness of masonry. Lintels shall be shipped primed unless galvanized lintels are called for in the drawings. Where lintels are made up of two or more members, they shall be

fabricated in the shop, and bolted or welded together, with separators if required, and plates where required. Masonry bearing at each end of lintels shall not be less than 6 inches.

Clearspan Opening	*Lintels - Steel Angles*	
	Brick	***Block***
4' or less	3 1/2" x 4" x 5/16"	2@ 3 1/2" x 4" x 5/16"
5'	3 1/2" x 5" x 5/16"	2@ 3 1/2" x 4" x 5/16"
6'	3 1/2" x 6" x 5/16"	2@ 3 1/2" x 4" x 5/16"
7'	4" x 6" x 3/8"	2@ 5" x 3 1/2" x 5/16"
8'	4" x 8" x 3/8"	2@ 5" x 3 1/2" x 5/16"

Where 12" block is used, each lintel horizontal ledge shall be approximately 4-1/2" such that entire cavity of block is concealed. The height of the lintel in 12" block shall be 6" minimum.

Note: Load bearing cavity walls require 2 lintels to be welded and attached to allow equal defection in both wythes. Block lintels requiring two units shall be welded in shop.

Note: If the clearspan of the opening exceeds that shown in the above table, or if the wall configuration dictates a different lintel, and if no detailed lintel is called for on the drawings, the Contractor shall provide a design consisting of a heavy W-shape structural steel member, reinforced and extended as required, designed to handle the maximum loading (including monorail or crane load if applicable). The design shall be coordinated with the masonry and all other aspects of the opening. The design shall be developed by and stamped by a licensed professional engineer.

14.0 STRUCTURAL AND MISCELLANEOUS ALUMINUM

Unless otherwise noted, all materials and work shall conform to applicable provisions of the Aluminum Association, "Standard for Aluminum Structures". All members shall be Aluminum Association standard structural shapes. Fabrication work shall be in accordance with current industry practice. Connections not specifically detailed on the Drawings shall develop the full strength of the least strength member of the connection. Unless otherwise noted, connections shall be all-bolted, bearing type, utilizing stainless steel bolts and nuts equipped with a helical spring lock washer under the stationary element (bolt head or nut) and a flat washer under the turned element. A sufficient number of bolts shall be provided in each connection to develop the shear strength of the members.

Structural aluminum shall be erected so that individual pieces are plumb, level, and aligned within a tolerance of 1:500. The elevation of horizontal members shall be within 1/16" of the required elevation. Baseplates shall be set level in exact position and grouted in place.

STANDARD SPECIFICATIONS

ARCHITECTURAL

STANDARD SPECIFICATION
FOR
PAINTING

SECTION 3-1

1.0 GENERAL

Paint work shall consist of furnishing all labor, materials, scaffolding, and equipment necessary for the complete finish coating of all equipment, piping and appurtenances, exposed structural work, concrete surfaces, masonry surfaces, woodwork, miscellaneous iron work and similar items except those surfaces specifically excepted. Where items are not specifically mentioned as requiring painting work but not specifically excepted, they shall be finished in the same manner as specified for similar items. It is the intent of these Specifications that the painting work be complete, and that no items of equipment, structural components, or surface normally requiring finish coatings be left unpainted. In general, exterior brick surfaces, concrete walls of basins, factory finished items, aluminum, stainless steel, and galvanized items, shall not be painted, except as hereinafter specified. Gypsum wall board shall be painted as noted on the Drawings or as specified in the Standard Specification for Gypsum Wall Board.

2.0 STANDARD OF QUALITY

Products of Tnemec Company, Inc., North Kansas City, MO is established as a standard of quality. Equal products may be approved by the Engineer. An "or equal" product will not be approved that decreases from that specified hereinafter recommended dry film thickness or the number of coats to be applied, or that changes the generic type of coating, or that fails to equal or exceed the manufacturer's printed performance data of the specified product(s) as specified hereinafter. Tank painting shall comply with AWWA D-102, Steel Structures Painting Council SSPC-PA2 as applicable, approved paint manufacturer's specifications, and as specified herein.

All paint used on surfaces which will be in contact with potable or treatable water shall be guaranteed by the paint manufacturer to be suitable for the intended surface and not to be a hazard to health. Any paint which cannot be so guaranteed, whether or not specified by manufacturer and product designation, shall not be used.

All paint used for intermediate and finish coats at sewage treatment plants and sewage pumping stations where hydrogen sulfide may be present, shall be guaranteed by the paint manufacturer to be fume proof and suitable for sewage plant atmosphere containing hydrogen sulfide. Any paint that cannot be so guaranteed shall not be used.

3.0 PREPARATION OF SURFACES

The Contractor shall properly prepare surfaces prior to proceeding with work and shall be held responsible for any poor work caused by improperly prepared surfaces. The application of the first coat of paint by the Contractor shall be construed as an acceptance by him of the responsibility for the condition of the base. Preparation of surfaces shall be as generally outlined below unless recommended otherwise by the manufacturer and approved in advance by the Engineer.

All surfaces shall be thoroughly cleaned and free from all dirt, oil, grease, rust, weld slag, projections, and other foreign matter before priming. This cleaning shall be done by the use of sandpaper, steel scrape, wire brush, or sandblasting as required. Where required, metal surfaces shall be cleaned with a liquid solvent to remove dirt or grease before application of paint materials. Metallic surfaces on which fluids have been used shall be thoroughly cleaned before any paint is applied. Where rust or scale is present, the Contractor shall prepare surfaces in accordance with these Specifications. He shall sandblast or thoroughly wire brush surfaces before priming. Primer shall be applied immediately after surface preparation within the same day and before rusting has begun. The Contractor shall repair all items that have been shop primed or finished coated (excluding items to be prepared and coated onsite) that have become damaged.

A. Metal
   1. All Metal. Grind smooth and remove rust, scale, and foreign materials.
   2. Submerged Metal. SSPC-SP10-63, Near White Blast.
   3. Non-submerged Metal. SSPC-SP6-63, Commercial Blast.
   4. Machinery and Equipment. SSPC-SP2-63, Hand Tool.
   5. Non-ferrous Metal. All non-ferrous metal shall be SSPC-SP1 solvent cleaned followed by abrasive blasting in accordance with SSPC-P 7 Brush Off Blast Cleaning to create a uniform profile of 1.0 – 2.0 mils.
   6. Submerged Ductile Iron (OD): NAPF 500-03-04: "External Pipe Surface Condition".

B. Masonry. Repair damaged areas, brush-off blast, and wash to remove loose materials.

C. Submerged Concrete Surfaces. Abrasive blast to provide adequate profile for coating system (Reference SSPC-SP 13. ICRI CSP 5).

D. Wood. Patch damaged areas, sand, dust, and dry before paint application.

E. Tar-Coated Surfaces. Tar-based coating shall not be allowed.

Steel, ductile iron, cast iron, and other ferrous metal surfaces not to be immersed in liquid shall receive one shop coat of N140 Pota-Pox Plus applied at 7.0 - 9.0 mils DFT. Such surfaces shall be prepared for shop coating in accordance with Steel Structures Painting Council Specification or NAPF Standards referenced herein. Shop coats shall be compatible with primers and finished coats specified herein for subsequent field application.

After receipt of such components, and proper repairs are completed if necessary, surfaces of components shall be prepared as follows:

- Shop Primed Steel Surfaces Submerged or in Vapor Zone Service (i.e., within a 10 ft envelope along/around contained process streams/water-levels that are open to atmosphere and everywhere within an enclosed process structure): All areas damaged during shipping and installation shall be abrasive blast cleaned in accordance with SSPC-SP 10 Near White Blast Cleaning. All areas of intact shop primer shall be abrasive blast cleaned in accordance with SSPC-SP 7 Brush-Off Blast Cleaning to provide a unform anchor profile. All edgers shall be feathered.
- Ductile Iron Pipe Surfaces Submerged or in Vapor Zone Service: All areas damaged during shipping and installation shall be abrasive blast cleaned in accordance with NAPF 500-03-04: "External Pipe Surface Condition". All areas of intact shop primer shall be abrasive blast cleaned in accordance with SSPC-SP 7 Brush-Off Blast Cleaning to provide a unform anchor profile. All edgers shall be feathered.
- Non-Submerged Steel and Ductile Iron Surfaces: All shop primed surface shall be power washed in accordance with SSPC WJ 4 Light Cleaning (minimum 3,500 psi) to remove all dirt, dust, chalk, loose paint, as well as any other foreign matter. All areas where the shop primer has been damaged shall be cleaned in accordance with SSPC-SP 11 Power Tool Cleaning to Bare Metal or abrasive blast to an SSPC-SP 6 Commercial Blast Cleaned Surface.
- Galvanized Steel: Where galvanized surfaces are specified to be painted or coated, such surfaces shall be abrasive blasted in accordance with ASTM D 6386 to provide a uniform 1.0 – 2.0 mils anchor profile

Where steel, cast iron, ductile iron, or other ferrous metals (such as motor housings, stands and similar items) are received on the job with finish coats already applied, cleaning shall be in accordance with Steel Structures Painting Council Specifications (SSPC-SP1, SSPC-SP2, SSPC-SP7), as required. A tie coat shall be applied in accordance with the painting schedule. Factory applied coatings shall be compatible with field coatings specified. Steel and other ferrous metals surfaces to be immersed in liquid shall be sandblasted in the field in accordance with Steel Structures Painting Council Specification for While Metal Blast Cleaning (SSPC-SP10). Ductile iron surfaces which will be immersed in liquid shall be cleaned in accordance with SSPC-SP6 Commercial Blast Cleaning.

Concrete and masonry surfaces shall be allowed to age for at least 30 days before coatings are applied. Concrete surfaces (walls, floors, beams, columns, ceilings) specified to be painted or coated shall be properly cleaned and etched to secure a granular surface free from glaze (SSPC-SP 13/ICRI CSP 1-2). When etching has been completed, the surface shall be rinsed, tested, and neutralized if required. Concrete surfaces specified to receive epoxy coatings shall be sandblasted or mechanically abraded in accordance with SSPC-SP 13 /ICRI CSP 3-5 (or as recommended by the manufacturer) to remove all laitance and surface film and shall produce a profile suitable for the specified coating. Where it is found that etching of high density precast concrete items (such as hollow core roof slabs) shall not provide adequate grip for standard masonry coatings, the Contractor shall use a coating

particularly suitable for application on such surfaces, and such coating shall be applied at no extra cost to the Owner. Concrete block masonry surfaces shall be cleaned and prepared for painting by scraping or wire brushing (SSPC-SP2) or by air blasting. Concrete floors, where specified in the Plans or Specifications to be painted, shall be prepared by mechanical means in accordance with the manufacturer's instructions. All concrete to be coated shall be tested for moisture vapor transmission in accordance with ASTM F1869. Should readings in excess of 3lb per 1,000 square feet be obtained, the surface shall be treated with Tnemec 208 Epoxoprime MVT in accordance with the manufacturer's instructions.

The Contractor shall clean wood surfaces to be painted of all dirt, soil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. He shall smooth these finished surfaces exposed to view, using sandpaper and shall dust them off. He shall scrape and clean small, dry seasoned knots before application of the priming coat. After priming, he shall fill holes and imperfections in finish surfaces with putty or plastic wood filler. He shall sandpaper smooth the filled holes or imperfections when the putty or wood filler has dried and cured.

4.0 APPLICATION

Unless approved in writing by the manufacturer and agreed upon in advance by the Engineer, no painting will be allowed until the paint manufacturer's representative is on the job. All painting will be accomplished in accordance with the paint manufacturer's specifications. The paint manufacturer's representative shall test all paint mil thickness and holidays in the presence of the Engineer. The Contractor will be required to perform Holiday Testing as soon as the work is sufficiently cured according to the manufacturer's recommendations. All pinholes and deficiencies will be repaired. Any coating not meeting specifications will be reworked. Adequate ventilation which will effectively remove solvents shall be provided for proper drying of paints on interior surfaces.

It shall be the responsibility of the Contractor to ensure the compatibility of the field painting products which will be in contact with each other or which will be applied over shop painted or previously painted surfaces. Paint used in successive field coats shall be produced by the same manufacturer but with varying colors and shades. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint.

No coating or paint shall be applied when (1) the surrounding air temperature or the temperature of the surface to be coated or painted as measured in the shade is below that recommended by the manufacturer and a minimum of 50°F, (2) when the substrate temperature exceeds the maximum temperature recommended by the manufacturer, or (3) when the substrate temperature is less than 5°F above the dew point. Dew point shall be measured by use of an approved instrument in conjunction with the U.S. Department of Commerce Weather Bureau Psychometric Tables. Paint shall not be applied to wet or damp surfaces and shall not be applied when the relative humidity exceeds 85 percent. The painting contractor is responsible for making himself aware of the weather conditions that would preclude him from painting under the above conditions.

5.0 SURFACES TO BE PAINTED

Except as specifically excluded below or indicated in the Plans. All metal subject to rust, piping, equipment, wood, and concrete masonry, and outdoor exposed (non-insulated) PVC/CPVC piping shall be painted in accordance with the coating systems specified herein. Unless otherwise specified or indicated in the Plans, the following surfaces shall be left unpainted:

a. Exposed surfaces of aluminum, except exposed ductwork.
b. Polished, finished, or unfinished stainless steel, except flashings and counter flashings.
c. Galvanized surfaces, except piping, exposed interior conduit, and exposed ductwork.
d. Piping concealed in inaccessible plumbing chases and above suspended ceilings.
e. Rubber and plastics.
f. Acoustical panel ceilings.
g. Face brick.
h. Exterior concrete more than one foot below finished grade or normal low water level.
i. Surfaces specified to be factory finished.
j. Existing surfaces not noted specifically in the Plans or Specifications.

All exposed interior and exterior poured-in-place concrete for walls, beams, columns, and precast concrete members (i.e. double tees, hollow core slabs, etc.) for non-water containing structures shall be painted to one foot below grade on the exterior and to the horizontal slab/surface on the interior with Thorocoat, Fine by BASF, Tex Cote or Tnemec Series 157 Enviro-Crete. For water containing structures, two coats of Thoroseal by BASF shall be used to one foot below grade and one foot below normal low water levels. Underground vaults, wet wells, electrical chases and other similar areas do not require coating unless shown on Drawings. Coating shall be applied per the manufacturer's recommendations as a two-coat acrylic based system achieving a dry film thickness of 12-16 mils. Prepare a 5' by 5' complete a test section to demonstrate the final color prior to application of the coating system. Coating shall not proceed until the test section is approved by the Engineer.

On any single structure, use the same product for all areas to be coated with a specified color. Do not mix colors or products from more than one source.

Curing compound on structural concrete construction that is to receive a protective coating shall be prohibited. The applying contractor shall notify other trades of this requirement. The Engineer may waive this prohibition and allow use of a curing compound meeting the requirements of the coating manufacturer. Where curing compounds are used, Contractor shall assume complete responsibility for removing compound as required to result in an acceptable coating finish. Existing items requiring coating will be set forth in the Plans.

Cementitious crystalline waterproofing shall be applied where called for on the Plans. Crystalline waterproofing shall form non-soluble crystals of dendritic fibers within the pores and capillary tracts of concrete. Crystalline waterproofing shall be the Xypex line of

products as manufactured by Xypex Chemical Corporation, or Engineer approved equal. Surfaces receiving waterproofing coating shall be prepared according to manufacturer's recommendations. Coating shall be slurry applied in accordance with the manufacturer's recommendations and consisting of the following:

A. 1st Coat: Xypex Concentrate at 300 square feet per 60lb pail or 1/16".

B. 2nd Coat: Xypex Modified at 300 square feet per 60lb pail or 1/16"

All painting shall be in accordance with the Engineer/Owner's color scheme selected during construction. Where specific color scheme is not required by Owner/Engineer during construction, the scheme specified herein shall apply. Many different color variations may be required for architectural effect, piping identification, or other reasons required by the Engineer/Owner. The painting contractor shall allow sufficient time during construction and the submittal process for color scheme selection, coordination, and delivery of coatings.

Factory finished surfaces which have become damaged prior to acceptance by the Owner shall be spot primed and repainted with materials equivalent to those used in the original application. If, in the opinion of the Engineer, spot repair of the damaged area is not satisfactory, the entire surface or item shall be repainted as required by the Engineer.

Throughout the work the Contractor shall use drop cloths, masking tape, and other suitable measures to protect all surfaces from cleaning operations, accidental spraying, spattering, or spilling of paint. The Contractor shall be responsible for and shall correct and repair damage resulting from his operations or the operations of those responsible to him. Paint deposited on surfaces which are not being painted at the time shall be immediately removed. Bituminous paints spilled or dropped on any material except metals shall be surface cleaned and spot painted with aluminum paint prior to applying the specified paint. Exposed concrete or masonry not specified to be painted which is damaged by paint shall be either removed and rebuilt or, where authorized by the Owner, painted with two coats of masonry paint.

6.0 MISCELLANEOUS - TANKS AND BASINS

Upon completion, allow the tank to dry at least 7 days or greater if recommended by the paint manufacturer after the finish coat has been applied and before the tank is sterilized and filled with water. During this period, both the door at the bottom and at the top must remain open.

Paint is to be applied by conventional or airless spray on the interior of the tank in accordance with the manufacturer's requirements. Spray coating of the interior surface shall have an approved method for overspray protection at the discharge from the venting fan. The exterior coating shall be applied with roller or brush.

After the tank has been thoroughly cleaned of all dirt, scale, etc., and after the Engineer has approved it, the Contractor shall sterilize the structure in accordance with AWWA requirements. A series of bacteriological samples shall then be taken and delivered to the state laboratories for examination. This procedure shall be repeated until satisfactory

bacteriological samples are taken. Upon receipt of satisfactory results and approval of the Engineer, the facility may be turned into the system.

7.0 MATERIALS

All materials required for painting shall be delivered in unbroken packages, bearing the brand and name of the manufacturer, and all materials shall be subject to review by the Engineer. All materials used shall be safely stored and stored in accordance with manufacturer's requirements. The Contractor shall provide access to storage space for the Engineer.

Paints approved for various surfaces shall be as manufactured as listed below. The manufacturer shall make available to the Contractor the services of a technical representative who shall be consulted with respect to drying times, cure-out times, compatibility of primers and overcoats, and miscellaneous problems that might arise during the progress of the work. No claim of the Contractor concerning the unsuitability of the materials specified or his inability to produce first-class work with the same, will be entertained, unless such claim is made in writing to the Engineer before the Contract is signed.

TNEMEC - PAINTING SYSTEMS

Item	***Prime Coat***	***Finish Coat(s)***
Masonry - Interior Non-Submerged	Fill porous surfaces with 130 EnviroFill @ 60-80 sq. ft./gal	1 Coat 113 Tneme-Tuffcoat @ 4.0 – 6.0 mills DFT. 1 Coat 297 Enviro-Glaze @ 2.0 – 3.0 mils DFT
Masonry – Exterior Above Grade	NONE	2 coats 156 Enviro-Crete @ 8.0 – 10.0 mils DFT per coat
Masonry - Exterior Below Grade	NONE	2 coats 46-465 @ 8.0 – 10.0 mils DFT per coat
Masonry - Submerged in Potable Water	218 MortarClad @ 1/16" minimum. Fill all bug holes, voids, and seal surface	22 Epoxoline @ 20 – 25 mils DFT
Masonry – Submerged in Wastewater	218 MortarClad @ 1/16" minimum. Fill all bug holes, voids, and seal surface	1 coat 436 Perma-Shield FR @ 100 – 125 mils DFT
Concrete Floors - Opaque Finish *	208 Epoxoprime MVT @ 6.0 – 8.0 mils DFT	2 Coats 280 Tneme-Glaze @ 6.0 - 8.0 mils DFT per coat
Concrete Floors - Clear Sealer *	NONE	1coat 201 Epoxoprime @ 6.0 - 8.0 mils DFT. 1 coat 295 CRU @ 2.0 – 3.0 mils DFT
Chemical Sumps *	218 MortarClad @ 1/16" minimum. Fill all bug holes, voids, and seal surface	2 coats 239SC Chembloc @ 6.0 – 8.0 mils DFT per coat.

Item	*Prime Coat*	*Finish Coat(s)*
Concrete Floors - Double * Laminate Quartz Floor	222 Deco-Tread @ 20 mils DFT- Broadcast to refusal - Repeat	One grout coat 222 Deco- Tread @ 6.0 – 8.0 mils One finish coat of 248 Everthane;@ 2.0 - 3.0 mils DFT
Wood Interior and Exterior	10-99W Primer @ 1.0 - 2.0 mils DFT	2 coats 1029 Enduratone @ 1.0 - 2.0 DFT per coat
Interior and Exterior Non-Submerged Metal	Prime: Series 91 H20 Hydro-Zinc @ 2.5 – 3.5 mils DFT Intermediate: Series 66 Epoxoline @ 2.0 - 3.0 mils DFT	1094 @ 2.0 – 3.0 mils DFT
Submerged Steel and Ductile Iron Pipe - Potable Water	Primer: Series N140-1211 Pota-Pox Plus @ 5.0 – 7.0 mils DFT.	2 coats 21 Epoxoline @ 8.0 – 10.0 mils DFT per coat.
Submerged Steel and Ductile Iron Pipe – Wastewater Open Top Structures	Primer: Series N140-1211 Pota-Pox Plus @ 5.0 – 7.0 mils DFT. Intermediate: N140 Pota-Pox Plus @ 4.0 – 6.0 mils DFT.	142 Epoxoline @ 10.0 – 12.0 mils DFT
Submerged Steel and Ductile Iron – Wastewater Closed Top Structures – Submerged and Vapor Zone	Series N140 Pota-Pox Plus @ 4.0 - 6.0 mils DFT	Finish: Series 435 Perma-Glaze @ 25.0 – 35.0 mils DFT.
Ductile Iron Pipe – Submerged and Vapor Zone Service - Wastewater	Series N140 Pota-Pox Plus @ 6.0 – 8.0 mils DFT	435 Perma-Glaze @ 25.0 – 35.0 mils DFT
Interior and Exterior Non-Submerged Ductile Iron Pipe	Prime: N140 Pota-Pox Plus @ 7.0 – 9.0 mils DFT Intermediate: Series 66 Epoxoline @ 2.0 - 3.0 mils	1094 Endura-Shield @ 2.0 – 3.0 mils DFT
Non-Submerged Ductile Iron – Vaults	Prime: N140 Pota-Pox Plus @ 7.0 – 9.0 mils DFT Intermediate: Series 66 Epoxoline @ 3.0 - 5.0 mils	Finish: 66 Epoxoline @ 4.0 – 6.0 mils
Outdoor, exposed (non-insulated) PVC/CPVC piping**	Series 20 Pota-Pox @ 3.0 – 5.0 mils DFT	Series 1070 Fluoronar @ 2.0 – 3.0 mils DFT

* *Where called for on Drawings.*

*** Surface Preparation: Clean and dry. Sand to provide a uniform, dense, surface profile of at least 1.5 mils*

Thinners shall be as recommended by the paint manufacturer. No other products will be used.

8.0 PIPING AND EQUIPMENT IDENTIFICATIONS

All installed process equipment and similar items (i.e. pumps, motors, tanks [process tanks and chemical tanks, etc.] etc.) shall have its equipment number (e.g. “1", “2", etc.) prominently painted on the equipment (or on both the inside and outside of the equipment

hatch for submersible pumps). The number shall be neatly stenciled in 3" high letters. High impact plastic adhesive strips may be used in lieu of painting if they have permanent adherence.

Exposed piping and piping in accessible areas shall be identified with lettering or tags designating the service of each piping system, shall have flow directional arrows, and shall be color coded as shown below. Colors to be used shall be verified in the submittal process and changed as directed by the Engineer at no additional cost to the Owner.

Piping shall be completely painted with the selected colors, unless approved otherwise by the Engineer. Color coded vinyl snap on markers with flow direction arrows (by Brady or equal) shall also be used on piping to be left unpainted. All other piping specified to be painted shall match adjacent surfaces, unless otherwise directed by the Engineer.

Lettering and flow direction arrows shall be provided near equipment served, adjacent to valves, on both sides of walls, and floors where pipe passes through, at each branch or tee, and at intervals of not more than 30 feet in straight runs of pipe. If, in the opinion of the Engineer, foregoing requirements will result in an excessive number of labels or arrows on a run of pipe, the number required shall be reduced as directed.

Where the outside of the pipe or pipe covering is 5/8 inch or smaller, metal tags shall be provided instead of lettering. Tags shall have the selected identifying lettering stamped in and shall be fastened to the pipe with suitable chains. Metal tags and chains shall be aluminum or stainless steel. Where tags are used, pipe shall be the color selected.

Lettering on piping shall be painted, stenciled, or snap-on markers. Snap-on markers shall be plastic sleeves, Brady “Bradysnap-On B-915" or Seton “Setmark”. Letter size shall be as follows:

Outside Diameter of Pipe or Covering	**Minimum Height of Letters**
5/8 inch and smaller	Metal Tags - 1/4 inch
3/4 inch through 4 inch	3/4 inch
5 inch and larger	2 inches

Aluminum tags shall be provided for all valves and gates. Buried valves with concrete pads shall be tagged as shown on the drawings. For all other valves, provide numbered aluminum tags fasten to valves with aluminum or stainless steel chains. Coordinate numbering with Engineer during submittal process.

8.1 WATER PLANT AND WATER BOOSTER STATION PIPING COLOR CODE:

A. **Water Lines:**

Raw	110GN Clover
Settled or Clarified	10GN Aqua Sky

Finished or Potable	11SF Safety Blue

B. **Chemical Lines:**

Alum or Primary Coagulant	04SF Safety Orange
Ammonia	00WH Tnemec White
Carbon Slurry	35GR Black
Caustic	02SF Safety Yellow with 09SF Safety Green Band
Chlorine (Gas and Solution)	02SF Safety Yellow
Fluoride	25BL Fountainbleu with 06SF Safety Red Band
Lime Slurry	37GN Irish Spring
Ozone	02SF Safety Yellow with 04SF Safety Orange Band
Phosphate Compounds	37GN Irish Spring with 06SF Safety Red Band
Polymers or Coagulant Aids	04SF Safety Orange 09SF Safety Green Band
Potassium Permanganate	14SF Safety Purple
Soda Ash	37GN Irish Spring with 04SF Safety Orange Band
Sulfuric Acid	02SF Safety Yellow with 06SF Safety Red Band
Sulfur Dioxide	37GN Irish Spring with 02SF Safety Yellow Band

C. **Wastewater:**

Backwash Waste	68BR Twin
Sludge	84BR Weathered Bark
Sewer (Sanitary or Other)	34GR Deep Space

D. **Other:**

Compressed Air	91GN Balsam
Gas	28RD Monterrey Tile
Other Lines	32GR Light Gray

8.2 WASTEWATER PLANT AND LIFT STATION PIPING COLOR CODE:

	Generic Color	Tnemec Color I.D.
Chlorine (Gas and Solution)	Yellow	OSHA Safety Yellow (02SF)

	Generic Color	Tnemec Color I.D.
Compressed Air	Dark Green	Balsam (91GN)
Fire Hydrant	Red	OSHA Safety Red (06SF)
Lime	Light Green	Irish Spring (37GN)
Polymers or Coagulant Aids	Purple	OSHA Safety Purple (14SF)
Potable Water	Dark Blue	Safety Blue (11SF)
Sewage Plant Effluent (Non-Potable Water)	Clay	Terra Cotta (07RD)
Sewer (Sanitary or Other)	Dark Gray	Deep Space (34GR)
Sludge (Dark Brown)	Dark Brown	Weathered Bark (84BR)
Primary Sludge	Dark Brown with	Weathered Bark (84BR)
	Yellow Label (Primary)	OSHA Safety Yellow (02SF)
Return Activated Sludge	Dark Brown with Red Label (RAS)	Weathered Bark (84BR) OSHA Safety Red (SC09)
Waste Activated Sludge	Dark Brown with Light Green Label (WAS)	Weathered Bark (84BR) Daiquiri Ice (PA30)
Primary Scum	Dark Brown with Light Gray Label (Scum)	Weathered Bark (84BR) Light Gray (IN01)
All Other Non-Process Lines	Light Gray	Light Gray (32GR)

STANDARD SPECIFICATIONS

PIPING, VALVES, AND GATES

STANDARD SPECIFICATION
FOR
PIPE MATERIALS

SECTION 4-1

1.0 GENERAL

All fittings required for horizontal and vertical bends and deflections are not necessarily shown or called out on the drawings. Plan and coordinate pipe installation such that all required fittings and appurtenances will be available when required. When working around existing utilities, or facilities, etc. carefully spot dig for potential conflicts in a timely manner to allow adjustments to be planned and to avoid delay.

2.0 DUCTILE IRON PIPE AND FITTINGS

Ductile iron pipe shall meet AWWA and ANSI Specifications C-150, C-151 and A 21.50, A 21.51 respectively. Pressure class of ductile iron pipe shall be as indicated on Drawings.

In general, ductile iron pipe shall be furnished with push-on (i.e. boltless) joints for buried applications. The principal standard covering push-on joints shall be AWWA C111/ANSI 21.11. Restrained push-on joint pipe shall be per the specification for Restrained Joint Ductile Iron Pipe and Fittings and shall generally be required in critical buried applications such as highway crossings, creek crossings, railroad crossings, and in other locations as identified on the Drawings. The pipe joint shall be rated/certified to meet or exceed the pressure rating of the pipe itself or a higher pressure rating as indicated on the Drawings. In no case, shall the pipe joint be rated for less than 250 psi.

In general, ductile iron pipe shall be furnished with flanged joints for exposed, above-grade applications, unless shown otherwise on the Drawings. The principal standard covering ductile iron flanged pipe shall be AWWA C115/ANSI 21.15 and AWWA C110/ANSI A21.10. All pipe flanges shall meet or exceed ductile iron Class 150 or Class 300 per ASME/ANSI B16.42 or cast iron Class 250 per ASME/ANSI B16.1 as indicated on the Drawings or as required for connections to equipment, valves, fittings, etc. The flanged pipe joint shall be rated/certified to meet the pressure rating of the connecting pipe or a higher pressure rating as indicated on the Drawings. In no case, shall the flanged pipe joint be rated for less than 250 psi.

All buried ductile iron pipe shall, unless indicated otherwise, be tar coated outside. Pipe and fittings to be installed in buildings, galleries, basins, other locations where such pipe and fittings will be permanently "exposed" shall have an exterior coat of rust inhibitive primer per the Standard Specification for Painting. Wall pipes, sleeves, fittings, etc., to be installed through concrete walls shall be furnished bare or the exterior coatings removed before installing. All ductile iron pipe and fittings shall be furnished with interior cement lining in accordance with ANSI A21.4/AWWA C104, latest revision, standard thickness, with an asphaltic seal coat unless indicated otherwise in the Drawings or these Specifications.

All ductile iron fittings shall have a body and joint rated/certified to meet or exceed the pressure rating of the connecting pipe or a higher pressure rating as indicated on the Drawings. In no case, shall the fitting body and joint be rated for less than 250 psi. Unless indicated in the Plans to be push-on joint, buried fittings shall be mechanical joint or restrained joint. Full body mechanical joint fittings shall meet or exceed AWWA C110/ANSI 21.10. Compact mechanical joint fittings and push-on joint fittings shall meet or exceed AWWA C153/ANSI A21.53. The principal standard covering mechanical and push-on joints shall be AWWA C111/ANSI 21.11. Restrained push-on joint fittings when required by the Drawings shall be per the specification for Restrained Joint Ductile Iron Pipe and Fittings.

For exposed, above grade applications, ductile iron fittings shall be furnished with flanged joints unless indicated otherwise on the Drawings. The principal standards covering ductile iron flanged fittings shall be AWWA C110/ANSI 21.10 and ASME/ANSI B16.42. Large fitting sizes including 54", 60" and 64" shall be covered by ASME/ANSI B16.42 and either AWWA C110/ANSI 21.10 or AWWA C153/ANSI A21.53. All fitting flanges shall meet or exceed ductile iron Class 150 or Class 300 per ASME/ANSI B16.42 or cast iron Class 250 per ASME/ANSI B16.1 as indicated on the Drawings or as required for connections to equipment, valves, fittings, etc. Flanged fitting joints shall be rated/certified to meet or exceed the pressure rating of the connecting pipe or a higher pressure as indicated on the Drawings. In no case, shall the flanged fitting joint be rated for less than 250 psi.

Bolting shall conform to Table 10.14 of ANSI A21.10/AWWA C110 or ANSI A21.15/AWWA C115 as applicable unless required otherwise by pressure rating requirements. Bolts for use with flat ring type gaskets between cast iron flanges shall conform to the requirements of ASTM A307-84, Grade B, hex head; and nuts shall be hex type of same grade and finish as the bolts. Bolts for use with full face type gaskets between cast iron flanges or ductile iron flanges shall conform to the requirements of ASTM A449-84a, Type 1 hex head; and nuts shall be hex type of same grade and finish as the bolts. Bolts shall also conform to the requirements of ANSI B18.2.1, and nuts shall conform to the requirements of ANSI B18.2.2. High strength bolting and nuts when required due to the pressure rating required by the Drawings or any combination of pressure rating, flange material, and/or gasket material required shall meet the requirements of ASTM A 193 Grade B7 and ASTM A 194 Grade 2H respectively.

The bolting requirements stated above shall apply except when specifically indicated otherwise and except in highly corrosive environments such as inside sewer lift stations, submerged applications, sewage valve pits, sewage/sludge tanks, or any other highly corrosive applications. For these highly corrosive applications, all bolting and nuts shall be 316 stainless steel. The bolts shall be UNC rolled thread, stainless steel per ASTM A 193, Grade B&M, (type 316). The nuts shall be heavy hex, stainless steel per ASTM A 194, Grade 8M, type 316, coated to prevent galling.

Couplings for use with grooved end joints, where specifically called for in the Plans, shall be ductile iron in accordance with ASTM 536, Grade 65-45-12. Gaskets shall be the center leg design manufactured of a nitrile compound. Bolts shall be track head design and manufactured in accordance with ASTM A-183, minimum tensile 110,000 psi. Couplings shall be Vitaulic or equivalent.

Gaskets for flanged joints, mechanical joints, and push-on joints shall meet the requirements of ANSI A21.11/AWWA C111, latest revision as a minimum. Special gaskets required to achieve high certified pressure ratings per the Drawings shall be per the

recommendations of the ductile iron pipe and fitting manufacturer and shall comply with ASME/ANSI Specifications. The gasket materials shall provide the required pressure rating and withstand the expected bolt load without injurious crushing and be suitable for the service conditions. Unless indicated otherwise or required due to pressure rating, gasket materials for various service conditions shall be as follows:

A. Water Service (up to 120° F) - SBR (Synthetic Rubber)
B. Water Service (above 120° F) - Neoprene
C. Wastewater Service - SBR (Synthetic Rubber)
D. Air Piping For Blowers - EPDM

3.0 RESTRAINED JOINT DUCTILE IRON PIPE AND FITTINGS

Where required by the Plans, restrained joint pipe and fittings shall meet Specifications in the Ductile Iron Pipe and Fittings sections and shall be a boltless restrained connection to protect against separation due to thrust. Restrained joint pipe shall be flexible restrained push-on type, unless otherwise indicated. Joints shall incorporate ductile iron locking segments, inserted through slots in the bell face, providing a positive axial lock between the bell interior surface and a retainer weldment on the spigot end of the pipe. Restrained push-on joint to be equal to American "Flex-Ring" or U.S. Pipe "TR Flex".

Restraining or "Gripper" gaskets to be used to restrain slip joint pipe shall only be allowed when specifically called for in the Plans. Restraining gaskets shall contain stainless steel locking segments vulcanized into the gasket which shall in all other respects meet the requirements of standard push-on gaskets in ANSI/AWWA C111/A21.11. Restraining gaskets shall be UL listed for a minimum working pressure of 250 psi or the pressure rating of the pipe, whichever is greater. Gaskets shall be equal to American Fast-Grip or U.S. Pipe Field Lok Gasket.

4.0 RESTRAINT FOR MECHANICAL JOINT VALVES AND FITTINGS

Where required by the Plans, mechanical joint restraint shall be provided for valves and fittings. Joint restraint shall be incorporated in the design of the follower gland and shall include a restraining mechanism, which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53, latest revision. Twist-off nuts shall be used to ensure proper actuating of the restraining devices.

The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG, Ford Meter Box Company, Uni-Flange, or equal.

5.0 BOSSES ON DUCTILE IRON PIPE

Bosses shall be ductile iron and welded to the pipe by the pipe company in the foundry. For pipe sizes 6" through 12" in diameter, a minimum of Class 52 pipe shall be used unless the pipe manufacturer recommends a higher class pipe. For pipe sizes 14" through 54" in diameter, Class 51 pipe shall be used unless a higher class pipe is recommended by the pipe manufacturer. Bosses shall be drilled and tapped for proper connection in accordance with the Standard Specifications.

6.0 POLYETHYLENE ENCASEMENT

Polyethylene wrap in tube or sheet form for piping encasement shall be manufactured of virgin polyethylene material conforming to the requirements of ANSI/ASTM Standard Specification D1248. The material requirement, if not shown on the Plans, shall be either 8 mil, low density polyethylene or 4 mil, high density, cross laminated polyethylene. Material and installation methods shall be in accordance with the requirements of AWWA C105 and the pipe manufacturer.

7.0 COPPER PIPE

Copper pipe shall be seamless copper water tube meeting the requirements of AWWA Specification 7S-CR for Type K copper water tube, Type K, hard drawn, or of ASTM Specification Designation B88-61 for seamless copper water tube, Type K hard drawn.

Class O tube may be used underground in sizes through 1-1/4". Class O tube is suitable for use with flared or compression fittings, and with solder-type fittings, provided that rounding, sizing, and preparation of tube ends is performed with the proper tools. Fittings for copper water tube, Class O, installed underground, shall be similar and equal to Mueller, Hays, Ford Meter Box Company or Swagelok (up through 1" size).

Copper water tube installed underground in sizes 1-1/2" and larger shall be Class H, furnished in straight lengths. Fittings shall be solder-type as manufactured by Mueller, Hays, or Crane. All branches from underground tube (1-1/2" and larger) shall be made by use of brass unions and copper to L.P.S. adapters. All valves installed at tees and/or crosses in piping runs shall be similarly equipped.

Copper water tube installed in buildings, vaults, galleries, etc. shall be Class H, furnished in straight lengths, and shall be installed in straight runs. An exception to the specification relative to installation of copper water tube in straight runs may be made when short lengths (not greater than 4') of tubing requiring bends and/or offsets are necessary for connection of items of equipment to water supply lines. This exception would apply only to tubing sizes 3/8" and smaller.

Fittings for tube of sizes 1-1/4" and larger shall be solder-joint type as manufactured by Mueller, Hays or Crane, except that all branches from the main run (whether from tees or crosses) shall be equipped with brass unions and copper to I.P.S. adapters. Valves are required on all branches and all valves are required to be equipped with brass unions and copper to I.P.S. adapters. Fittings for tube size 1" and smaller shall be manufactured by Swagelok or Imperial.

8.0 STAINLESS STEEL PIPE

Stainless steel tubing shall meet the requirements of ASTM Specifications Designation A269 for seamless stainless steel tubing, Type 316. All fittings for use with stainless steel tubing shall be Swagelok or equal.

Two inch and smaller stainless steel pipe shall meet ASTM A312, TP316L, schedule 40S, seamless. Stainless steel pipe 2-1/2" or larger shall be pickled and passivated by full immersion meeting ASTM A778, TP316L, as welded grade. Fittings 2" and smaller shall be screwed, stainless steel to ASTM A182, type 316 or barstock to ASTM A276, type 316. Fittings 2-1/2" or larger shall meet ASTM A774 type 316L, butt welded type, stainless steel, schedule to match the pipe, as welded grade. All ells shall be long radius unless specifically indicated otherwise. Flanged pipe ends shall be made up of type 316L stainless steel continuously welded slip-on type rolled angle face rings. Flanges and all flange components shall be stainless steel. Flanges shall be drilled to ANSI 16.1 Class 125 standard. Piping sections shall be shop welded to the maximum extent possible for shipping and handling, field connections in addition to those indicated on the Drawings shall be flanged as described above. Bolting shall be stainless steel type 316. Gaskets shall be EPDM. Welding shall be performed using welders and procedures qualified in accordance with ASME Section IX. On exposed pipe clean all markings, stains, paint, concrete, dirt, etc. from pipe.

9.0 PVC PIPE - SMALL DIAMETER

PVC pipe and fittings for small diameter service pipe shall be rigid, polyvinyl chloride pipe and fittings meeting the requirements of ASTM Specification Designation D-1785, Type I, Schedule 80, and Commercial Standard Specification CS 207-60, Type I, Schedule 80. Pipe shall be furnished with threaded joints or glue joints for connection to fittings, companion flanges and flanged valves. Glue on glued piping and fittings (including on spare lines) shall be fully compatible with and recommended for the chemical being conveyed. Glue for chemical lines shall be weld on 724 or equal.

10.0 POLYVINYL CHLORIDE SEWER PIPE

All pipe and fittings 15” and less shall be slip joint and made from polyvinyl chloride (PVC) components as described in ASTM D-1784. The sewer pipe and fittings shall meet or exceed the requirements of ASTM D-3034 (SDR 26), Type PSM Polyvinyl Chloride Sewer Pipe and Fittings. Laying lengths shall be 13 feet minimum. All pipe 18” and larger shall meet ASTM 679 and be PS115.

The bell shall consist of an integral wall section with joints conforming to ASTM D-3212. Gaskets shall be vulcanized and comply with ASTM F-477 for Elastomeric Seals for Joining Plastic Pipe.

Each Pipe shall be marked as prescribed by ASTM Standard D-3034 of F-679 as follows: Pipe size, manufacturer's name and code, cell classification, standard dimension ratio (SDR), use (sewer pipe) and ASTM standard.

Representative samples, as directed by the Engineer, will be tested with acetone in accordance with ASTM 2152.

11.0 POLYVINYL CHLORIDE PIPE (PRESSURE CLASS)

The pipe shall be made from Polyvinyl Chloride plastic (PVC) as defined in ASTM Specification D-1784. The pipe shall conform to ASTM Specification Bell conforming to ASTM D-3139 and be approved by the National Sanitation Foundation. The pipe shall have water working pressure rating of 200 psi (SDR21) or 250 psi (SDR17) at 23 degrees C. or greater if shown on the plans. Pipe used for sanitary sewer force mains shall be green in color. Fittings shall be ductile iron and mechanical joint. The pipe will be stored away from direct sunlight.

The joints shall be "push-on" or "twin gasketed coupling", meeting ASTM Standards D-3139. Thickened bell pipe shall be provided meeting Section 6.2 of ASTM D-3139. Pipe lengths shall not exceed 20 feet. Lubricant shall be nontoxic and have no effects on the gasket or pipe material. Gaskets shall meet ASTM F477 requirements. The gasket manufacturer's mark and year of manufacture shall be molded in the rubber. Gaskets shall be vulcanized natural or synthetic rubber. No reclaimed rubber shall be used. The Owner shall be supplied a certified copy of the manufacturer's quality control report.

As a minimum, the pipe shall have the following data applied to each piece every two feet:

1. Nominal Size
2. Type of Material
3. ASTM Standards
4. Manufacturer
5. National Sanitation Foundation Seal of Approval
6. Quality Control Code
7. Working Pressure Rating

All spigot ends shall be marked to indicate the distance the spigot end should be extended into the bell.

12.0 POLYVINYL CHLORIDE PIPE (AWWA C900 OR C905)

PVC water pipe shall be extruded from clean, virgin PVC resin compound in accordance with ASTM D1784, Class 12454-A or 12454-B. PVC pipe shall meet the requirements of AWWA C900 and C905, Class 200 (SDR 14, minimum) unless indicated a higher Class in the drawings, with the same outside diameters for corresponding nominal sizes of ductile iron pipe meeting the requirements of AWWA C151. PVC pipe shall be capable of making connection with cast iron fittings meeting the requirements of AWWA C111 without the use of adaptors. Pipe shall be fabricated in nominal 20 foot length. Fittings shall be ductile iron, mechanical joint. Marking requirements of every joint include:

A. Nominal size and outside diameter dimension base (C.I.)
B. PVC
C. Dimension ratio
D. AWWA pressure class
E. AWWA (900) designation number

F. Manufacturer's name and production code indicating date of manufacturer and production shift time
G. Type of service

PVC pipe shall be equipped with bell and spigot joints. Bell shall consist of integral wall section with pipe. Bell section shall have same hydrostatic strength as pipe wall and meet the requirements of AWWA C900. Joints shall have elastomeric gaskets manufactured in conformance with ASTM F477. Gaskets shall be formulated for water service and be supplied separately from the pipe bell and lubricate recommended by the pipe manufacturer.

13.0 TRANSITION COUPLING

Transition coupling for sewer service lines shall be flexible, made of elastomeric plastic, resistant to chemicals and sewer gases and leakproof. Clamps, hardware, and appurtenances shall be stainless steel. Coupling shall be Fernco or equal. Main line coupling, 8" or larger, will be ductile iron or stainless steel sleeves.

14.0 PIPE NIPPLES

All pipe nipples 3" and less with screwed connections shall be Schedule 40 brass or stainless steel. No galvanized material will be allowed for screwed joints.

15.0 VALVES - GENERAL

Valves shall close clockwise with 3 turns per inch. Unless indicated otherwise, valves shall have mechanical joint or flange ends. Sewer valve operating nuts shall be of a different size and/or shape of water valve nuts as approved by the owners. All valves operators will be extended as required for safe, convenient and easy access for operation.

All valves, operators, floorstands, brackets, and appurtenances, etc., that require painting shall be prepared and painted in accordance with the Painting Specifications for this project. Primer, intermediate coat, and top coat shall be the coating system required by the Painting Specifications and manufactured by the same paint manufacturer as submitted to the Engineer and accepted for the remainder of the project. Color shall be as selected by the Owner. Refer to the Painting Specifications for the project.

All exterior materials shall be suitable for underground service. Exterior bolting shall be 304 stainless steel. Valve assemblies installed in typical underground applications shall be rated for underground service and be designed for satisfactory operation under an external hydrostatic head of 10 psi. Valve assemblies installed in submerged applications (e.g., wetwells, basins, wetlands, ponds, lagoons, etc.) shall be rated for continuous submerged services under 25' (min.) of water submergence or as required by the application shown in the Contract Drawings.

16.0 BUTTERFLY VALVES

The butterfly valves shall be of rubber seated tight closing type and shall meet AWWA Standards C504 and be Class 150B unless indicated on the Plans to be Class 250. Where shown or called out for such application, valves shall be suitable for submerged and underground service and/or air service. Valves on blower discharge piping shall be suitable for hot air. The valve operator shall be suitable for underground service with permanent lubrication. The operator shall close clockwise. All valves shall have an epoxy coating in accordance with AWWA C550 on the inside of the body. Valve bearings shall be sleeve type that are corrosion resistant and self-lubricating. Bearing load shall not exceed 1/5 of the compressive strength of the material. Valve actuators shall be fully grease packed and have stops in the open/close position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft. lbs. against the stop. The traveling nut shall engage alignment grooves in the housing. The actuator shall be a slotted lever type for 4" to 12" valves and a link and lever type for 14" through 48". A means of adjusting the stem and shaft to attain zero leakage on closure of valve vane shall be provided without taking the valve out of service.

Class 150B butterfly valves shall comply with the following details. Valve discs shall be made from cast iron ASTM A-126 Class B for 3" through 20" sizes or ASTM A-48 Class 40 for 24" size. Sizes 30" and larger shall be ductile iron ASTM A-536 Grade 65-45-12. Disc shall be furnished with 316 stainless steel seating edge to mate with the rubber seat on the body. Ductile iron of adequate strength may be substituted for cast iron. Valve shafts shall be stainless steel conforming to ASTM A-276 Type 304. Shaft seals shall be standard self-adjusting chevron "V" type packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft. All valves shall be hydrostatic and leak tested. The leak test shall be performed at a differential pressure of 150 psig with the disc in a closed position. In a slightly open position, internal hydrostatic pressure equal to 300 psig shall be applied to the inside of the valve body for five minutes. Certified test results shall be made available to the Engineer.

Valves rated for 250 psig service shall comply with the following details. Valves discs shall be constructed of cast iron ASTM A-40 Class 40 for 10" through 20" sizes or ductile iron ASTM A-536 Grade 65-14-12 for 6", 8", 24" through 48" sizes. Disc shall be furnished with 316 stainless steel seating edge to mate with the rubber seat. Ductile iron of adequate strength may be substituted for cast iron. Valve shafts shall be stainless steel ASTM A-564 Type 630 Condition H-1150. Stub shafts or through shafts are acceptable. Shaft seals shall be standard self-adjusting chevron "V" type packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft. All valves shall be hydrostatic and leak tested. The leak test shall be performed at a differential pressure of 250 psig with the disc in a closed position. In a slightly open position, internal hydrostatic pressure equal to 500 psig shall be applied to the inside of the valve body for five minutes. Certified test results shall be made available to the Engineer.

Where used in water plant or filter applications, valve supplier shall provide valves with actuators as shown on the drawings and/or as required by the filter manufacturer. Supplier/manufacturer shall review application and provide valves and actuators specifically suited for the application (pulsing, throttling, etc.) The actuator shall comply with all filter manufacturer recommendations including but not limited to operating frequency and duration

and control logic, etc. Completely coordinate valves and actuators with filter manufacturer prior to making the first submittal. Provide written concurrence with the valves and actuators from the water plant/filter manufacturer and filter control panel manufacturer with the first submittal.

All valves shall be assembled, machined, and tested domestically at the manufacturer's facility. All valves shall be equal to Mueller, DeZurick, Val-Matic or approved equal.

See painting requirements under "Valves - General" and in the "Painting Specifications".

17.0 RESILIENT SEATED GATE VALVE

Valves shall be resilient seated wedge type manufactured to meet the requirements of AWWA C515 with ductile iron bodies. Valves shall have a clear, unobstructed water way when fully opened and shall be at least as large as the pipe inside diameter for which it is intended. All internal surfaces shall be coated with epoxy to a minimum thickness of 8 mils. Said coating shall be non-toxic, impart no taste to water and shall conform to AWWA C550. Gate valves 12" and smaller shall be rated for 250 psi cold water working pressure and shall be tested to 500 psi. Valves 14"-24" shall be rated for 200 psi cold water working pressure and shall be tested to 400 psi. Gates valves 18" through 24" shall have gearing. Gate valves in horizontal position shall have bevel gearing and valves in vertical position shall have spur gearing. Allen screws or metric bolting shall not be allowed. Stem shall be sealed by three O-rings. The top two O-rings shall be replaceable with valve fully opened and while subject to fully rated working pressure. O-rings set in cartridge shall **not** be allowed. Valve shall have two thrust washers with one located above and one below the thrust collar to assure trouble-free operation of valve. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction, and shall consist of a cast or ductile iron gate with a resilient seat bonded or mechanically attached. Further, it shall be designed such that no sliding of rubber on the seating surfaces is required to compress the rubber. It shall also be designed such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The gate shall be provided with a drain in the bottom to flush the internal cavity of foreign material each time the valve is opened. The valve shall be American Flow-Control, Mueller or approved equal.

See painting requirements under "Valves - General" and in the "Painting Specifications".

18.0 TAPPING SLEEVES AND VALVES

Tapping sleeves shall be bolted split type of ductile iron construction meeting ASTM A 536 Grade 65-45-12. Side flange seals shall be of the O-ring type of either round, oval, or rectangular cross-sectional shape to form a watertight joint when bolted in place. Tapping sleeves shall conform to the respective chemical and physical properties specified for ductile iron fittings in ANSI A21.10/AWWA C110. Walls of sleeves shall be extra heavy and the sleeves shall accommodate gray iron pipe, ductile iron pipe of the various standard

thickness classes and C-900 type PVC pipe. Tapping sleeve and valves shall be manufactured by Dresser, Mueller, American, or equal.

Sleeves for use with ductile iron, cast iron, and C-900 PVC shall be equipped with mechanical joint ends. The Contractor shall determine the type sleeve required for accommodating the pipe and pipe outside diameter before ordering the sleeve. All sleeves are to include the end joint accessories and split glands necessary to assemble sleeve to pipe. No special tools shall be required other than a standard socket wrench. Sleeve shall be coated with asphaltic varnish in compliance with NSF-61.

Tapping sleeves for pressure class PVC lines shall be of heavy welded stainless steel per ASTM A240, type 304 and type 304L. Gasket shall be virgin SBR per ASTM D2000 MAA 610, compounded for water and sewer service with broad cross-section to resist rolling and provide dependable seal. Bolts shall be 5/8 inch UNC rolled thread trackhead, stainless steel per ASTM A193, type 304. Nuts shall be heavy hex, stainless steel per ASTM A194, type 304, coated to prevent galling. Flange shall be ductile iron per ASTM 536, Grade 65-45-12 or stainless steel per ASTM A240, type 304 to accommodate tapping valve flanges. Tapping sleeves for pressure class PVC shall be Romac Industries, Inc., style “SST III”, Mueller “H-304", or equivalent.

Branch outlets of sleeves shall be equipped with flanges made with female faces to accommodate raised male faces of tapping valves.

Tapping valves shall meet or exceed the requirements of these Specifications for AWWA resilient seat gate valves with bodies and bonnets made of ductile iron for 250 psi working pressure. The tapping side of the valve shall be equipped with flange having raised male face to ensure proper alignment with the sleeve and shall be equipped with a flange having slotted bolt holes for attachment of tapping machine. The outlet end of the valve shall have the desired joint connection for the intended pipe. All interior and exterior ferrous surfaces shall be protected against corrosion by fusion bonded epoxy coating. Valves shall meet requirements of AWWA C509. Coating shall be applied prior to assembly to assure coverage of all exposed areas including bolt holes. Seat rings shall be oversized so as to permit the use of cutters of the full nominal size of the tapping valves.

19.0 VALVE BOXES

The Contractor shall furnish and install valve boxes for all buried valves. Valve boxes shall be cast iron, screw type, with extension pieces as required to make up the length of box required from surface of ground to top of the valve body. Valve box lids shall be marked as to service. Valve boxes shall be equal to Dresser.

See painting requirements under "Valves - General" and in the "Painting Specifications".

20.0 CHECK VALVES

Check valves shall have ductile iron or cast steel bodies, and shall be plug type, with disc mounted on guided stem. Plug, seat, stem, and guide bushing shall be bronze meeting requirements of AWWA C508. Valves shall be gravity swing type, equipped with lever and weights with stainless steel hinge pins. Valves shall be equal to Mueller, Dresser, American.

21.0 FIRE HYDRANTS

Fire hydrants shall conform to the specifications of the American Water Works Association, C502 with a pressure rating sufficient to match test pressure of the line. They shall be compression type traffic model with 5-1/4" valve opening. Hydrants shall have one 4-1/2" or 5" and two 2-1/2" steamer nozzles with sizes to match the local fire department. Larger nozzle shall be fitted with integral Storz connection when shown on drawings. Threads shall match fire department equipment. Hydrants shall have a bury of 3-1/2 feet unless noted otherwise in plans. The fire hydrants shall be installed as shown on the Plans. Fire hydrants shall be M & H, American, Mueller, or equal, and/or as called for in the plans or specifications or required by Owner for matching their standard. All fire hydrants shall be connected to the main with a 6" valve and rodded throughout.

22.0 STORM DRAINAGE PIPE

Reinforced concrete drainage pipe for storm water shall conform to ASTM C-76, or A.A.S.H.O. M41. Pipe shall be fitted with tongue-and-groove type joints with rubber gaskets unless otherwise indicated. Corrugated metal pipe and arches shall conform to the requirements of the A.A.S.H.O. Designation M-36. All pipe arches shall be bituminous coated in accordance with the requirements of A.S.H.D. Specification 525 and/or 526.

23.0 PRECAST CONCRETE MANHOLES

The pre-cast reinforced concrete manholes shall be constructed in accordance with ASTM C-478. Manholes shall consist of circular pre-cast concrete sections not less than 4'-0" in diameter or as shown on the Drawings. The top section shall be suitable for mounting cast iron manhole frames and covers. Risers shall be furnished in suitable increments to an elevation not more than 12" below the base of the cast iron frame and cover. Maximum elevation of riser shall permit setting top of manhole frame at the finished grade shown on the Drawings. The bottom riser of the manhole shall be provided with openings to accommodate the sewers entering and leaving the manhole. The arrangement of the openings shall permit the construction of sewers in accordance with the alignment, elevations, and grades shown on the Drawings. All pre-cast concrete manholes shall be set on a foundation bed of compacted crushed stone, 8" minimum thickness, and covering the bottom of the excavation.

Steps, frames, and covers shall conform to the requirements of Gray Iron Casting, ASTM A48-60T, Class 20. The manhole cover shall be the solid indented type with bearing surface machined to provide solid bearing and prevent rocking. Vented manholes are not allowed unless specifically called for in the plans. When required, waterproof manhole frames and covers shall have bolted on lid with rubber or neoprene gasket for watertight sealing. Stainless steel anchor bolts will be used. Frames shall be firmly anchored to top section of manhole. Weight of frames and covers shall be 308 pounds or heavier.

Joints between the manhole sections will be made with offset joints with rubber gaskets or preformed butyl sealants. Rubber gaskets shall meet the requirements of ASTM C 443, latest revision. Sealants shall meet federal specifications SS-S-00210 (210-A) and AASHTO M-198B.

Manholes of precast concrete construction shall have flexible openings to accept sewers entering and exiting the manhole. The openings shall comprise a complete joint with insert piece precast in wall of manhole and comprised of cast iron insert ring tapped to receive draw bolts, cast iron compression flange, and rubber O-ring gasket, or a complete joint with seal assembly inserted in a hole cored in the manhole wall and comprised of a rubber or neoprene boot, stainless steel seal band, stainless steel pipe clamp.

4' diameter manholes shall have a minimum base thickness of 6" unless a greater thickness is called for elsewhere. 6' diameter manholes shall have a minimum base thickness of 8" unless a greater thickness is called for elsewhere.

Flexible connectors shall be provided as follows:

A. Pipes Less than 18 Inches Diameter

Flexible manhole connectors for lines 18 inches in diameter or less shall be Kor-N-Seal, as manufactured by NPC, Inc. Milford, New Hampshire, or equal. Connectors shall conform to the latest revisions of ASTM C923 and ASTM A167. Boots shall be of chemical resistant, resilient EPOM rubber. Assemblies with toggle or wedge-type expanders shall be fabricated of 304 Series non-magnetic stainless steel. Wedge assemblies shall be from reinforced nylon. External take-up clamps shall be Series 304 non-magnetic stainless steel. Bolt assemblies shall be of Series 305 non-magnetic stainless steel. Flexible connectors shall be stored and installed in strict accordance with the manufacturer's recommendations. Pipes shall be centered in the connector opening and supported during installation such that the pipe does not rest on the connector core band.

Pipes Larger than 18 Inches Diameter

For pipes larger than 18 inches diameter, flex connectors shall be the A-Lok Connector, as manufactured by A-Lok Products, Inc. Tullytown, Pennsylvania, or approved equal. Seal shall provide a flexible, positive watertight connection between pipe and manholes. The seal between the connector and the manhole wall shall be made by casting the connector integrally with the manhole wall during the manufacturing process in such a manner that is will not pull out during coupling.

The seal between connector and pipe will be made by pure compression of the resilient material against the outside diameter of the pipe. The connector shall be capable of being cast into a round structure in a curve and remain centrally located in the manhole wall so that there is no loss of compression or deflection in larger pipe due to curvature of the manhole wall. The connector shall be the only component to affect the seal between the pipe and structure. The connector shall be molded or extruded and vulcanized from materials whose physical/chemical properties meet or exceed the physical/chemical resistant properties outlined in ASTM C923. The connector shall meet or exceed the performance requirements prescribed in ASTM C923. The connector shall be

of size specifically designed for the pipe material being used and shall be installed in accordance with the recommendations of the manufacturer.

24.0 PRECAST CONCRETE WETWELLS

When allowed in the Plans to be substituted for precast manholes, precast wetwell sections shall conform to the minimum requirements of ASTM C789. Concrete box sections shall be provided for depth of bury load conditions indicated on the Plans. Unless indicated otherwise, all pipe penetrations or connections shall be made with flexible type connectors. Joints shall be watertight subject to both an infiltration and exfiltration test prior to and following backfilling.

When wetwells are used for manholes, precast flat tops may be provided to transition to a standard four foot diameter manhole if shown to be acceptable in the plans. Manhole steps shall extend continuous through four foot manhole risers and precast wetwell to the ground invert.

STANDARD SPECIFICATION
FOR
MATERIAL, INSTALLATION, AND TESTING
FOR POLYETHYLENE PIPE (HDPE)

SECTION 4-2

1.0 MATERIALS - POLYETHYLENE

High-density polyethylene (HDPE) piping and fittings shall be equal to DriscoPlex pipe manufactured by Performance Pipe. The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Owner or their Authorized Representative. The Owner shall approve qualified Manufacturers.

Black PE materials used for the manufacture of polyethylene pipe and fittings shall be PE 4710 high density polyethylene meeting ASTM D3350 cell classification 445574C and shall be listed in the name of the pipe and fitting manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73EF. Color material, when used, shall be the same except for meeting ASTM D3350 cell classification 445574E. For potable water distribution, the material shall be listed and approved for potable water in accordance with NSF Standard 61. The Manufacturer shall certify that the materials used to manufacturer pipe and fittings meet these requirements.

For water/wastewater applications, pipe sizes 1-1/4" through 3" IPS diameters shall be manufactured in accordance with the requirements of AWWA C901 and ASTM D3035. 4" IPS pipe and DIPS pipe sizes 4" and above shall be marked or certified by the manufacturer that it meets or exceeds AWWA C906 and ASTM F714 and be marked per the requirements of AWWA C906. Markings shall also indicate the pipe's Pressure Rating (PR) and/or Pressure Class (PC).

Unless specified otherwise on the Contract Drawings, pipe for water/wastewater applications shall be IPS for 4" and smaller and DIPS for 6" and above (all SDR-9 or SDR-7.3). Pipes shall be black. Potable water distribution pipe shall have color coded bands/stripes. IPS potable water pipe shall have four (4), equally spaced, blue color stripes co-extruded into the pipe outside surface. DIPS potable water pipe shall have three (3) equally spaced pairs of longitudinal blue color stripes co-extruded into the pipe outside surface. Stripes painted on the pipe outside surface shall not be acceptable.

For landfill leachate applications, the material/product specifications for the pipe and fittings shall meet all requirements listed above for water and wastewater applications but shall also be in compliance with ASTM D2513 and API 15LE. Unless specifically required otherwise, piping/fittings for landfill leachate applications shall be provided in IPS sizes.

MJ Adapters 4" thru 16" will be provided with Stainless Steel Stiffeners. MJ Adapters 14" and above shall be provided with Heavy Duty Back-up Ring Kits. All MJ adapters 18" and above must be provided with Stainless Steel Stiffeners.

Joints between plain end pipes and most polyethylene fittings shall be made by butt fusion. Branch connections to the main made with polyethylene fittings shall be made with saddle fittings or tees. Polyethylene saddle fittings shall be saddle fused to the main pipe.

The butt fusion and saddle fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed. Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR. Transitions between unlike wall thickness greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means or electrofusion. SDR's acceptable for polyethylene pipe are 7.3 and 9. Pipe shall be rated for a sustained working pressure of 200 psi minimum unless a different rating is required by the Plans.

Polyethylene pipe and fittings may be joined together or to other materials by means of (a) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (b) MJ Adapters or (c) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed. A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. Branch connections to the main and other required fittings shall be made with ductile iron fittings for water (unless indicated otherwise in the Contract Drawings) and polyethylene fittings for landfill leachate, unless it is connecting to an existing line of a different material (e.g., PVC, D.I., etc.).

The same Qualified and Approved Manufacturer shall produce polyethylene pipe and fittings. Products such as fittings or flange adapters made by sub-contractors or distributors are prohibited. Polyethylene fittings to be joined by thermal heat fusion may be molded, thermoformed from pipe sections, or fabricated by heat fusion joining polyethylene components prepared from pipe, molded fittings, thermoformed pipe, or polyethylene sheet or block. Molded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D326l for butt-type fittings, or ASTM Fl055 for electrofusion-type fittings, and the requirements of AWWA 906. Fittings shall be homogeneous throughout and as uniform in color, opacity, density, and other properties as commercially practical; however, co-extrusions and pipe striping will be allowed. The inside and outside surfaces shall be semi-matte to glossy in appearance and free of sticky or tacky material. The walls shall be free of cuts, cracks, holes, blisters, voids, foreign inclusions, or other defects that are visible to the naked eye and that may affect the wall integrity. Molded fittings shall conform with the dimensional requirements described in the applicable ASTM fitting standard when measured as specified in that standard. Fabricated fittings shall meet the minimum dimensional requirements and tolerances of the pipe at the point of fusion. Each polyethylene fusion fitting shall meet all the material requirements established for the pipe to which the fitting is to be joined. Fittings fabricated from pipe shall be manufactured from pipe stock with a wall thickness at least 25% greater than that of the pipe to which the fitting is to be joined or shall be otherwise externally reinforced so that the fitting carries a pressure rating equal to that of the pipe from which it is made. The wall thickness of an outlet may be the same as the wall thickness of the pipe to which the outlet is to be joined. Each fitting shall be designed and manufactured to operate at not less than the design pressure of the pipe system for which it is intended.

2.0 PIPE BEDDING, BACKFILL, AND FOUNDATION BACKFILL MATERIAL

Aggregates used for polyethylene pipe bedding and backfill shall be either crushed limestone or crushed dolomite. The use of slag will not be allowed. Crushed stone shall be ASTM D-448 No. 57 stone. No other screening size is acceptable. In no case is "crusher run", (unscreened gradations that include fine material), acceptable unless specifically called for.

Earth backfill shall consist of suitable native materials of low organic content. Stumps, roots, topsoil, and other highly organic materials are not acceptable for use as backfill. Earth backfill shall not contain any rocks, stones, or boulders which might be large enough to damage or endanger the water line. The decision regarding the suitability of a particular material for use as earth backfill will be at the sole discretion of the Owner's Construction Inspector but in no case shall stones as large than 2 inches contact or be within 1 foot of the pipeline.

Foundation backfill is a term used to describe a coarse stone aggregate which may be used at the direction of the Owner's Construction Inspector to stabilize the bottom of the pipe trench prior to placement of pipe bedding material. Foundation backfill shall be a coarse gradation of either crushed limestone or crushed dolomite. The gradation of stone for foundation backfill shall be determined on a case by case basis.

3.0 GENERAL INSTALLATION

All fittings required for horizontal and vertical bends and deflections are not necessarily shown or called out on the drawings. Plan and coordinate pipe installation such that all required fittings and appurtenances will be available when required. When working around existing facilities, carefully spot dig for potential conflicts in a timely manner to allow adjustments to be planned.

The Contractor shall furnish and install all pipe, fittings, valves, operators, extensions, couplings, valve boxes, gaskets, bolts, nuts, supports, hangers, bracing, appurtenances, and accessories as specified or as required, and shall place the entire piping installation in proper operating condition in every respect. The Contractor shall carefully examine all pipe and piping materials before placing them in the work. If any such pipe or materials should be found to be defective, the Contractor shall promptly notify the Engineer and discard such pipe and materials. Piping materials shall be of the types, classes, and sizes shown on the Plans or, if not indicated on the Plans, as specified herein.

The interior of all pipe, fittings, valves, and accessories shall be kept free from dirt and foreign material. Suitable bulkheads shall be used to block or plug ends of piping at the close of each workday and when work on a particular section of piping is temporarily discontinued. Should dirt, mud, concrete, laitance, paint, or other foreign materials enter the piping or any section of piping, such piping or section of piping shall immediately be cleaned. Each length or section of pipe shall be cleaned immediately before being placed in the trench and joined. Cleaning shall be accomplished by use of a tight swab or other suitable cleaning device. If necessary, a brush pig shall be run through the section of pipe prior to final swabbing. Pipe ends shall be wiped clean before the pipe is joined.

4.0 HANDLING AND STORING PIPE AND ACCESSORIES

The Contractor shall provide the proper equipment, tools, and facilities necessary for the efficient prosecution of the work. Materials damaged in unloading, handling, or installation shall be promptly discarded and removed from the area of the work. No pipe shall be unloaded or moved by allowing the pipe to roll, slide, or fall to the ground or to cushions placed on the ground. No pipe, fittings, valves, etc., shall be unloaded by inserting loader blades, teeth, etc., into the pipe interior.

Pipe shall be stored on racks or timbers in such a manner that pipe ends are above the ground surface. When pipe is to be moved, it shall not be dragged or rolled but shall be lifted by use of a sling designed to prevent damage to the pipe coatings. Should an intermediate placement of the pipe along the side of the trench be required, the pipe shall be placed on racks or timbers along the side of the trench in a manner as specified hereinabove.

When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire rope and chain are prohibited. Slings shall be of sufficient capacity for the load and shall be inspected before use. Worn or damaged equipment shall not be used.

5.0 PIPE LAYING

The top of the pipe shall be a minimum of 30" below the surface unless specified deeper by a permitting agency or the plans. The pipe shall have a uniform bearing. The pipe shall be swabbed for cleanliness before lowering to the trench. Whenever pipe is cut, it shall leave a smooth end at right angles to the axis. All polyethylene pipe for water lines, except services, shall have a #14 copper wire, plastic coated and laid continuously beneath the pipe. Locating tape will not be used. The end of the pipe shall be closed when the work is left temporarily. Angles or bends in the line shall be braced against movement by using concrete and/or permanent joint restraints. Rock and boulders shall be removed to a clearance of at least 6 inches from pipe, valves, and fittings. If the bottom of the trench is found to be unsuitable, the Contractor will remove the material, backfill, and compact with a suitable base. If unsuitable material cannot be removed, the Contractor shall construct a structural foundation, which does not include stone, for the pipe as directed by the Engineer. Additional compensation will be allowed for this structural foundation work. Extend all valve operators as required for safe, convenient, and easy access for operation.

The width of the trench shall be sufficient for pipe not to touch the sidewalls of the trench. The Contractor will take into effect the uneven alignment of polyethylene and allow a safety factor in the trench width. The pipe must have a cushion of 12" from any rock in the trench. Stone bedding will not exceed 3/4" particle size**.**

Backfill and embedment shall be placed and compacted to at least 90% Standard Proctor Density in 6" lifts to at least 6" above the pipe crown unless indicated otherwise on the Contract Drawings. During embedment placement and compaction, care shall be taken to ensure that the haunch areas below the pipe spring-line are completely filled and free of voids. Any special trench requirement will be shown on the drawings. When utilities cross other utility trenches, compact trench sufficient distance on either side of existing trench. In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle,

branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.

The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation, and fusion procedure, and shall re-make the rejected fusions.

Generally, polyethylene piping may be joined by thermal butt fusion or electrofusion. Polyethylene piping shall not be joined by solvent cements, adhesives (such as epoxies), or threaded-type connections. All joining methods shall be capable of conveying water at the test pressure of the piping system or pipe rating pressure whichever is greater. In situations where different kinds of polyethylene piping materials must be joined to each other, the manufacturers of the subject pipe or fitting should be consulted to determine the appropriate fusion procedures. Thermal fusion shall be conducted only by persons who have received training in the use of the fusion equipment in accordance with the recommendations of the pipe supplier or the equipment supplier.

Thermal butt fusion shall be portable, field-proven equipment with the ability to hold pipe or fittings in close alignment while the opposing butt-ends are faced, cleaned, melted, and fused together and then cooled under fusion parameters recommended by the pipe and fusion equipment supplier. Prior to attempting fusion of polyethylene pipe, personnel should verify that they have the optimum range of fusion conditions, such as fusion temperature, interface pressure, and cooling time for the material being joined.

Electrofusion uses equipment to prepare the pipe surfaces by scraping, aligning of the pipe sections to be joined, and holding them in place through the heat-fusion and cool-down cycle. With the electrofusion joining method, fusion times and temperatures shall be included in the design of the equipment. There is no concern of different heat times or pressures between the polyethylene materials described in this standard. Dissimilar PE materials can be joined without concern for special handling by the operator. The procedures for dissimilar polyethylene materials are the same as for similar material being joined.

6.0 BRACING OF PIPE AND FITTINGS

All pressure piping with joints that cannot transmit maximum longitudinal thrust shall be braced against internal thrust by means of poured-in-place concrete bracing where changes in direction occur or where branches from the line are located. Thrust restraint will be with concrete bracing against undisturbed soil on all bends, fire hydrants, terminal ends, etc. On heat fusion joints, thrust restraints are not required unless directed otherwise or if joints cannot hold rated pressure.

Braced underground pressure piping shall be securely braced against movement with concrete thrust blocks and bearing against solid, undisturbed ground. Where solid or undisturbed ground cannot be obtained for bracing or where indicated on the Drawings,

restrained joint fittings shall be required. Fittings shall be wrapped in plastic with no concrete being placed directly on accessories. All concrete used in underground bracing shall be Class "B" concrete in accordance with the requirements of these Specifications unless shown otherwise.

Special bracing for particular locations identified on the Drawings and/or described herein shall be in accordance with details shown on the Drawings for the particular special brace and shall be complete with reinforcing steel and miscellaneous metal work, if required.

7.0 GUARANTEE OF PIPE INSTALLATION AND REPAIRS

All work and materials shall be guaranteed for a period of one (1) year after final acceptance. The Contractor shall pay for cost incurred by the Owner for repairs within and during the guarantee period.

8.0 TESTING

Hydrostatic leak testing shall be conducted on water and sewer mains and pneumatic pressure testing is prohibited. Before applying pressure, all piping and all components in the test section must be restrained. This means that if piping or parts move or separate during the test, it will not result in damage or injury. Never conduct leak tests on unrestrained piping. Heat fusion joints must be properly cooled before testing. Mechanical connections must be completely installed and tightened per manufacturer's instructions. If backfill provides restraint, it must be properly placed and compacted. Joints and connections may be exposed for inspection. End closures must be suitable for pressure service and pressure-rated for the test pressure. Ensure that all connections to test equipment are secure. Disconnect or isolate all low pressure filling lines and all other parts that are not to be subjected to test pressure. Restrain, isolate, or remove expansion joints before leak testing.

The Contractor shall furnish approved equipment. Testing shall be done in the presence of the Engineer. For water main or sewer force mains, testing will be 1-1/2 times the normal operating pressure at the lowest point of the test section but not less than 150 pounds per square inch. Gravity sewer mains will be tested at 100 psi. The Engineer shall determine the test pressure and test sections which shall be limited to a maximum of one mile. Tests with joints uncovered shall be maintained for a period to inspect the section, but in no case for less than two hours. Tests shall be made with a pressure recording gauge as provided by the Owner. The Contractor shall provide all piping for installing the gauge.

The test pressure is measured at the lowest elevation in the test section. The test pressure is 150% of the system design operating pressure provided that all components in the test section are rated for the test pressure but not less than 200 psi. For leak testing purposes, the maximum allowable test pressure in polyethylene pipe is 150% of the pipe's pressure rating for the application and the application service temperature. When testing at pressures above system design pressure up to 150% of the system design pressure, the maximum test duration is eight (8) hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section. If the test is not completed due to leakage, equipment failure, or for any other reason, depressurize the test section completely, and allow it to relax

for at least eight (8) hours before pressurizing the test section again. Testing at excessive pressure or for excessive time may damage the piping system.

Fill the restrained test section completely with test liquid. Ensure that there is no air trapped in the test section. Use equipment vents or install temporary air releases at high points to remove air. Gradually pressurize the test section to test pressure and maintain test pressure for three (3) hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase. When the test pressure is equal or below the pipe pressure rating, use the following test procedure. Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test liquid then if test pressure remains steady (within 5% of the target value) for one (1) hour, no leakage is indicated.

When the test pressure is greater than the pipe pressure rating, the following procedure is utilized. Immediately following the initial expansion phase, monitor the amount of make-up water required to maintain test pressure for three (3) hours. If the amount of make-up water needed to maintain test pressure does not exceed the amount in Table 2 for a 3-hour test, no leakage is indicated.

	Make-Up Water Allowance for Test Phase (U.S. Gal./100 ft. of pipe)		
Nominal Pipe size (in.)	*1-Hour Test*	*2-Hour Test*	*3-Hour Test*
1-1/4	0.06	0.10	0.16
1-1/2	0.07	0.10	0.17
2	0.07	0.11	0.19
3	.10	0.15	0.25
4	0.13	0.25	0.40
5-3/8	0.19	0.38	0.58
5	0.21	0.41	0.62
6	0.3	0.6	0.9
7-1/8	0.4	0.7	1.0
8	0.5	1.0	1.5
10	0.8	1.3	2.1
12	1.1	2.3	3.4
13-3/8	1.2	2.5	3.7
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.0	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
26	5.0	10.0	15.0

	Make-Up Water Allowance for Test Phase (U.S. Gal./100 ft. of pipe)		
Nominal Pipe size (in.)	*1-Hour Test*	*2-Hour Test*	*3-Hour Test*
28	5.5	11.1	16.8
30	6.3	12.7	19.2
32	7.0	14.3	21.5
34	8.0	16.2	24.3
36	9.0	18.0	27.0
42	12.0	23.1	35.3
48	15.0	27.0	43.0
54	22.0	31.4	51.7

At the conclusion of the test, carefully depressurize the test section by the controlled release of test liquid.

9.0 TESTING OF SEWER MAINS

Testing of sewer mains will be conducted by hydrostatic pressure and per Section 8 herein.

10.0 DISINFECTION OF POTABLE WATER PIPING SYSTEM

All potable water mains, pipe fittings, valves, hydrants, etc., installed or affected by the project through which water passes must be properly flushed and sterilized as required by ADEM, the State Board of Health, or any other governing state/local health or environmental agency. In general, procedures for flushing and disinfecting shall be in accordance with AWWA C651, latest revision. The applicable procedures for short term disinfection of new and repaired potable water mains included in ANSI/AWWA C651, Disinfecting Water Mains, shall be followed. ANSI/AWWA C651 uses liquid chlorine, sodium hypochlorite, or calcium hypochlorite to chemically disinfect the main. Disinfecting solutions containing chlorine should not exceed 12% active chlorine, because greater concentration can chemically attack and degrade polyethylene. Operational disinfection practices should limit available chlorine levels to <=5ppm for temperatures up to 75°F. At temperatures between 75°F and 90°F, the active chlorine levels should be reduced further, and the pipe manufacturer should be consulted. The final disinfection procedure to be used shall be per the pipe manufacturer's specific recommendations while still providing proper disinfection. Dry chlorine shall not be placed directly into the pipe unless specifically allowed by the pipe manufacturer and the manufacturer's procedures are strictly followed.

Flushing velocities shall be at least 2.5 fps. For large diameter pipe, where it is impractical or impossible to flush the pipe at specified velocity, the Contractor shall clean the pipeline in place from the inside by brushing and sweeping, then flush the line. If required, the Contractor shall flush the pipe through flushing branches and remove branches after flushing is complete. Service connections and hydrants shall be flushed following pipeline flushing. Contractor shall provide temporary connections as required and operate all valves at

least twice during flushing to ensure the complete piping system (including short runs and dead end runs) installed or affected during construction has been thoroughly flushed. Contractor shall provide hoses, temporary pipes, ditches, and other conduits as needed to dispose of flushing water without damage to adjacent properties.

Chlorine solution shall be used for disinfection. Dry chlorine shall not be placed directly into the pipe unless specifically allowed by the pipe manufacturer and the manufacturer's procedures are strictly followed. The Contractor shall furnish all chlorine, chemical feed pumps, generator sets, temporary valves and connections, materials, labor, and equipment required for proper disinfection of the piping system. The Contractor shall operate valves, hydrants, and appurtenances during disinfection to ensure that disinfecting solution is dispersed into all parts of pipeline, including dead-ends and areas that otherwise may not be treated. In no case shall the Contractor allow disinfecting solution to enter piping systems which are in service.

Samples will be taken to the State Health Department for analysis. If the samples do not meet the standards of the Health Department, the disinfection process shall be repeated until satisfactory test results are obtained. Approval of samples shall be secured before placing piping system in service. After disinfection, the Contractor shall flush water from pipeline and hydrants until water through the entire piping system is equal chemically and bacteriologically to the water supply. Contractor shall properly dispose of all disinfecting solution and flushing water in accordance with all applicable requirements and regulations. Contractor shall not allow flow into a waterway without adequate dilution or other satisfactory methods to prevent damage to adjacent properties and environment.

11.0 WATER SERVICE CONNECTIONS

Service connections shall be 3/4" unless specifically indicated otherwise and shall consist of a mainline tap, using a hinged saddle (designed for IPS or DIPS HDPE pipe as applicable), installing a corporation stop, 3/4" copper pipe and terminating with a curb stop and a swing check valve at the meter box. Service pipe shall be laid with a minimum of 24" of cover with fittings to be equal to the Mueller Company. Service pipe depth under paving will be in accordance with existing local or State Highway Owner regulations.

STANDARD SPECIFICATION
FOR
DUCTILE IRON SEWER PIPE
INTERIOR COATING

SECTION 4-3

1.0 GENERAL

All ductile iron pipe and fittings supplied for gravity sewer shall have a high build protective lining on the interior and a bituminous coating on the exterior except for 6 inches back from the spigot end. The bituminous coating shall not be applied to the first 6 inches of the exterior of the spigot ends. All ductile pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining.

2.0 LINING MATERIAL

The material used for lining the pipe and fittings must have a successful history of protecting pipe lines in sewer service. The material must be a high build multi-component Amine cured Novalac Epoxy lining. The standard of quality is Protecto 401 Ceramic Epoxy. Any request for substitution must be approved by the engineer, meet the following criteria and be accompanied by the following data.

1. The permeability rating when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 42 days as reported by an independent laboratory.

2. A statement from the manufacturer of the submitted material attesting to the fact that at least 20% of the volume of the lining contains ceramic quartz pigment.

3. A laboratory report containing test data for Immersion in Acids, Bases, and Deionized Water at elevated temperatures using ASTM-D 714-56 (1974) for the rating method. The report should also contain data on ASTM D-2794 Direct Impact and ASTM-G 53-77 Moisture and Ultraviolet Light Exposure.

4. A statement concerning recoatability and repair to the lining.

3.0 APPLICATION

The lining shall be applied by a competent firm with a successful history of applying linings to the interior of ductile iron pipe and fittings. Prior to abrasive blasting, the entire area which will receive the protective compound shall be inspected for oil, grease, etc. Any areas with oil, grease, or any substance which can be removed by solvent shall be solvent cleaned using the guidelines outlined in SSPC-1 Solvent Cleaning. After the surface has been

cleared of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering annealing oxide may be left on the surface. Any area where rust reappears before coating must be reblasted to remove all rust.

After the surface preparation and within 8 hours of surface preparation, the interior pipe shall receive 40 mils dry film thickness of the protective lining. No lining shall take place when the substrate of ambient temperature is below 40 degrees Fahrenheit. The surface also must be dry and dust free. If flange fittings of pipe are included in the project, the linings must not be used on the face of the flange with full face gaskets being used to protect the ends of the pipe. All fittings shall be lined with 40 mils of the protective lining. The 40 mils system shall not be applied in the gasket grooves.

Due to the tolerances involved, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum Protecto Joint Compound. This coating shall be applied by brush to ensure coverage. Care should be taken that the coating is smooth without excess buildup in the gasket groove or on the spigot end. All materials for the gasket groove and spigot end shall be applied after the application of the lining.

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The time between coats shall never be less than the time recommended by the lining material manufacturer. No material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.

Protecto Joint Compound shall be used for touch-up or repair. Procedures shall be in accordance with manufacturer's recommendations.

4.0 INSPECTION AND CERTIFICATION

All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating. The interior lining of all pipe and fittings shall be tested for pinholes with a nondestructive 2,500 volt test. Each pipe joint and fitting shall be marked with the data of application of the lining system and with its numerical sequence of application on that date.

The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified, and that the material was applied as required by the specification.

5.0 PROCEDURE FOR FIELD REPAIR OF COATING

All coatings damaged in field whether from cutting edges or from handling shall be repaired as follows:

1. Remove burrs caused by field cutting of ends or handing damage and

smooth out the edge of the lining if rough.

2. Remove all traces of oil, grease, asphalt, dust, dirt, etc.

3. Remove any damaged lining caused by field cutting operations or handling and clean any exposed metal by sanding or scraping. Sandblasting or power tool cleaning roughening is also acceptable. It is recommended that any loose lining be removed by chiseling, cutting, or scraping into well adhered lined area before patching. Be sure to overlap at least 1" of lining in the area to be repaired.

4. With the area to be sealed or repaired absolutely clean and suitably roughened, apply a coat of Protecto Joint Compound using the following procedure:

Mixing Procedure - Protecto Joint Compound is a seven-to-one (7:1) mix ratio. When mixed, it should contain 7 parts of the black activator and one part of the translucent blending resin. After blending resin is added to the activator, the mixture should be thoroughly agitated. All activated material must be used within 45 minutes of mixing.

Application of Material - After the material has been thoroughly mixed in a seven-to-one (7:1) ratio, it can be applied to the prepared surface by brush. Brushing is usually best, due to the fact that the areas are usually small. Practices conducive to a good coating are contained in the technical data sheet for Protecto Joint Compound.

It is important to coat the entire freshly cut exposed metal surface of the cut pipe end. To ensure proper sealing, overlap at least one inch of the lining with this repair material.

STANDARD SPECIFICATION
FOR
BORING AND JACKING

SECTION 4-4

1.0 GENERAL

This Item shall consist of the crossing of state, federal, and county highways or under railroads with pipe. Crossings shall be made by boring and installing pipe in welded steel casing. The casing pipe shall be jacked in place during boring. "Jetting" or "Mud Boring" will not be permitted. The Owner will secure the permit to make the crossing and furnish the required bond. Crossing of streets and roads not listed to be bored in the Bid Items shall be included in the Contract Unit Price Bid for pipe. The installation of pipeline casings under the railroad or highway as shown on the Drawings shall be in accordance with all the requirements of the railway company or the Highway Department including, but by no means limited to, bonds, cash deposits, insurance, and safety requirements, etc. The Contractor shall furnish all labor, equipment and materials required to protect the public. The Contractor shall be solely responsible for satisfying all requirements and costs of highway, railroad, or utility crossing permits or agreements regardless of whether such requirements are imposed on the Owner or are imposed directly on the Contractor. This shall include, but by no means be limited to, such requirements as bonds, insurance, indemnification, and flagmen, etc.

2.0 OPEN CUTS

Where open cutting is required, the backfill will be made with concrete or crushed stone, wet and tamped to acceptable density. The cost shall be included in the Contract Unit Price for the crossing.

3.0 RELEASE

The Contractor shall secure a release from the agency controlling the crossing before acceptance.

4.0 CASING FOR CROSSINGS

All casing used for crossing shall be steel, continuous circumferential welded joint, at construction site, and large enough to permit the installation and/or removal of the carrier pipe. No used or mid-weld casing from factory or supplier will be allowable. Casing shall meet A139B and ASTM 252 Grade 2 with the exception of thickness which must meet or exceed the thickness shown herein or the plans whichever is greatest. No thickness tolerance or allowance less than what is specified or shown in the plans will be accepted. Whichever specification noted above is more restrictive, that specification shall apply. The minimum diameter for casing shall be as follows:

PIPE SIZE	*O.D. BELL RESTRAINED JOINT*	*MINIMUM CASING O.D.**	*THICKNESS*
3"	6.08"	10.50"	.25"
4"	7.88"	12.50"	.25"
6"	9.75"	14"	.25"
8"	11.88"	16"	.25"
10"	14.13"	18"	.25"
12"	16.63"	20"	.375"
14"	19.02"	24"	.375"
16"	21.14"	26"	.375"
18"	23.36"	28	.375"
20"	25.48"	30"	.375"
24"	30.35"	36"	.500"
30"	36.69"	42"	.500"
36"	43.19"	49.25"	.625"
42"	48.64"	55.25"	.625"

* Where the drawings or crossing permit call for a larger casing or thicker wall, it shall be provided. All casing's inside diameter will be approximately 4" larger than the outside diameter of the pipe bell used with a 1/2" tolerance allowed (See Chart above). If one pipe manufacturer's bell does not allow this clearance, then an approved substitute pipe manufacturer with an appropriate outside diameter bell will be used. If the minimum size casing as shown on the drawings provides additional space based on the "Bell O.D of Restrained Joint" greater than that shown in the table above, the calculated clearance of the specified casing and bell outside diameter in the table will be maintained.

5.0 SUBSURFACE EXPLORATION

The Contractor will be required to make exploration holes to determine elevation of rock. The cost shall be included in the Bid Price.

6.0 CASING INSTALLATION

If required in the Plans, a two-inch auger pilot hole shall first be attempted to determine if rock will prevent the installation of the casing. If the pilot hole is successfully made, the casing shall be installed and the leading section of conduit shall be equipped with a jacking head securely anchored to prevent any wobble or variation in alignment during the jacking operation. After jacking is completed, the Contractor shall drill holes in the casing at the locations of ground loss and elsewhere where voids are suspected and shall force grout in to fill voids to refusal at pressures determined by the Engineer but not to exceed 50 psi.

Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of 1 part cement to 5 parts granular material. Where the soil is not suitable for this purpose, the Contractor shall import suitable material at his expense. The soil cement

shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

Extreme care shall be exercised by the Contractor to maintain line and grade during jacking operations and the Contractor may be required to modify the manner in which he is conducting his jacking operation to correct any deviation when deemed necessary by the Engineer. The Contractor shall be fully responsible for the structural sufficiency of the casing and the placement thereof. The details shown on the Plans are to be considered minimum only.

7.0 PIPE INSTALLATION

Unless noted otherwise, restrained joint ductile iron pipe shall be installed in the casing with casing spaces and end caps.

If the alignment of the casing is such that the pipe grade cannot be met, the grade of the casing shall be adjusted. If realignment is not deemed feasible by the Engineer, another casing meeting the required grade shall be installed. The abandoned casing shall be filled with sand and the ends plugged. Realignment or replacement work shall in no way result in extra cost to the Owner.

All pipe installed in a casing shall be braced or filled to prevent shifting or flotation during backfilling operations. The space between the casing pipe and the force main or sewer pipe shall be filled with sand with concrete collars at each end of the casing pipe if flotation could occur. If restrained joint pipe is used for bend or other deflection for soil frictional bracing inside a casing, the casing will be filled with sand.

Casing spacers shall be all stainless steel equal to Cascade Waterworks Manufacturing Company or approved equal. Spacers shall provide restraint from moving whether pipe is centered in casing or at bottom of casing.

STANDARD SPECIFICATION
FOR
INSTALLATION OF PRESSURE PIPE

SECTION 4-5

1.0 GENERAL

All fittings required for horizontal and vertical bends and deflections are not necessarily shown or called out on the drawings. Plan and coordinate pipe installation such that all required fittings and appurtenances will be available when required. When working near existing utilities and facilities, etc., carefully spot dig for potential conflicts in a timely manner to allow adjustments to be planned and to avoid any delay.

The Contractor shall furnish and install all pipe, fittings, valves, operators, extensions, couplings, valve boxes, gaskets, bolts, nuts, supports, hangers, bracing, appurtenances, and accessories as specified or as required; and shall place the entire piping installation in proper operating condition in every respect. The Contractor shall carefully examine all pipe and piping materials before placing them in the work. If any such pipe or materials should be found to be defective, the Contractor shall promptly notify the Engineer and discard such pipe and materials. Piping materials shall be of the types, classes, and sizes shown on the Plans or, if not indicated on the Plans, as specified herein.

The interior of all pipe, fittings, valves, and accessories shall be kept free from dirt and foreign material. Suitable bulkheads shall be used to block or plug ends of piping at the close of each work day and when work on a particular section of piping is temporarily discontinued. Should dirt, mud, concrete, laitance, paint, or other foreign materials enter the piping or any section of piping, such piping or section of piping shall immediately be cleaned. Each length or section of pipe shall be cleaned immediately before being placed in the trench and joined. Cleaning shall be accomplished by use of a tight swab or other suitable cleaning device. If necessary, a brush pig shall be run through the section of pipe prior to final swabbing. Pipe ends shall be wiped clean before the pipe is joined.

2.0 HANDLING AND STORING PIPE AND ACCESSORIES

The Contractor shall provide the proper equipment, tools, and facilities necessary for the efficient prosecution of the work. Materials damaged in unloading, handling, or installation shall be promptly discarded and removed from the area of the work. No pipe shall be unloaded or moved by allowing the pipe to roll, slide, or fall to the ground or to cushions placed on the ground. No pipe, fittings, valves, etc., shall be unloaded by inserting loader blades, teeth, etc., into the pipe interior.

Pipe shall be stored on racks or timbers in such a manner that pipe ends are above the ground surface. When pipe is to be moved, it shall not be dragged or rolled but shall be lifted by use of a sling designed to prevent damage to the pipe coatings. Should an intermediate placement of the pipe along the side of the trench be required, the pipe shall be placed on racks or timbers along the side of the trench in a manner as specified hereinabove.

3.0 PIPE LAYING

The top of the pipe shall be a minimum of 30" below the surface unless specified deeper by a permitting agency or the plans. The pipe shall have a uniform bearing. Bell holes shall be dug so that the bell will clear the ground. The pipe shall be swabbed for cleanliness before lowering to the trench. Whenever pipe is cut, it shall leave a smooth end at right angles to the axis. All plastic pipe, except services, shall have a #14 copper wire, plastic coated and laid continuously beneath the pipe. Locating tape will not be used. The end of the pipe shall be closed when the work is left temporarily. Angles or bends in the line shall be braced against movement by using concrete and/or permanent joint restraints. Rock and boulders shall be removed to a clearance of at least 6 inches from pipe, valves and fittings. If the bottom of the trench is found to be unsuitable, the Contractor will remove the material, backfill and compact with a suitable base. If unsuitable material cannot be removed, the Contractor shall construct a structural foundation, which does not include stone, for the pipe as directed by the Engineer. Additional compensation will be allowed for this structural foundation work. Extend all valve operators as required for safe, convenient and easy access for operation.

4.0 BRACING OF PIPE AND FITTINGS

All pressure piping shall be braced against internal thrust by means of restrained joints and/or poured-in-place concrete bracing where changes in direction occur or where branches from the line are located.

Braced underground pressure piping shall be securely braced against movement with concrete thrust blocks and bearing against solid, undisturbed ground. Where solid or undisturbed ground cannot be obtained for bracing or where indicated on the Drawings, restrained joint pipe and/or fitting shall be required. Fittings shall be wrapped in plastic with no concrete being placed directly on accessories. All concrete used in underground bracing shall be Class “B” concrete in accordance with the requirements of these Specifications unless shown otherwise.

Special bracing for particular locations identified on the Drawings and/or described herein shall be in accordance with details shown on the Drawings for the particular special brace and shall be complete with reinforcing steel and miscellaneous metal work, if required.

Piping installed above ground in buildings, galleries, tunnels, piping trenches, and chases shall be supported and braced as indicated on the Drawings and specified herein. Where pipes are braced or supported above ground piping by means of concrete piers or thrust blocks, the concrete used by construction of such piers or thrust blocks shall be Class “A” as specified in these Specifications; shall be reinforced; shall be anchored to slabs and/or walls by dowels; and shall be finished to match adjacent concrete surfaces or finished surfaces of adjacent walls or floors, whichever is applicable.

All exposed piping shall be installed neatly in straight lines and without sags. Unless a closer spacing is called for elsewhere, the maximum distance between hangers shall be as follows:

Metal Pipe - Maximum Spacing		
Diameter (inch)	***Spacing (feet)***	***Maximum Hanger Diameter (inch)***
1-1/4 or smaller	6.5	3/8
1-1/2 to 2	10.0	3/8
2-1/2 to 3	10.0	1/2
4 - 6	10.0	5/8
8 - 12	14.0	7/8
14	20.0	1

Schedule 80 - PVC - Maximum Spacing		
Diameter (inch)	***Spacing (feet)***	***Minimum Hanger Diameter (inch)***
1/2	4-1/2	3/8
3/4	4-1/2	3/8
1	5	3/8
1-1/2	5-1/2	3/8
2	6	3/8
3	7	1/2

If thinner wall PVC is allowed and utilized, the maximum spacing shall not exceed 1/2 of that allowed for Schedule 80 PVC.

5.0 TRENCH BACKFILL

Backfill shall be compacted in layers not to exceed 8 inches and to a minimum density of 95 percent of Standard Proctor Compaction Test. Provide greater compaction where required by other specifications or by the plans. Backfill will be selected earth-free of rocks and hard objects, to a point 12" above the pipe with the remainder of the trench to be kept free of large rocks. Any special trench requirement will be shown on the drawings. When utilities cross other utility trenches, compact trench sufficient distance on either side of existing trench.

6.0 GUARANTEE OF PIPE INSTALLATION AND REPAIRS

All work and materials shall be guaranteed for a period of one (1) year after final acceptance. The Contractor shall pay for cost incurred by the Owner for repairs within and during the guarantee period.

7.0 TESTING OF WATER AND SEWER MAINS

The Contractor shall furnish approved equipment. Testing shall be done in the presence of the Engineer. Testing will be 1-1/2 times the normal operating pressure at the lowest point of the test section but not less than 150 pounds per square inch at any point in the test section. The Engineer shall determine the test pressure and test sections which shall be limited to a maximum of one mile. Tests with joints uncovered shall be maintained for a period to inspect the section, but in no case for less than two hours. Where the pipeline is backfilled, the test will be maintained a minimum of two (2) hours with hydrostatic test performed in accordance with AWWA C-600. Make-up water will be added and measured by a calibrated meter and in a method acceptable to the Engineer. Calibrated pressure gauges shall be used and, when requested, verified on-site such that the testing method is suitable to the Engineer. The make-up water is the "testing allowance" or leakage. Leakage shall not exceed the following:

Maximum Leakage per
1,000 Feet of Pipe in Gallons per Hour

Pipe Diameter	at 150 psi	at 200 psi	at 250 psi
3 Inches	0.28 GPH	0.32 GPH	0.36 GPH
4 Inches	0.37 GPH	0.43 GPH	0.47 GPH
6 Inches	0.55 GPH	0.64 GPH	0.71 GPH
8 Inches	0.74 GPH	0.85 GPH	0.95 GPH
10 Inches	0.92 GPH	1.06 GPH	1.19 GPH
12 Inches	1.10 GPH	1.28 GPH	1.42 GPH
14 Inches	1.29 GPH	1.48 GPH	1.66 GPH
16 Inches	1.47 GPH	1.70 GPH	1.90 GPH
18 Inches	1.66 GPH	1.91 GPH	2.14 GPH
20 Inches	1.84 GPH	2.12 GPH	2.37 GPH
24 Inches	2.21 GPH	2.55 GPH	2.85 GPH
30 Inches	2.76 GPH	3.19 GPH	3.56 GPH
36 Inches	3.31 GPH	3.82 GPH	4.27 GPH
42 Inches	3.86 GPH	4.46 GPH	4.99 GPH
48 Inches	4.41 GPH	5.09 GPH	5.70 GPH

Tests shall be made with a pressure recording gauge. The Contractor shall provide all piping for installing the gauge. Projects financed by the Farmer's Home Administration shall have a maximum leakage of 10 gallons per inch of pipe diameter per mile of pipe in 24 hours.

It is the Contractor's responsibility to remove all air from the line before testing and plug as required each end of the test section at his expense. Valves may be used at the Contractor's discretion. Contractor shall furnish all water for testing and flushing.

This testing applies to all pipelines (except gravity sewers) including but not limited to pipelines not supplied by pumps.

8.0 TESTING OF AIR MAINS

All plant air piping under low pressure shall be tested to 30 psi by 24 hour recording gauge and all joints being subject to a bubble test before any backfill is placed. All leaks shall be promptly repaired and piping retested.

9.0 DISINFECTION OF WATER DISTRIBUTION SYSTEM

All water mains, pipe fittings, valves, and hydrants installed or affected by the project through which water passes must be properly flushed and sterilized as required by ADEM, the State Board of Health, or any other governing state/local health or environmental agency. In general, procedures for flushing and disinfecting shall be in accordance with AWWA C651, latest revision, and as generally outlined in the *Installation Guide for Ductile Iron Pipe* published by the Ductile Iron Pipe Research Association.

Flushing velocities shall be at least 2.5 fps. For large diameter pipe, where it is impractical or impossible to flush the pipe at specified velocity, the Contractor shall clean the pipeline in place from the inside by brushing and sweeping, then flush the line. If required, the Contractor shall flush the pipe through flushing branches and remove branches after flushing is complete. Service connections and hydrants shall be flushed following pipeline flushing. Contractor shall provide temporary connections as required and operate all valves at least twice during flushing to ensure the complete piping system (including short runs and dead end runs) installed or affected during construction has been thoroughly flushed. Contractor shall provide hoses, temporary pipes, ditches, and other conduits as needed to dispose of flushing water without damage to adjacent properties.

Chlorine shall be used for disinfection. If adequate disinfection is not achieved with dry chlorine additions, liquid chlorine solution methods shall be employed. The Contractor shall furnish all chlorine, chemical feed pumps, generator sets, temporary valves and connections, materials, labor, and equipment required for proper disinfection of the piping system. The Contractor shall operate valves, hydrants, and appurtenances during disinfection to ensure that disinfecting solution is dispersed into all parts of pipeline, including dead-ends and areas that otherwise may not be treated. In no case shall the Contractor allow disinfecting solution to enter piping systems which are in service.

Samples will be taken to the State Health Department for analysis. If the samples do not meet the standards of the Health Department, the disinfection process shall be repeated until satisfactory test results are obtained. Approval of samples shall be secured before placing piping system in service. After disinfection, the Contractor shall flush water from pipeline and hydrants until water through the entire piping system is equal chemically and bacteriologically to the water supply. Contractor shall properly dispose of all disinfecting solution and flushing water in accordance with all applicable requirements and regulations. Contractor shall not allow flow into a waterway without adequate dilution or other satisfactory methods to prevent damage to adjacent properties and environment.

10.0 WATER SERVICE CONNECTIONS

Service connections shall be 3/4 inch and shall consist of a mainline tap, using a hinged saddle, installing a corporation stop, 3/4 inch copper pipe and terminating with a curb stop and a swing check valve at the meter box. Service pipe shall be laid with a minimum of 24 inches of cover with fittings to be equal to the Mueller Company. Service pipe depth under paving will be in accordance with existing local or State Highway Department regulations.

STANDARD SPECIFICATIONS
FOR
VALVES AND ACCESSORIES

SECTION 4-6

1.0 GENERAL AND PAINTING

All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior. The inside of floor stands shall be painted. All anchor bolts shall be stainless steel.

2.0 CHECK VALVES WASTEWATER AND RETURN SLUDGE SERVICE

Check valves for wastewater, waste sludge, return sludge, and effluent water service shall have ductile iron or cast iron (ASTM A48, Class 40) bodies, stainless steel seats ASTM A276, Buna-N seat rings (80 Durometer), and extended stainless hinge pins (pivot shafts) Type 304, 309 or 316. Valve shall be gravity swing type, and shall be equipped with levers, weights, and air or oil cushion chamber (as indicated on the Drawings) adjustable for controlling closure. Valves shall be manufacture of APCO; Golden-Anderson; or equivalent. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

3.0 RUBBER CHECK VALVES

Check valves for use at the termination of drain lines or outfall lines shall be furnished as shown on the Drawings and shall be flexible, rubber type. Unless indicated otherwise, valves shall have a flanged connection. Inlet port area shall be 100% of the mating pipe port size. The port area shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow. Valve construction shall be butyl rubber. Valve shall be Tide Flex Series 35 as manufactured by Red Valve, or equivalent. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

Rubber check valves for gravity sewer applications shall have a maximum headloss of 3 inches for a design flowrate capacity of the applicable line size and slope at 75% full flow.

4.0 FLAP VALVES

Flap valves shall be iron body construction with iron gates, bronze disc (gate) rings and bronze seats. Bushings and hinge pins shall be bronze. Flap valves shall be furnished with flanged frames, hub frames or spigot frames as required and/or as shown on the

Drawings. Flap valves shall be as manufactured by Mueller Company, or M&H Valve Company, or American Valve & Hydrant Company. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

5.0 MUD VALVES

Mud valves shall be furnished and installed complete with stainless steel stems and (stainless steel) extension stems, stem guides and brackets, floor stands (provided with stainless steel stems) and benchstands where required, floor stand or bench-stand supports and operators. Mud valves shall be of the heavy duty flanged type designed to provide a positive seal under both seating and unseating head conditions. The valves shall be rising stem style. Frame, plug and yoke shall be cast iron (ASTM126B). Valve operating stem and lift nut shall be bronze (B421). The seat ring shall be bronze (B62) with a tapered, accurately machined seating face. The plug seat shall be seamless molded neoprene tapered to accurately mate with the seat ring for a positive seal. Each valve shall be complete with coupling for connecting valve stem to extension stem. Floor stands shall be provided where shown on the drawings. Floor stands shall be indicating, standard pattern. Provide stem guides for a maximum unsupported length of 5'. Provide floor stand brackets as required for application. Floor stand mounting to grating shall be as shown on the drawings. Mud valves shall be manufacture of Troy Valve, Mueller Company; M&H Valve Fittings Company; or equivalent. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

Mud valves shall be installed by attaching (with stainless steel hardware) to tapped flanges that are recessed below the top of the floor so that entire contents of the structure can be completely drained. The top of the mud valve flange shall not extend above the adjacent floor of the structure or tanks, etc.

6.0 BALL VALVES FOR CHEMICAL SERVICE

Ball valves for chemical service shall be manufactured from rigid polyvinyl compounds conforming to ASTM Specification Designation D-1784, latest revision, Type 1 Grade 1. Valves shall be suitable for 100 psi service, shall be approved by the National Sanitation Foundation, and shall be Hills-McCanna; Chemetron; or equivalent. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

7.0 SIGHT FLOW INDICATORS

Sight flow indicators shall be furnished and installed in all pressure feed lines (water) to water lubricated bearings or bushings; in all seal water lines to water sealed packing or stuffing boxes on waste pumps; in discharge lines from chemical feed pumps; and elsewhere

as indicated on the Drawings.

Sight flow indicators shall be of the following styles and types:

1. For horizontal pressure pipelines and for vertical pressure pipelines with upward flow Jacoby-Tarbox Style 100-S, Flapper type; Johnson; or equivalent.
2. For horizontal and vertical pressure lines with upward or downward flow Jacoby-Tarbox Style 300-S, Rotary Type; Johnson; or equivalent.
3. For vertical pressure pipelines with upward flow at low flow rates - Jacoby-Tarbox Style 400-S, Ball Type; Johnson; or equivalent.

Bodies for sight flow indicators under water service shall be bronze or cast iron; and indicators shall be Teflon or Nylon.

Bodies for sight flow indicators under chemical feed service shall be PVC as specified in these Specifications or other materials resistant to the particular chemical, and indicators shall be of materials unaffected by the chemical solution.

8.0 AIR RELEASE VALVES

Air release valves for pump discharge piping shall be air and vacuum type; and shall have cast iron body, bronze trim, stainless steel float, and heavy duty closed head tapped for discharge piping. All valves shall be installed complete with discharge piping from tapped head of valve, and with throttling valve in discharge line. Air release valve assemblies shall be furnished and installed complete with inlet piping, gate valve, discharge piping, and steel bracing or supports. Valves shall be APCO, sizes and series as indicated on the Drawings, and complete with surge check unit in sizes 4" and larger; or shall be similar combination as manufactured by Metraflex; Golden-Anderson; or equivalent. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the “Standard Specifications for Painting” for this project unless the Engineer determines that the valve manufacturer’s coating is superior.

9.0 PRESSURE RELIEF VALVES

Cast iron hydrostatic pressure relief valves shall be installed in a vertical position in the concrete base slab of structures in locations shown on the Drawings. Valves shall have bronze body seat with resilient neoprene seat in the cover. Valves shall be 4 inch diameter, body length as required, and shall be Model A2550 as manufactured by the Troy Valve; or equivalent. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the “Standard Specifications for Painting” for this project unless the Engineer determines that the valve manufacturer’s coating is superior.

10.0 BACKFLOW PREVENTER

Backflow preventer shall have bronze body, bronze working parts, stainless steel springs, integral strainer, neoprene valve discs, neoprene coated cotton duck diaphragm; shall have a maximum working pressure of 175 psi, hydrostatic test pressure of 350 psi and

temperature range of 32°F - 145°F. The device shall consist of two spring-loaded check valves and a spring-loaded, diaphragm actuated, differential pressure relief valve located in the zone between the check valves. All piping in backflow preventer box including backflow preventer shall be insulated with 1" thick fiberglass Micro Lok pipe insulation with weather protective jacket to prevent freezing. Backflow preventer shall be mounted above grade with fittings as required and an insulated housing as described below. Backflow preventer shall be Watts Model 909S, or equivalent. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

Fiberglass enclosure where shown on drawings shall be insulated and lockable, with provisions for drainage. Enclosure shall be mounted to 4" thick concrete pad. Suitably sized enclosure shall be the Lokbox as manufactured by Northeast Florida Enterprises, or equivalent.

11.0 EXTENSION STEMS

Extension stems and stem guides shall be furnished and installed where specified, indicated on the drawings, or otherwise required for proper valve operation. Extension stems shall be of solid steel and shall be not smaller in diameter than the stem of the valve actuator shaft. Extension stems shall be connected to the valve actuator by a single universal joint water or grease filled protective boot. All stem connections shall be pinned and tack welded.

At least two stem guides shall be furnished with each valve requiring stem guides. Guide spacing shall be per the manufacturer's recommendations. Stem guides shall be of cast iron construction, bronze bushed and adjustable in two directional Stem guide spacing shall not exceed 100 times the stem diameter or 10 feet, whichever is smaller. The top stem guide shall be designed to carry the weight of the extension stem. The extension stem shall have a collar; the collar shall be pinned to the stem and shall bear against the stem thrust guide.

Extension stems shall be provided for buried valves when the valve actuator is 4 feet or more below finished grade. Each extension stem for a buried valve shall extend to within 6 inches of the ground surface, shall be provided with spacers which will center the stem in the valve box, and shall be equipped with a wrench nut.

Unless the stem is manufactured from stainless steel, all paint on the stem shall comply with the "Standard Specifications for Painting" for this project.

12.0 CHECK VALVES - SCUM, GRIT AND PRIMARY SLUDGE SERVICE

Checks valves shall be rubber flapper swing check with heavily constructed cast iron body and cover. The body shall be long pattern design (not wafer), with integrally cast-on end flanges. The flapper shall be Buna-N having an "O" ring seating edge and be internally reinforced with steel.

Flapper shall be captured between the body and the body cover in a manner to permit the flapper to flex from closed to full open position during flow through the valve. Flapper shall be easily removed without need to remove valve from line. Check valves to have

full pipe size flow area. Seating surface to be on a 45□ angle requiring the flapper to travel only 35□ from closed to full open position, for minimum head loss and non-slam closure.

Buna-N flapper to have an elastic spring, molded internally, to assist the flapper to close against a slight head to prevent slamming. A manually operated backflow device shall be provided to create backflow through the check valve. Backflow device shall be constructed of cast bronze ASTM B-143 Alloy 922.

Materials of construction shall be certified in writing to conform to ASTM Specifications as follows:

Body and Cover	Cast Iron	ASTM A48, Class 30
Flapper	Buna-N	

Valve to be APCO series 100 rubber flapper swing check valve or equal. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

13.0 AIR RELEASE AND VACUUM VALVES - SEWAGE AND SLUDGE SERVICE

Sewage and sludge service and vacuum valves shall allow unrestricted venting or re-entry of air, through it, during filling or draining of the force main, to prevent water column separation or pipeline collapse due to vacuum. Valves shall incorporate one upper and one lower stainless steel floats, connected by a common stainless steel float guide, thereby maintaining an air gap between the bottom float and top shut-off float. The air gap shall retard waste solids from fouling or clogging the top shut-off float. The internal baffle shall be fitted with a guide bushing and act to protect the shut-off float from direct air flow. The baffle shall retain the 45 Durometer Buna-N seat in place, without distortion, for tight shut-off. All internals shall be easily removed through the top cover without removing the main valve from the lines. Both floats shall withstand 1000 psi or more. Valve shall be fitted with blow off valves, quick disconnect couplings and minimum 6' of hose, to permit backflushing after installation without dismantling valve.

The valve inlet shall be 2" N.P.T. and the outlet 1" N.P.T. The valve manufacturer shall furnish installation and maintenance instruction manuals with each valve. The valve manufacturer shall be certified in writing to conform to ASTM specifications as follows:

Body, Cover and Baffle	Cast Iron	ASTM A48 Class 30
Internal Parts	Brass	ASTM B16
Float and Float Guides	Stainless Steel	ASTM A240
Seat	Buna-N	
Exterior Paint	Per Paint Spec FDA approved for	Potable Water Contact

Valves to be APCO Series 400 Sewage Air and Vacuum Valves, or equal. All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the

"Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

14.0 FLOOR BOXES

Where openings through concrete slabs are provided for key operation of valves with the operating nut being in or below the slab, such openings shall be provided with a cast iron floor box complete with cover. Each floor box shall be of the depth required for installation in the slab indicated on the Drawings. Where the operating nut is in the slab, the stem shall have a guide to maintain the nut in the center of the box; where below the slab, the opening in the bottom of the box shall permit passage of the operating key. Covers shall have cast theron designation of the service for which the valve is used.

Each floor box and cover shall be shop coated by dipping in asphalt varnish. Floor boxes in plants and pump stations shall either be painted in accordance with the "Standard Specifications for Painting" for this project, or, if allowed by the Owner, dipped in asphalt varnish.

15.0 BUTTERFLY VALVES - AIR SERVICE

Unless otherwise indicated or specified, air service butterfly valves shall be of the EPDM-seat tight-closing type. Except where other types are indicated or specified, butterfly valves shall have flanged ends above ground and MJ ends with megalugs below ground. All gaskets shall be rated for hot air with a temperature as stated below. Valve discs shall seat at 90 degrees with the pipe axis.

Flanged end valve shall be of the short-body type. Where mechanical joint ends are specified, either mechanical joint or push-on ends conforming to ANSI/AWWA C111/A21.11 will be acceptable. For buried or submerged service, shaft seals shall be O-ring type.

Each valve shall be provided with an actuator having a torque capability sufficient to seat, unseat, and maintain intermediate positions under the anticipated operating conditions. Lever actuators may be furnished for 6 inch and smaller valves, except where electric, handwheel, or chain wheel actuators are indicated to be required. All 8" and larger valves shall have enclosed, geared, handwheel or chainwheel actuators with position indicator. Actuators shall be designed to produce the rated torque with a maximum pull of 80 pounds on the lever or wheel.

Each valve actuator, except actuators that are located in manholes, buried, or submerged, shall have a valve disc position indicator mounted on the end of the valve shaft. A disc position indicator shall also be provided on each operating stand or the actuator mounted thereon. Actuators in manholes, buried or submerged shall be suitable for submerged service.

Butterfly valves in air piping shall be industrial valves suitable for 15 psi air service, a maximum air velocity of 100 fps, and a minimum operating temperature of 225° F. Materials of construction shall be as follows:

Body	Cast Iron
Shaft	AISI Type 304 or 316 stainless steel

Disc	Bronze, or cast iron with corrosion-resistant metal plating
Seat	EPDM, or other elastomer with suitable temperature rating
Shaft Bearings	Upper and lower bearings, bronze or reinforced Teflon
Shaft Seal	Synthetic rubber rings with suitable temperature rating

Motor operated valves shall be furnished with electric valve actuators as specified in the Electric Valve Operator Section., or if called for in the drawings, or if specified elsewhere

All valves, except those buried in earth, floor stands, and all appurtenances shall comply with the "Standard Specifications for Painting" for this project unless the Engineer determines that the valve manufacturer's coating is superior.

16.0 FLEXIBLE COUPLINGS, REDUCERS AND FITTINGS

Flexible coupling, joint, increasers, etc. where indicated on the Drawings shall be constructed with high strength fabric and elastomer reinforced with metal rings. Flanges shall be integral with the body and utilize ductile iron retaining rings. Standard flange drilling mates with 125/150# flanges.

Flexible fittings for sewage or sludge service shall be supplied with a soft rubber arch filler to prevent the collection of solid materials in the arch. Multiple arches shall be provided as required for pipe misalignment and expansion or contraction.

Concentric and electric reducer connections shall connect unequal size pipes as indicated in the Plans and confirmed through the submittal process. Joints shall be provided with arches as described above and provide sound and vibration isolation.

A high strength synthetic fabric shall be used to reinforce the body. Flanges are drilled to standard ANSI dimensions and provided with ductile iron retaining rings. Control rods, gussets and compression sleeves shall be provided for all pressure applications.

Couplings shall be as manufactured by Metraflex, Chicago, IL; Mercer Rubber Company, Hauppage, NY; or equal.

STANDARD SPECIFICATION
FOR
PLUG VALVES

SECTION 4-7

1.0 GENERAL

Water and wastewater plug valves for sludge service shall be eccentric type, either non-lubricated or permanently lubricated. Valves shall have bodies of semi-steel, or of cast iron ASTM A126D, Class B or of ductile iron ANSI/ASTM A536, Grade 65-45-12. Discs or plugs shall be semi-steel or ductile iron ANSI/ASTM A536, Grade 65-45-12 and all bushings, bearings and journals shall be corrosion resistant. All wetted surfaces shall be made corrosion resistant by application of nylon or epoxy coatings, fusion bonded.

All valves (non-wetted surfaces of valves), operators, floorstands, brackets, and appurtenances, etc., shall be prepared and painted in accordance with the Painting Specifications for this project. Primer, intermediate coat, and top coat shall be the coating system required by the Painting Specifications and manufactured by the same paint manufacturer as submitted to the Engineer and accepted for the remainder of the project. Color shall be as selected by the Owner. Refer to the Painting Specifications for the project.

Valves shall be rated at not less than 150 psi working pressure, bi-directional. Valves shall operate from fully closed position to fully-open position with 90° turn, shall have full port openings of not less than 82% of connecting pipe area, and shall be equipped with position-indicating quadrants, pointers, adjustable stops and locks. Valve ends shall be flanged ANSI B16.1 Class 125, except when installed underground. Valves for underground service shall be equipped with mechanical joint ends. Valves shall be similar and equal to manufacture of DeZurik, Clow, Keystone, or equivalent.

Each valve shall be equipped with operating device to suit the location of the particular valve. In general, all manual valves shall be equipped with handle (lever) wrenches; or supplied with handwheel or chainwheel operators for 8" or larger valves or floor stands where shown. Chainwheel operators will be equipped with stainless steel chain. Valves located in piping trenches shall be provided with extension socket wrenches of proper length so that the handle is 30 inches above the grating or floor. Openings in gratings shall be framed with 1/8-inch bar stock of same material as grating and of same depth as grating, and circular stem collars (split type) shall frame the openings. Collars shall have flanged bases for attachment (bolted) to grating and collar height shall be not less than 2" so as to maintain the extension stem in vertical position.

All valves installed at heights greater than 6'-6" above finished floor, without regard to size of valve, shall be equipped with worm-and-gear operators and chain wheels complete with chains of proper lengths. All worm-and-gear operators shall be enclosed in oil-tight and dust-proof cases.

Valve assemblies installed in typical underground applications shall be equipped with geared operator of traveling-nut type, sealed, gasketed and lubricated and rated for underground service. The encased operators shall be designed for satisfactory operation under an external hydrostatic head of 10 psi. Valved assemblies installed in submerged applications

(e.g., wetwells, basins, wetlands, ponds, lagoons, etc.) shall be rated for continuous submerged service under 25' (minimum) of water submergence or as required by the application shown in the Contract Drawings. High-head extension boxes and extension stems for valves shall be provided for all underground valve installations. Tops of extension stems shall be equipped with operating nuts, and bottom sockets of extension stems shall be pinned to operating nuts of valves. Extend all valve operators as required for safe, convenient, and easy access for operation.

2.0 AIR SERVICE

Plug valves for air service shall be brass construction in sizes through 2" and be cast iron or semi-steel in sizes greater than 2" with all valves rated for a working pressure of 175 psi. Plugs shall be lubricated type, with close tolerances between plug and body sealing surfaces; and the plugs shall rotate easily in corrosion resistant bushings and journals and on corrosion resistant bearing surfaces. Valves shall operate from fully closed to fully-open with 90° turn, and shall be equipped with indicating quadrants, pointers, adjustable stops and locks. Valves of sizes through 2" shall have full port openings (100% of connecting pipe area); but valves of sizes greater than 2" may be restricted port opening provided that port area is not less than 65% of connecting pipe area. Valve ends may be either screwed or flanged ANSI B16.1 Class 125 or ANSI B16.5 Class 150, as required or indicated on the drawings. Valves shall be similar and equal to Homestead Industries, AFC Industries, Inc., or Dresser Industries.

The Contractor shall furnish to the Owner one (1) lubricant gun and one (1) 25% container (full) of <u>each type</u> of lubricant required for each service condition specified.

STANDARD SPECIFICATIONS
FOR
MANUAL VALVE ACTUATORS

SECTION 4-8

Valve actuators shall be provided, installed, and adjusted by the valve manufacturer. Actuator mounting arrangements and handwheel or chainwheel positions shall be as indicated on the drawings, specified herein, or as directed by the Engineer.

1.0 GENERAL

Unless otherwise required by the Owner, the direction of rotation of the wheel or wrench nut to open each valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the work "Open" and an arrow indicating the direction to open.

The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or set screws to prevent rotation of the nut or collar on the reach rod will not be acceptable. The valve and actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.

Comply with painting requirements in Painting Specifications.

2.0 HANDWHEELS

Handwheel diameters shall be at least 8" but not more than 24" for 30" or smaller valves and not more than 30" for 36" and larger valves. The required Force to force the valve from a closed position and to operate the valve shall not be more than 30 foot – pounds. The gearing and handwheels shall be such that the valve is easy to operate.

3.0 CHAINWHEELS

Unless indicated otherwise or specifically required to be equipped with other types of actuators, all valves with center lines more than 7'-6" above the floor shall be provided with chainwheels and operating chains. Each chainwheel operated valve shall be equipped with a chain guide which will permit rapid handling of the operating chain without "gagging" of the wheel and will also permit reasonable side pull on the chain. Suitable actuator extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be hot-dip galvanized carbon steel and shall be looped to extend to within 4 feet of the floor below the valve.

4.0 FLOOR STANDS

Floor Stands and Extension Stems: When required by the installations, floor stands and extension stems shall be provided for operation of valves. Floors stands shall be of the nonrising stem, indicating type, complete with all necessary steel extension stems, couplings handwheels, stem guide brackets, and special yoke attachments as required by the valves and recommended and supplied by the stand manufacturer. Stem guides shall be spaced so that the stem L/R ratio does not exceed 200. Provide all necessary anchor bolts in type 304 stainless steel. Floor stands shall be cast iron base type, Figure F-5515 as manufactured by Clow Corporation, Figure A-26426 as manufactured by Mueller Company, or equal. All handwheels shall turn counterclockwise to open the valves. Where operators for quarter-turn valves are located on floor stand, extension stems shall be torque tube type properly sized for the maximum torque capacity of the valve.

Floor stand stems and extension stems shall be stainless steel where called for elsewhere in the specifications or drawings. Floor stand anchor bolts shall be stainless steel.

STANDARD SPECIFICATIONS

ELECTRICAL

SPECIFICATION
FOR
ELECTRICAL - ALL EQUIPMENT

SECTION 5-1

1.0 GENERAL

The requirements in this "ALL EQUIPMENT" Specification apply to all equipment, including all electrical equipment and electrical items, etc., provided for this project. Where more stringent requirements for a piece of equipment are contained in the Contract, the more stringent requirements shall apply. **The requirements in this "ALL EQUIPMENT" specification apply to all equipment and all specifications for all equipment** and this "ALL EQUIPMENT" Specification shall be considered to be an integral part of all other equipment specifications.

The requirements in this "ALL EQUIPMENT" Specification also applies to all Electrical equipment and all SCADA equipment provided for the project. The requirements in this **"ALL EQUIPMENT"** specification shall be considered an integral part of all Electrical and all SCADA specifications.

The Contractor shall provide all labor, material, equipment, and incidentals, etc. to furnish, install, and place into proper operating condition all the equipment and appurtenances as shown on the Drawings or described in the Specifications. The equipment manufacturer shall completely design and furnish a coordinated and completely engineered system to meet all the conditions required by the project.

The General Specifications contain extensive, detailed submittals, shop drawing, and O&M Manual submittal requirements. The Contractor shall require all equipment manufacturers and suppliers to understand and fully comply with all shop drawing, submittal, and O & M Manual requirements in the General Specifications. The Contractor shall carefully review and comply with all Submittal and Shop Drawing requirements, including O & M Manual requirements, as per the General Specifications. All exceptions to the project requirements must be listed on the "EXCEPTIONS" sheet included with the submittal.

In order to assure standardization, uniform quality, ease of maintenance, and minimal parts storage, all equipment called for under individual equipment specifications shall be supplied by a single manufacturer who, through the Contractor, shall be fully responsible for its design, coordination, and performance.

No equipment shall be supplied by any manufacturer not regularly engaged in the manufacturing and production of equipment for the same purposes as used on the project. The manufacturer shall have installed and had in satisfactory use for a period of not less than five (5) years a minimum of ten (10) installations of similar size as shown in plans for this project comparable to the units specified. No consideration will be given to an individually sized equipment that has not been commercially available for five (5) years.

The equipment assemblies shall include all necessary equipment and appurtenances. Standard manufactured equipment shall be modified if necessary to meet all requirements of the plans and specifications. The equipment is designed around the first manufacturer listed on the List of Material Suppliers and Equipment Manufacturers. If changes in the project are necessary due to the use of equipment of a different manufacturer,

the Contractor shall submit such changes to the Engineer. The Contractor shall bear all costs associated with such changes. The listing of a manufacturer, whether in the plans, specifications, bid documents, or contract documents, in no way relieves that manufacturer from meeting all the requirements of the plans and specifications. Note that the equipment specified herein may be non-standard or non-typical.

All equipment shall be designed and manufactured for reliable and trouble-free performance. All equipment shall provide dependable and trouble-free operation.

The Drawings and Specifications illustrate and specify functional and general construction requirements of the equipment and do not necessarily show or specify all components, wiring, piping, or accessories, etc. required to make a completely integrated system. The drawings do not show all details of all equipment or installation requirements. The Contractor shall provide all components, piping, wiring, mounting devices, supports, accessories and labor, etc., required for a complete, workable and integrated system. The Contractor shall coordinate these with the actual equipment manufacturer who provides the equipment and shall install all components in accordance with the manufacturer's requirements except where the requirements of the contract drawings or specifications are more stringent, in which case they shall be followed.

All equipment (including, but not limited to, motors, drive equipment and components, electrical components, controls, and control panels) shall be designed for and have a long trouble-free life, and perform reliably and properly in the environment in which it will be installed. Where equipment or control panels are installed outdoors, it will be subject to ambient temperatures from minus 10 to plus 110 degrees, direct sunlight, blowing rain, nearly continuous high relative humidity, periodic icing, corrosive atmospheres and splashing typically associated with sewage. Equipment may be operated intermittently, continuously, or in a standby mode.

All equipment, etc., shall be manufactured to fit within the space allocated on the drawings. No additional space shall be available or provided. This also includes control panels, electrical appurtenances, and piping, etc. Provide special designs if needed to fit in available space. Coordinate with available space.

The equipment shall be powered by the electrical sources shown in the electrical drawings for the project.

All electrical panels, boxes, conduits, unistrut, hardware, components, and appurtenances, attachments, etc., shall be stainless steel or aluminum and shall be corrosion resistant.

All pipe hangers, unistrut, hardware, components, and appurtenances, attachments, etc., shall be stainless steel or aluminum and shall be corrosion resistant.

Orient all flowmeters, pressure gauges, light, and other instrumentation, etc. such that is it promptly and easily visible and readable.

When PLCs are included in a submittal, provided and whenever else requested, submit descriptions of the control methodology that will be employed. This shall include a description of operation, interlocks, and other features to fully understand the functioning and control of the system. Manufacturer-provided panels shall meet all requirements of Control Panel Specifications (in other specifications sections). Such panels shall have a main, pad-lockable circuit breaker. Prior to making the first submittal, all panels shall be completely and thoroughly coordinated with all other project equipment, controls, and SCADA system, etc.

The submittal may be rejected without review if it appears that careful and comprehensive coordination was not performed by the Contractor or Manufacturer, etc.

All equipment shall be designed solely by the Manufacturer with safety features and guards as required to meet the standards of OSHA and applicable codes. The Manufacturer shall design all equipment to allow for safe and convenient operation and maintenance.

All panels shall be designed by the Panel Manufacturer to meet the requirements of the project and of the installation. If control drawings are included in the plans, the manufacturer shall consider those as conceptual drawings showing only minimum requirements. The detailed design is the responsibility solely of the panel manufacturer who shall include additional features as desirable for trouble-free, reliable operation. Include appropriate surge protection. Where located outdoors or in non-conditioned space, panels shall be furnished with condensation heaters. NEMA 4 or 4X panels shall be furnished with 3-point latches. Clips or similar closure devices shall not be permitted.

Miscellaneous hardware, nuts, bolts, etc., shall be stainless steel when the equipment will be located outdoors, or in non-conditioned space, or in humid areas.

All control panels shall be fully tested prior to shipment from the manufacturer. Written certification shall be provided to the Engineer certifying that the testing demonstrated that all contract requirements were complied with. Mechanical equipment shall be tested prior to shipment to the extent practical or required.

Spare parts shall be boxed separately from the regular items. A separate packing list clearly labeled "SPARE PARTS" is required for inventory purposes. Package each part individually or in sets in moisture proof containers or wrappings, clearly labeled with part name, manufacturer's parts/stock number, and the equipment it is provided for.

Provide all the spare parts recommended by the manufacturer for the number of units and equipment installed. Provide any special tools required to install, operate, or maintain the equipment. All spare parts shall be delivered to the Owner, in the presence of the Engineer, at the end of construction and in one occurrence (i.e. one transfer for all spare parts). The Contractor shall prepare a detailed list of all the spare parts for the project, and the Owner shall sign for the spare parts received.

The Contractor shall inspect all equipment and materials against reviewed shop drawings at the time of delivery. Equipment and materials damaged or not meeting the requirements of the reviewed shop drawings shall be immediately returned for replacement or repair.

All equipment and its components shall be properly stored in a manner that will protect the equipment and insure long life. As a minimum, all equipment shall be stored in accordance with the equipment manufacturer's recommendations, unless more stringent requirements are contained in the plans or specifications. All equipment shall be properly stored and maintained during storage. All storage requirements also apply to equipment that has been installed but is not in full time normal operations.

The Contractor shall thoroughly coordinate all dimensions for this equipment with other shop drawings and with the plans and submit to the Engineer any required changes in concrete or piping dimensions, etc., that may be needed to allow the equipment to fit, to perform properly, and to be maintained or replaced. Concrete and appurtenances shall be placed by the Contractor well within the manufacturer's required construction tolerances. Templates provided by the manufacturer shall be utilized to set embedded anchor bolts.

Comply will all painting requirements as contained in the "Standard Specifications for Painting". Refer to and understand all the "Standard Specifications for Painting" for the project. Provide the primer specified in the "Standard Specifications for Painting". Finish field preparation and painting shall be performed as specified in the Painting Section. The Contractor shall touch-up all shipping damage to the paint as soon as the equipment arrives on the job site. The equipment should be totally re-coated if needed for a uniform and pleasing appearance.

All equipment, etc., shall be manufactured to fit within the space allocated on the drawings. No additional space shall be available or provided.

Refer to and comply with all other sections of the specifications including but not limited to electrical, controls, control panels, instrumentation, and motors, etc..

Fully coordinate all equipment requirements, controls, and connections, etc. in a timely manner. Coordinate supports and piping, etc.

Provide all miscellaneous accessories, brackets, supports, instrumentation, appurtenances, and adaptors, etc. that are required for the specific installation on this project. If the equipment manufacturer recommends that the water pressure of connecting water lines be limited, he shall provide a water pressure regulator.

Where initial maintenance (oil changes, tightening belts or chains, etc.) are recommended to be performed at 6 months or less after startup, such maintenance shall be performed by the Contractor utilizing factory authorized personnel.

All anchor bolts shall be stainless steel and shall be provided by the equipment manufacturer who shall select the bolts based on the maximum possible loading for the equipment.

For all electrical, control, or instrumentation panels, the colors of indicator lamps shall be consistent throughout the project and plant. Swap or replace lamps and LEDs at startup as needed for consistency.

Prior to assembly, all stainless steel bolts and nut threads shall be coated with a non-seizing compound by the Contractor.

The Contractor shall install all project components and all equipment in strict accordance with manufacturer recommendations. The Contractor shall carefully follow all manufacturer safety recommendations and shall continuously utilize effective safety practices.

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The manufacturer shall include in his price and schedule trips to the project site as needed for equipment installation, start-up assistance, inspection of installed equipment for proper operation as noted below, and operator training, etc. The manufacturer's representative shall be from the factory and shall have a minimum of 10 years of meaningful and acceptable experience starting up such equipment. The representative shall be well qualified to perform the startup and training. The Contractor shall submit the representative's qualifications for review and approval prior to scheduling the visit.

After the Contractor has installed the equipment and it is capable of being operated, the equipment manufacturer shall furnish a qualified representative meeting above stated requirements to inspect the equipment and to supervise field testing and start-up.

Install equipment and accessories in accordance with the drawings, approved shop drawings, and the manufacturer's installation instructions and recommendations. All final

electrical connections shall be made by the electrical sub-contractor. The Contractor shall make adjustments including but not limited to level, plumbness, and alignment, provide lubricants, lubricate all equipment, and adjust all controls, equipment, and appurtenances in accordance with the manufacturer's instructions and leave equipment in proper working condition. He shall carefully test all safety equipment and insure it operates as recommended. Where required for proper installation, the Contractor shall install non-rusting, non-shrink grout. The Contractor shall verify that the electrical power available is proper and that motor rotation is correct. Unless otherwise allowed, new or rebuilt equipment shall be started up on a Monday, Tuesday, or Wednesday to allow some time for malfunction to occur prior to the weekend. Where desirable for the project, new or rebuilt equipment shall be started up in the morning. The Contractor shall demonstrate all features of the equipment and its controls and demonstrate that the equipment operates properly under all types of conditions including but not limited to high speed and low speed, etc. Where units are furnished with more than one pulley combination for speed changes, the Contractor shall demonstrate that the equipment operates properly at all speeds provided. The Contractor shall coordinate with the Engineer to determine which set of pulleys should be left on the equipment at the conclusion of testing and demonstration. The testing shall also include safety features, operation from local and remote control stations, and local and remote alarm simulation.

The Contractor shall conduct testing to demonstrate to the Owner’s satisfaction that the equipment performs as required. Performance and/or installation testing shall be repeated at no cost to the Owner if requested by the Owner after experiencing problems with the equipment or after repairs or after any indication that the testing may potentially not be representative.

After testing, the Contractor, in conjunction with the manufacturer's representative, shall make whatever adjustments are required for the anticipated operating conditions.

The Manufacturer's representative shall sign a Certificate of Compliance on a form provided by the Engineer stating that he has thoroughly reviewed the equipment and its installation and it meets the requirements of the Manufacturer. All written certifications shall be delivered to Engineer before startup item is paid. All certifications shall be delivered concurrently with the performance of the work being certified and again at project completion in one single three-ring binder with a Table of Contents listing each certification contained in the binder.

A qualified and experienced technical representative of the manufacture shall provide operator training for Owner's personnel after system is operational. He shall be from the factory and shall have a minimum of 10 years experience with the equipment. If time and conditions permit, training may take place while manufacturer's representative is at the job site for inspection. All training shall occur at a time that is convenient for the Owner, operators, and Engineer. Training may be videotaped or otherwise recorded by the Owner, operator, or Engineer if they wish even if prior approval or arrangements have not be made. For operating facilities, it may be necessary to conduct the training in two separate independent sessions so that all operators can attend. If training is conducted before equipment fully and properly operational, it may be necessary to repeat the training after the equipment is fully and properly operational.

No warranty period shall begin prior to the final acceptance by the Owner.

All equipment shall be warranted by the manufacturer for a period of one (1)

year from the date of final acceptance by the Owner. Longer warranty periods are required where noted in individual equipment specifications. Warranties shall be non-prorated. Manufacturer warranties shall in no way relieve the Contractor of his warranty requirements established by the Contract Documents.

STANDARD SPECIFICATION
FOR
ELECTRICAL – GENERAL REQUIREMENTS

SECTION 5-2

1.0 GENERAL

All the requirements contained in all the other parts of the Contract Documents fully apply to all electrical work. This shall include, but not be limited to, the Bid Documents, Contract Documents, Special Provisions, General Specifications, Standard Specifications, and Equipment Specifications. The "All Equipment" Specification (contained in the Equipment Specifications) fully applies to all electrical equipment, materials, components, and work, etc.

The Electrical Subcontractor shall fully understand and always comply with all the above specifications.

When working in existing water and wastewater facilities, the Electrical Subcontractor and all his personnel shall understand that (1) circuits may be mislabeled, (2) power is often fed from more than one source and is not disconnected by main disconnects, and (3) equipment is often automatically or remotely controlled such that it starts unexpectedly without any warning. The Contractor and Electrical Subcontractor shall take all measures appropriate to safely address these and all other potentially dangerous situations. Record drawings and other drawings may not be accurate. Wiring and controls etc. may have been changed (possibly multiple times) after original installation.

When working on equipment and circuits in existing facilities, the Electrical Subcontractor shall always positively lock off the power supply to all the components on which or near which he will be working. It shall be the responsibility of the Contractor and his Electrical Subcontractor to positively determine the correct circuit(s) to be locked out. He shall lock out such circuits with his own padlocks. He shall tag out the facilities not to be made hot in accordance with OSHA procedures. All such work shall be carefully coordinated with the Owner and the Contractor shall provide clear written notice to the Owner and Engineer that the facilities have been locked out and are not to be operated unless the Contractor removes his lock and advises the Owner in writing that it is safe to restore power and operate the facilities. All interruptions must be carefully coordinated with and approved by the Owner. It shall be the responsibility of the Contractor and his Electrical Subcontractor to always perform all work involving existing facilities in a careful and safe manner. See other important requirements in the project plans and specifications regarding work in existing facilities and interruption of existing facilities.

The Electrical Subcontractor shall be responsible for the safety of his personnel and all others persons affected by his work. This requirement applies continuously throughout the entire project and is by no means limited to normal working hours. Neither the Owner nor the Engineer are responsible for safety. Neither the Owner nor the Engineer are responsible for the means and methods that the Contractor or his Electrical Subcontractor or other subcontractors or personnel, etc. use to perform the work.

Work in all types of existing or proposed water and wastewater facilities can be and usually is inherently unsafe due to a wide variety of hazards. Some examples - <u>but by no means all</u> - of the these hazards include the following: electrical hazards, confined space

hazards, chemical hazards, falling hazards, trenching hazards, drowning hazards, explosive hazards, and bacterial/viral infectious hazards. The Electrical Subcontractor shall have a thorough and complete understanding of all of these hazards and all other hazards that may be encountered in the performance of the work included in this project and in the performance of other water or wastewater related work. The Electrical Subcontractor shall not utilize personnel on this project who do not have a thorough understanding of the many hazards and are not willing to always utilize appropriate measures to properly address the hazards.

Some of these hazards may also be listed in other parts of the specifications or plans. The Electrical Subcontractor (including all his personnel on this project) shall be thoroughly familiar with and understand this additional information.

The Electrical Subcontractor shall continuously and fully comply with all OSHA rules, regulations, requirements, and guides, etc. All the work shall always be performed in a safe manner.

Temporary power shall be responsibility of the Contractor and his Electrical Subcontractor. It shall be installed in a safe manner and maintained in a manner to continuously protect project safety for all persons. The Contractor shall be solely responsible for all costs and Safety associated with temporary power.

The Electrical Subcontractor shall have an effective safety program that fully complies with NFPA 70E and 29 CFR 1926. It shall be the responsibility solely of the Electrical Subcontractor to carefully and regularly review his safety program to insure that it meets all the requirements of these standards and that it effectively protects all personnel performing or affected by this work.

The Electrical Subcontractor shall use only well-qualified and trained persons who are well-experienced at all the work that they will be performing. This applies to all persons associated with the project including bidding personnel, project management personnel, project superintendent, and other field personnel. As a minimum, the project manager and superintendent shall have experience in those roles that is satisfactory to the Owner on at least three similar water or wastewater projects of equal or greater size and complexity. The three projects shall include all the types of electrical and control work that are included in this project. Additionally, the Electrical Subcontractor personnel must have the same experience background as that required for the Contractor. See the General Specifications for those requirements. Where the project being constructed includes standby power, the Electrical Subcontractor shall thoroughly understand and have experience installing and wiring standby generators and transfer switches having the same characteristics as those on this project.

The Electrical Subcontractor shall perform all work in accordance with the National Electrical Code (i.e. the NEC). The Electrical Subcontractor shall comply with all local requirements, regulations, ordinances, and laws. He shall comply with all requirements of the governmental Authority Having Jurisdiction (the AHJ).

The Electrical Subcontractor shall comply with all requirements of the local electrical utility. He shall coordinate with the utility in a timely manner so that any required utility work can be performed in a timely manner and not delay the startup of the project. He shall provide service poles, transformer concrete pads and conduits, etc., in accordance with the requirements of the utility and at no extra cost to the Owner. The Electrical Subcontractor shall pay all charges of the utility to provide service.

The Electrical Subcontractor shall have all licenses required by the state, county, and local jurisdictions. He shall obtain and pay for all permits, inspections, and approvals, and other items that that may be necessary to satisfy the AHJ and others. He shall pay all costs related to certifications or inspections etc. related to codes or UL or similar certifications or similar work. Provide to the Owner and Engineer a certificate of final inspection and approval from the Authority Having Jurisdiction and other agencies as required. Fulfill all necessary requirements such that the electric utility can provide power to the project.

Prior to bidding on or providing a quote for performing the work, the Electrical Subcontractor shall carefully and thoroughly review the plans and specifications and visit the sites of the work (multiple times if needed) so that he has a complete understanding of all the work that is required. This will require that the Electrical Subcontractor also have an understanding of the non-electrical work so that he can better perform all work required. This understanding is necessary for the Electrical Subcontractor to coordinate, sequence, and schedule his work for the Contractor.

In addition to the various circuits listed in the SCADA schedules or other tables, etc., in the drawings or specifications, other circuits (not included in such schedules or tables) are shown or called for in other locations in the drawings (such as the plan views of various processes or structures). Work that is shown in one part of drawings is not necessarily shown in other parts of the drawings pertaining to the same structure or process, etc. The Electrical Subcontractor shall thoroughly understand how the various circuits in different sections of the plans and specification relate so that he can be certain to include all his costs for all work in his bid. In preparing his bid, the Electrical Subcontractor shall use well-qualified personnel who are experienced in bidding and constructing water and wastewater projects at least as complex and as large as that included in this project.

In pricing his work, the Electrical Subcontractor shall coordinate with the General Contractor and other subcontractors to insure that all materials, equipment, and work needed to complete the project is included either in his electrical scope or in the scope of one of the other contractors. The Electrical Subcontractor shall list in his written scope to the Contractor all items potentially related to electrical work (including but by no means limited to concrete pads, controls, instrumentation, alarms, telemetry, field wiring and work associated with manufacturer provided items, all interconnections, and all SCADA work etc.) that he has not included in his scope. The Owner shall not be responsible for any extra costs due to any items or work that is required but not included in the pricing for the project.

The electrical work may have to be performed in a specific sequence. Where the electrical work poses a possibility of interruption or disruption, etc., of normal water or wastewater operations, the requested schedule for performing such work must be approved by the Owner prior to performing the work. Some of these sequencing considerations may be listed in other parts (including non-electrical parts) of the specifications or plans. The Electrical Subcontractor (including all his personnel on this project) shall be familiar with and understand this additional information and requirements. The Electrical Subcontractor and Contractor shall continue to be fully responsible for safety during any necessary sequencing or special work or extra work, etc.

The electrical work will have to proceed simultaneously with work that is being performed by the General Contractor (or Contractors) as well as other subcontractors. The Electrical Subcontractor shall coordinate and cooperate with all other contractors and subcontractors onsite to allow all work to proceed expeditiously. No extra time shall be given

or money shall be paid due to claims of delays, interference, or damages due the other ongoing or planned work, etc.

2.0 MATERIALS, EQUIPMENT, AND SUBMITTALS

All material, equipment, and components utilized in the project shall meet the requirements of OSHA, UL, and NEMA, and shall be designed, manufactured, and installed such that they are safe to operate and maintain. Labels showing compliance with above standards shall be attached but shall be removed and the surface cleaned after receiving the ok from the Owner. Unless noted otherwise, all material shall be new. All materials shall be installed and all work performed in a "first-class manner". No materials shall be delivered to the jobsite without its submittal being approved prior to delivery.

All electrical equipment and all electrical items, etc., installed on the project shall be designed, manufactured, and installed in a manner to safely protect the employees, visitors, and other personnel at the site where they are installed.

As soon as a notice to proceed has been issued, the Contractor shall promptly initiate the preparation of all submittals for equipment whose timely delivery may impact the project. Coordinate and schedule submittals with the Engineer such that review priority can be given to those submittals where turnaround time is most important.

The Electrical Subcontractor shall provide submittal information to the Contractor so that the General Contractor can make submittals to the Owner. Submittals shall be made for all equipment of any type, panels, conduit, wiring, and all components, etc. to be installed for the project. The submittals must comply with the submittal requirements contained in the General Specifications and in the All Equipment specification. Additional submittal requirements may be contained in other specifications.

The Electrical Subcontractor shall thoroughly review all electrically related submittals prior to submittals to the Engineer. He shall stamp all of his submittals as "Approved" by his company and sign his name on the stamp. The Contractor shall also stamp all electrical submittals prior to submitting them to the Engineer. All exceptions to the Contract requirements must be listed in the form included with the submittal transmittal. If parts of the submittal appear to be in non-compliance with the Contract requirements, the submittal may be returned without review or comment.

Operation and maintenance manuals shall be submitted for review, revision as necessary, and approval. These shall be submitted in a timely manner. They shall contain all safety warnings relative to the equipment to which they pertain. The Electrical Subcontractor shall comply with the O&M requirements contained in the General Specifications and in the "All Equipment Specification".

The Contractor shall completely coordinate submittals with all interconnecting equipment or affected equipment prior to making the first submittal. The Electrical Subcontractor shall carefully coordinate with the manufacturers and suppliers of SCADA equipment and manufacturers of control panels, etc. All wiring and SCADA interconnections, etc., shall be clearly shown on all submittals. The source of the power for all interconnections shall be clearly shown. Provide narratives if necessary to facilitate interpretation of control methods and interconnections. Submit narratives to fully describe all PLC or other functionality so that the Engineer can easily see if all the required control functionality has been provided. If submittals are incomplete or not fully coordinated or propose equipment

with deviation from the project requirements (plans and specifications), the Engineer may reject the submittal without review.

All equipment, and components used in or installed in hazardous areas shall be U.L. listed for use in such areas. This applies to all equipment for areas defined by the NEC as Class 1 Divisions 1 Groups C and D.

All equipment and panels etc. must fit within the available space. Provide specially – designed custom equipment and panels, etc. if necessary to fit in available space.

Any equipment used as service entrance must be rated and marked for such use.

3.0 EQUIPMENT STORAGE

All equipment, electrical components, and devices, etc., shall be stored in accordance with storage procedures as recommended by the manufacturer as a minimum. Additional protection shall be provided as required by the Contract. The equipment shall be stored in a manner such that it is protected from any damage. All electrical gear – including but not limited to MCCs, switchgear, switchboards, transfer switches, VFDs, power panels, lighting panels, control panels, and SCADA panels, etc. – shall be stored indoors in conditioned space where the temperature does not exceed 104 degrees F. Once installed on the site, internal heat shall be maintained by a heat strip or light bulb to prevent condensation. The equipment shall be continuously protected from dust during all storage through final acceptance of the total project. The Owner and Engineer shall be provided convenient access to verify compliance with all storage requirements. Failure to maintain proper storage may result in the Owner refusing to accept the equipment or deducting payment from the Contractor to keep as an allowance for potential premature failure due to the Contractor's failure to comply with the Contract.

4.0 PERFORMANCE

The Electrical Subcontractor shall perform all work in accordance with the Contract and in accordance with all applicable codes and regulations. Install all components and items in accordance with the manufacturer's recommendations except where more stringent requirements are required by the Contract. Install conduit and all other facilities and components in neat straight lines. Install items horizontal or plumb as applicable. Install items that must be accessed in a convenient location. Install items so no potential tripping hazards or low headroom hazards, etc., are created.

Where working in any existing water and wastewater facilities (including treatment plants, pumping stations, etc.) maintain all conditions in a manner that is safe to Owner personnel and all others that must continue to operate, maintain, or be in the facilities. Lockout and tag-out all equipment not intended for operation. Keep walk paths clear. Safe access must be provided for all operators and maintenance personnel. Keep tools, materials, trash and unneeded containers, etc. cleaned up. Properly guard all live electrical components to prevent contact by unauthorized persons.

Perform all work required by the Contract and all work necessary for a complete and properly functioning project. Provide all conduit, wiring, and work to connect all equipment and all components, etc., requiring electrical, control, or SCADA connections. This shall include all items shown on the drawings or called for in the specifications. Connect

all loads such that the loads will be balanced across the phases. Perform all grounding work shown on the drawings or required by manufacturers. Provide unit heaters, surge protectors, and all other components shown or called for, or required for the installation and/or proper performance of the shown or called for items.

For locations and final depth of duct banks and other conduit in the yard, coordinate with the Contractor so that conflicts with piping and other facilities can be avoided. If the electrical facilities conflict with the required location of other facilities, the electrical items shall be removed and replaced. There shall be no extra time given or payment made if electrical facilities are installed in a manner that conflicts other facilities.

All work by the Electrical Contractor, including but not limited to all site work, must comply with all the Contract requirements, including requirements contained in non-electrical sections of the plans and specifications. Payment shall be in accordance with the Contract requirements. No extra payment shall be made for rock excavation or dewatering or other such items. Excavation, backfill, and compaction, unless specifically called out otherwise, shall be as described for in the Standard Specifications and notes on the drawings, whichever is more stringent. Backfill and compaction, including that under roads, paving, buildings, and structures, etc., shall be the same material and compaction as required for piping in the same location under the same structures. Payment shall only be made as described in the Contract.

Exercise care when unloading or moving equipment to prevent it being damaged. Damaged or potentially damaged equipment shall be removed from the jobsite and replaced with new equipment. No extra time shall be granted or extra payment made for the replacement of damaged equipment or items, etc.

If roof penetrations are required, they shall be performed in a permanently watertight manner that results in zero leakage. The Electrical Subcontractor shall submit details for any such penetrations for the Engineer's review and approval.

Carefully coordinate with the Contractor all locations where conduits are to be stubbed up. The locations shown on the drawings are approximate and general in nature. The Electrical Subcontractor must determine from a review of process equipment submittal drawings and electrical equipment submittal drawings the exact location where the conduit is to be stubbed up. Floor space is limited in most cases. It shall not be allowable to create a tripping hazard by any of the electrical work or obstruct space needed for access or operations, etc.

Cutting and patching, etc., shall be held to a minimum. Any cutting and patching that is required shall be performed in a neat manner that is acceptable to the Owner.

Ground and bond all panels, all equipment, and all electrical components in accordance with the requirements of the National Electrical Code and the recommendations of the equipment manufacturers. Ground and bond as necessary to achieve a properly functioning and safe electrical system.

Disconnect switches and control device locations must be carefully and accurately coordinated with the Engineer and with the actual equipment furnished (per the submittals) which they will disconnect or control. They must be located in a position that is easily and promptly accessible, intuitive, and provides for safe lockout and control. Coordinate the mounting height of all electrical equipment so that the final height is acceptable to the Owner.

Where the project includes Ground Fault Protection on the main incoming power to the facility or to downstream switchboards or MCCs, etc., the Electrical Subcontractor shall carefully coordinate, both during the submittal phase and during the construction phase, all field wiring and components to insure that proper protection is provided. The Electrical Subcontractor shall coordinate with both the electrical gear providers and the automatic transfer switch provider if different. Provide all necessary components, transformers, and wiring etc., to make the Ground Fault Protection effective without nuisance tripping. Test and make all necessary adjustments. Where possible, all Ground Fault Protection components and wiring shall be performed at the factory, and factory tested.

Use care in the installation of PVC coated conduits so as not to mar the surface. Treat threads with cold galvanizing to prevent rust. Clean all grease, concrete, and other substances from all conduits.

Install the following sign on all electrical panels having more than one source of power. This includes but is not limited to panels having one source of power plus 120-volt SCADA or separately powered controlled circuits, etc: "DANGER – ELECTRICAL SHOCK HAZARD – EQUIPMENT HAS MULTIPLE POWER SOURCES".

If any electrical panels or transformers, etc., are hot to the touch, install a warning sign.

Unless specifically called out otherwise, the Electrical Subcontractor shall provide and install all unit heaters on the project. The Electrical Subcontractor shall install the heaters in accordance with the recommendations of the heater manufacturer. Provide mounting brackets and hardware to install the heaters a sufficient distance from all adjacent surfaces to avoid damaging surfaces or causing potential combustion.

Lighting circuits shown on the drawings do not show all the individual wires required to achieve the functionality required by the control logic. Provide all needed wiring (including but not limited to that needed for 3-way and 4-way switches etc.).

The Electrical Subcontractor shall mount all panels in the space shown on the drawings. Provide stainless steel floor stands where called for or needed to properly support panels. Where other floor support is acceptable, the Electrical Contractor shall use stainless steel or aluminum components as shown in the drawings. Increase support member sizes above those shown in the drawings if needed to rigidly support panels so that the panel is sturdy and does not sway, etc. Bracing for floor supports, if allowed, must not protrude into walking paths or other areas needing access, or create a potential tripping hazard, etc. Where wall mounting of panels is acceptable, mount panels to stainless steel unistrut to offset the panel from the wall.

All spare parts must be clearly labeled identifying what they are and what specific equipment or panel etc. that they pertain to. Additionally a typed list shall be provided showing the inventory of spare parts, the equipment in which they will be installed, and the locations where that equipment is installed. All spare parts shall be turned over to the over at one time at the end of the project when the Owner is ready to take ownership of the spare parts. They shall be grouped by type and clearly labeled to facilitate checking the spare parts delivered versus the inventory. The spare parts shall be delivered to the Owner at a location or locations designated by the Owner. The spare parts shall be delivered simultaneously with all other spare parts turned over to the Owner unless the Owner requests otherwise.

See the notes in the drawings for additional important requirements for electrical work.

5.0 EQUIPMENT STARTUP

The Electrical Subcontractor shall assist with the startup of all equipment having any wiring connections. Prior to requesting startup or the attendance of a manufacturer's representatives for startup, the Contractor shall write the manufacturer and clearly state what work has been fully completed and also clearly state all work that is not totally completed. Particular attention shall be given to all interconnections to related panels, related equipment, and the SCADA system. All appurtenances and support equipment shall be ready prior to attempting startup. The Contractor shall be responsible for all delays associated with such lack of completion or coordination. Time spent by manufacturer's representatives in preparation for startup due to the incomplete work shall not count towards the time required by specifications for the manufacturer's representative to startup the equipment.

Provide complete record drawings showing all field wiring, duct bank information (including but not limited to locations, depths, cross-sections), and terminations, etc.

6.0 FINAL INSPECTION

Upon completion of work, the entire plant and electrical system shall be fully tested to verify that it is compliance with all the requirements of the Contract. If the testing indicates any non-compliance, corrections that are acceptable to the Owner shall the made and then the system completely retested. Testing shall be performed at a time such that the Owner and his representatives can schedule to be in attendance to observe all testing if they desire.

The Electrical Subcontractor shall provide permanently engraved phenolic labels identifying all panels, switches, pushbuttons, breakers, controls, and all other electrical appurtenances, etc. It shall be attached with stainless steel screws in a location where it is clearly applicable and acceptable to the Owner. Breakers and circuits in all panels shall be clearly identified and labeled. The wording on all labels – including schedules and directories, etc. - shall be satisfactory to the Owner. Labels and directories, etc. for lighting panels shall be typed or machine printed in a manner such that they are easy to read. After installation and all labeling have been completed, the electrical contractor shall test all circuits to verify that they are correctly labeled and that all schedules and directories are correct. He shall provide written certification to the Owner on a form provided by the Owner certifying that he has tested all controls and circuits, etc., and all are correctly labeled and correctly listed in all schedules and directories. Each circuit tested shall be listed by the Electrical Subcontractor.

Wire and conduits shall also be labeled to facilitate future maintenance.

Final inspection by the Engineer shall not be requested until the work is actually complete. See the General Specifications for requirements related to final inspection. See the SCADA Specifications, and related specification for work relative to the SCADA System.

7.0 CLEAN UP

Protect all electrical facilities from concrete splatter when concrete is being placed. Cover all facilities and conduits, etc., to prevent them from being splattered with concrete. Provide protection at all times to prevent damage or staining or discoloration, etc. to all electrical components and equipment, etc. Completely clean all electrical facilities,

including but not limited to, inside and outside of all electrical equipment, conduits, pull boxes, supports, miscellaneous items, and lights, etc. Thoroughly clean the interior and exterior of all electrical panels, gear, equipment, and appurtenances, etc., as necessary and prior to a final inspection. Clean any dust, dirt, discoloration, paint splashes, wiring remnants, grease, etc. Re-clean if necessary so that all electrical items are clean at the final completion of the work.

Repair any damaged surfaces in a manner acceptable to the Owner. Damaged paint shall be sanded and refinished with the same brand and type of coatings as the original coatings. Rusty or stained areas shall be repaired. The final surfaces after repair shall be acceptable to the Owner. If the Electrical Subcontractor cannot achieve a finish acceptable to the Owner, he shall replace the enclosure, panel, or equipment, etc.

See additional clean up requirements in the General Specifications.

8.0 WARRANTY

All electrical work shall be guaranteed to the Owner by the Electrical Subcontractor for a minimum period of one year beginning on the date of final acceptance of the entire project. No early start date for parts of the project shall be allowed. This guarantee shall be executed on a form prepared by the Owner. This guarantee shall be in addition to the guarantee required to be provided by the Contractor.

Where specific equipment specifications require longer guarantees, they shall also begin on the date of final acceptance by the Owner. The Contractor shall furnish documentation acceptable to the Owner showing that the longer guarantees have been provided. At the completion of the project, the Electrical Subcontractor shall furnish one labeled binder that has all supporting information for all extended warranties included.

STANDARD SPECIFICATION
FOR
ELECTRICAL - RACEWAYS

SECTION 5-3

1.0 GENERAL

The following types of raceways shall be used in the locations shown unless specially called out otherwise in the drawings:

	For Power Wiring	***For Instrumentation and Non-Power Wiring***
Application		
Buried (Concrete Encased)	PVC	PVC Coated RGS
In Poured Concrete Slabs, Walls, Ceilings, etc.	PVC	Rigid Galvanized Steel
Exiting Poured Concrete to Exposed Areas	PVC Coated RGS	PVC Coated RGS
In Concrete Block	PVC	PVC Coated RGS
In Stud Walls	Aluminum	PVC Coated RGS
Exposed	Aluminum	PVC Coated RGS

NOTES:

For purposes of table above, all 120 volt control circuits and float switch circuits shall be considered power wiring. Instrumentation circuits include but are not limited to: 4-20 mA circuits, 24 volt or lower circuits, ethernet circuits, fiber optic circuits, communication circuits, computer related circuits, and similar.

In space that is air conditioned: In stud walls or in lay-in ceilings, EMT (Electrical Metallic Tubing) may be used for lighting and receptacle circuits only. All other power circuits shall be aluminum and all instrumentation circuits shall be PVC Coated RGS.

PVC Coated RGS is PVC coated rigid hot dipped galvanized steel.

Use PVC Coated RGS for applications not listed above.

All raceway shall be UL listed.

2.0 MATERIAL SPECIFICATIONS

PVC Conduit and Fittings: PVC conduit shall be schedule 40 minimum. PVC conduit shall meet NEMA TC-2 and UL651. PVC fittings shall meet NEMA TC3 and UL651. PVC conduit and fittings shall be UL or ETL listed and UL or ETL labeled. Conduit shall be rated for use with 90 degree conductors.

PVC Coated Hot Dipped Galvanized Steel Conduit and Fittings: PVC Coated Hot Dipped Galvanized Steel conduit and fittings shall comply with ANSI C80.1, UL 6, and

NEMA RN-1. PVC shall have a coating of 40 mills thickness. Conduit and fittings shall be manufactured by Ocal. Threads shall be treated for corrosion resistance.

Aluminum Conduit and Fittings: Aluminum conduit and fittings shall comply with ANSI C80.5 and UL 6A. When connecting to different metals, provide adaptors to prevent galvanic corrosion as recommended by the manufacturer.

Conduit outlet bodies shall be provided with rollers.

Provide rain tight connectors in exterior locations and in any interior locations except electrical rooms and offices.

Flexible connectors shall be corrosion proof and water tight.

Supporting hardware and clamps, etc., shall be aluminum or stainless steel. Support and anchor conduit per manufacturer's recommendations.

3.0 INSTALLATION

General:

All wiring on the project shall be installed in conduits.

No conduit shall be installed in a manner that creates a potential tripping hazard. No conduit shall be run across the floor. Install conduit in or under slabs to avoid creating potential trip hazards. No conduit shall be installed such that it blocks passage. No conduit shall be installed such that it creates a potential headroom obstruction, etc.

Instrumentation conduits (for all circuits identified above) shall be installed a minimum of 12" away from all 110 volt or higher power circuits. Do not install any instrumentation circuits in the same conduit with any ac power circuits.

The Contractor and Electrical Subcontractor shall always comply with all OSHA requirements for all work throughout the entire project. Where work is in an existing facility, take appropriate measures to protect operators and other persons who may be present. Beware that water and wastewater facilities may be staffed 24-hours/day and are subject to personnel having to access the site at any time to address potential problems. Therefore all electrical work must be performed in a manner that is safe for others on the site.

Conduits that enter a structure or a building below grade or in another manner such that water could exit the conduit shall be provided with drain fittings piped to an acceptable drain so that water does not accumulate in the conduit or other electrical facilities and does accumulate on the floor.

All conduits shall be labeled at each end describing the circuit.

Spare conduits shall be left clean and with a pullcord.

The minimum allowed conduit size shall be 3/4".

Prior to installation, the Contractor shall prepare his duct bank schedule showing the number and size of conduits based on circuit schedules and other wiring requirements contained in the drawings. Include all required spare conduits shown in schedules or in duct bank details, etc. Provide duct bank schedule and supporting information to Engineer prior to proceeding with work.

No power and signal or instrumentation circuits shall be contained in the same conduit.

Use adaptors or other special appurtenances or where conduit materials change or as otherwise needed.

Route conduit away from hot equipment or hot piping or ducts to prevent excessive temperatures.

Coordinate actual final location of all equipment and facilities and stub-up conduit in appropriate locations.

Install sealtite watertight flexible conduit and fittings at connections to motors and other equipment. All components must be corrosion proof.

A separate green grounding wire must be run in all conduits and flexible conduits.

All metal conduits shall have grounding bushings installed and all shall be bonded to the grounding electrode system. Bond pullboxes to the grounding electrode system.

Follow all manufacturer recommendations for installation of conduits, fittings, and appurtenances, except where the requirements of the Contract are more stringent.

Where conduits exit from a floor, if a conduit bend in the floor or through the floor is necessary, install the bend fully beneath the floor so that the conduit is straight and vertical where it exits the floor and becomes visible. The curved portion shall not be visible above the finished floor.

Conduits connecting to panels shall enter from the bottom or lower part of the side. If this is not practical, coordinate with the Engineer prior to performing the work. Use rain tight hubs.

The conduit sizes shown in the drawings are the minimum sizes allowed. Where sizes are not shown or are insufficient, size conduits per the NEC as a minimum.

For conduits located inside containment areas or other areas where liquids may accumulate, extend conduits above maximum possible containment area prior to installing fittings. If this is not practical, all fittings, conduit, and appurtenances, etc., below the maximum possible liquid level shall be watertight.

Store conduit off the ground and protected from dust and dirt, etc., so that they conduits remain clean when ready for installation.

All manufacturers of conduit shall have a minimum of 5 years of experience.

Additional requirements are contained in the drawings.

Buried Conduit:

All buried wiring shall be in conduit and all buried conduit shall be encased by a minimum of 6” of concrete. Prefabricated plastic conduit spacers shall be used in duct banks in accordance with manufacturer instructions to maintain a minimum of 2” separation between each conduit. The spacing shall be greater if shown as such in the drawings. The concrete shall contain reinforcing steel at all road crossings and as otherwise indicated in the drawings.

The Electrical Subcontractor and Contractor shall coordinate all conduit locations in a timely manner to avoid any conflicts, including but not limited conflicts in elevations between conduits and piping and other facilities. There shall be no extra payment or extra contract time for encountering rock or muck or groundwater or underground obstructions, etc. The Electrical Subcontractor and Contractor shall be responsible for the location of all existing underground utilities (including electric and gas) and other conflicts prior to beginning excavation for the conduits. Adjust conduit and duct elevations to avoid conflicts.

Dirt, mud, and debris, etc., shall be kept out of the electrical trenches until concrete has been placed around the conduits. Prevent flotation or other movement of the conduits during placement of encasement concrete. The concrete used for encasement and all other electrical facilities shall be the same design mix as used for structures on the project.

Buried conduits and duct banks shall be backfilled with the same material and compacted to the same or higher level as called out if it were piping in the same location. As a minimum, all backfill under roads, walks, paved areas, buildings, or structures, or beneath piping, shall be backfilled in 6" maximum loose-fill lifts of pugmix limestone and compacted to 98% SPD. Backfill and compaction in such areas shall be compacted when convenient for the inspector to observe the activity.

Use PVC end bells flush with the concrete slab where PVC conduits enter pullboxes or slab mounted enclosures, etc.

All buried conduit shall be marked with red plastic warning tape imprinted with "CAUTION BURIED ELECTRICAL LINE". The warning tape shall be buried at a depth of 15 to 20" below ground. If the buried conduit will be crossed by a pipeline at a shallower depth than the conduit (i.e. above the conduit), also install additional tape below the bedding of the deepest pipeline. The warning tape shall be a minimum of 3" wide and shall have a foil core or equivalent to allow detection by pipe horns, etc.

Other Conduit:

Unless specifically shown otherwise, all conduit shall be concealed. No conduit shall be installed in a manner such that it presents a potential tripping hazard or obstructs access or presents a potential headroom obstruction.

Conduit shall be installed in neat parallel lines where exposed. When encased in walls or floors, conduit shall be installed near middepth of the concrete unless prior approval is given for a different location. Conduits encased in floors and walls or ceilings shall be spaced such that they are no closer than 3 diameters on center. Conduits shall not be laid on rebar. Allow room for concrete between all rebar and conduit. Provide extra reinforcing steel as determined by Engineer in areas where conduits are densely placed.

Protect the ends of conduit to prevent concrete or trash from obstructing the conduit. Protect exposed conduit and appurtenances during placement of concrete to prevent concrete from splattering on the conduit. Promptly clean off any concrete or other substance that gets on exposed conduit, etc.

All exposed conduit shall be thoroughly cleaned at the completion of construction. The cleaning requirements in the General Specifications apply to conduit and all other electrical facilities, etc.

Use appropriate procedures to prevent marring or damaging the coating on PVC coated conduits. Follow manufacturer recommended procedures for cutting, threading, and bending conduit. Use special tools, etc., as desired to protect the PVC coating. Use cold galvanizing or equivalent products to treat threads and such connections to prevent any corrosion or rust for PVC coated or galvanized steel conduits. If PVC coated conduit is damaged during installation, repair it with products and procedures recommended by the conduit manufacturer. The final condition and appearance must be acceptable to the Owner or the conduit shall be replaced with new conduit.

Prevent cutting or threading oil or fluids from dripping on floors, concrete, or paving. If any such material discolors any surface, the Contractor must completely restore the entire area to a uniform and like-new appearance. The final appearance must be acceptable to the Owner.

All metal conduit shall be joined with threaded connections. Provide expansion couplings where conduit crosses a structural expansion joint.

Label all spare conduits so the destination is clearly apparent.

STANDARD SPECIFICATION
FOR
ELECTRICAL - CONDUCTORS

SECTION 5-4

1.0 GENERAL

All wiring shall have copper conductors. All wiring shall be UL listed for its intended purpose.

2.0 PRODUCTS

Power Wiring:

Power wiring shall be rated for 600 volts. Each size wire provided shall be rated for the current capacity shown in the National Electrical Code for that size. The smallest size power wiring allowed shall be #12. All wire shall be rated for wet or dry locations.

All wiring to motors, all feeder circuits, and all wiring #8 or larger shall have a RHH/RHW/USE rating.

Wiring #10 and smaller that does not supply motors or feeders shall have a THHN/THWN rating.

Control Wiring shall be rated for 600 volts. Control wiring shall be #12 except where #14 is specifically shown in the wiring schedules. Control wiring shall be THHN/THWN. All wire shall be rated for wet or dry locations.

Wiring for Analog Circuits and Other Instrumentation: This wiring shall be shielded #16 twisted pairs. The foil shield shall provide 100% coverage. A drain wire shall be included. All cables shall be rated "Water Resistant". The cable shall have a rated pulling tension of at least 80 pounds.

Wiring for VFD Circuits:

In addition to the three power conductors, VFD cables shall include three ground cables located symmetrically around the power conductors. The insulation shall be cross-linked and be rated for 2,000 volts. The EMI shield shall consist of a copper braid and a foil shield and shall provide 100% coverage. The cable shall comply with UL and be listed as Type TC.

Termination instructions prepared by the cable manufacturer shall be included with the submittal. The instructions shall address where and how the shield will be terminated as well as other applicable instructions. The instructions shall be specific to each application on the project where the VFD cable is being utilized and may vary from one application to another within the same project. Where the VFD cable is routed through safety switches (disconnect switches), provide full instructions on how the shield and ground wires, etc., are to be handled at the switch. Where the VFD cable connects to a submersible pump or submersible mixer or other equipment with manufacturer provided cables, provide full instructions on how the shield and ground wires, etc., are to be handled at the manufacturer's

cable. The VFD cable shall be installed and terminated in accordance with the written instructions from the manufacturer.

Fixture Wiring shall have silicon rubber insulation rated at 200 degrees C. It shall have silicon rubber insulation and be type SF-2. The minimum size allowed shall be #16. The maximum amperage in the wire shall not exceed 6 amps for size AWG 16 and 13 amps for size AWG 14.

Connections: Where splices and taps are allowed, use products approved by UL that are compatible with the conductors and provide the same or better mechanical strength than the conductors themselves. Wire nuts are not allowed. Use solderless connections such as manufactured by Sta-Kon and install with tool provided by the manufacturer of the product. Insure the final connection is properly insulated and achieves the same insulation effectiveness as the conductor insulation.

Miscellaneous:

All wiring and appurtenances utilized on the project shall be approved by UL for its intended use. All wiring and appurtenances installed underground or in a ductbank shall be rated by UL for use in wet areas. If cable tray or similar facilities are allowed, all wiring installed in such facilities shall be rated TC in addition to the other requirements.

All conductors and cables shall be installed in conduits.

No wire smaller than #12 shall be used unless it is called out to be smaller in the wiring schedule in the drawings.

3.0 INSTALLATION

During storage and installation, continuously protect the open ends of conduits to prevent dirt, water, or other foreign substances from getting in the conduit. Clean conduits before pulling wire. During storage, protect ends of wire from rain, water, and moisture. Store wire in accordance with manufacturer recommendations. Pulling compounds shall be acceptable for use on the conductors being pulled.

Any splices must be in suitable boxes and not in conduits.

Perform conduit cleaning and wiring pulling in a manner that will not damage the conduit or conductors or conductor insulation.

When pulling the wire, do not exceed the conductor or cable maximum tension as recommended by the manufacturer. Do not exceed the manufacturer recommended bending radius for any cables or conductors, including but not limited to fiber optic cables.

Motors 100 horsepower and larger shall be connected to power wiring by an approved motor connection kit utilizing heat shrink components as manufactured by Raychem or equal.

Insulation resistance testing with Megger test equipment shall be performed at the completion of installation. This testing shall be performed on all feeder circuits and all circuits supplying motors 10 horsepower and larger. The Electrical Contractor shall be solely responsible for the safety, means, and methods of conducting the test. Prior to performing the test, disconnect all equipment that may be damaged by the testing. The test voltage shall be per ANSI for the voltage of the circuit being tested and the required IR shall not exceed that allowed by ANSI. The test shall not be performed during periods of high humidity. Provide

written certification listing all circuits tested and the results. Identify all circuits as "Pass" or "Fail". Correct the circuits that do not pass or exhibit questionable results and retest.

Check all circuits for continuity, short circuits, and grounding.

Install grounding conductors and bonds per NEC requirements. See grounding system test requirements in other specifications.

Provide a written report to the Owner listing individually all circuits tested, the type of test, the results, and certifying that all circuits passed the testing. The report shall be in a format acceptable to the Owner.

Apply permanent identification labels to all conductors identifying the circuit in accordance with an accepted name corresponding to the circuit identification in the plans and according to the circuit purpose. The labels shall be attached at every point, box, panel, pullbox, etc., where the conductor can be accessed. Clean conductors prior to attaching the labels and use products that will stay permanently adhered.

Mark conductors with tape to indicate the following:

PHASE	***120/208/240 VOLT COLOR***	***277/480 VOLT COLOR***
A	BLACK	BROWN
B	RED	ORANGE
C	BLUE	YELLOW
NEUTRAL	WHITE	WHITE
GROUND	GREEN	GREEN

All equipment and appurtenances, etc., shall be installed in strict accordance with the manufacturer's recommendations except where more stringent requirements are contained in the plans or specifications.

Where flexible equipment cables exit conduits and in other locations as needed, they shall be supported by stainless steel wire mesh strain relief grips which are in turn attached to the concrete or other structural member by stainless steel appurtenances and hardware. This includes, but is not limited to, all cables to submersible pumps, mixers, and aspirators, etc.

STANDARD SPECIFICATION
FOR
ELECTRICAL - ELECTRICAL ACCESSORIES, DEVICES, FUSES, AND MISCELLANEOUS ITEMS

SECTION 5-5

All junction boxes, wireways, cable trays (which are allowable only if and where specifically called for on the drawings) shall be aluminum or stainless steel with all stainless steel hardware, supports, attachments, and appurtenances, etc.

All wiring devices shall comply with NEMA WD 1 and WD 6 standards.

Switches shall comply with UL 20. Switches shall comply with Federal Specification WS896 and shall be rated Extra Heavy Duty or equivalent. Switches shall be manufactured by Hubbell, Cooper Arrow Hart, Pass & Seymour, or equal.

Receptacles shall meet UL 498 and GFCI receptacles shall meet UL 498 and UL 943. Receptacles and plugs etc. shall comply with Federal Specification W-C-596. Receptacles shall be manufactured by Hubbell, Cooper Arrow Hart, Pass & Seymour or equal.

Boxes shall be sized sufficiently to allow convenient installation of required conductors and appurtenances.

Coordinate the exact location and elevation of all wiring devices with the Owner. Light switches for rooms and offices etc. shall be mounted within 8" of the door opening to facilitate reaching for the switch. Where multiple switches or other devices are adjacent to each other, the relative locations shall be logical and intuitive to the persons using the devices.

Switches shall be rated for the voltage of the circuits in which they will be utilized. Switches shall be commercial grade as a minimum but must also meet all other specifications herein, including the Federal Specification. Switches installed outside (including under canopies) shall be rated for outdoor use in wet areas. Switches shall be rated for 20 amp minimum.

Receptacles shall be commercial grade or heavy duty as a minimum but must also meet all other specifications herein, including the Federal Specification. Receptacles shall match the plugs on equipment provided with plugs.

Receptacles in outdoor or damp areas or as called for in the drawings shall have GFCI protection. Receptacles in outdoor or damp areas or as called for in the drawings shall be weather resistant and have GFCI protection.

After installation, test all receptacles with a high quality Ground Circuit Impedance Tester. Additionally, test for all the following conditions as a minimum: open ground, open neutral, open hot, hot/ground reversed, hot neutral. For all GFCI circuits, the tester shall simulate a ground fault problem to verify that the circuit trips. This GFCI tester shall be used at every GFCI receptacle to verify that each one trips as required. At the completion of all testing, the Electrical Subcontractor shall provide a written certification, on a form prepared by the Engineer, that all receptacles have been properly tested and all passed all required testing. This shall include a list of every individual receptacle that was tested.

For switches, panels, and other locations as needed, provide fuses of the sizes and types recommended by the manufacturer of the equipment being protected. The fuses shall

be appropriately sized. Select fuses for proper protection without nuisance interruption. Fuses shall be manufactured by Bussmann or equal. Fuses shall be dual element having (1) an overload element with time delay and (2) a short circuit element.

Provide a minimum of 10% spare fuses, including a minimum of 3 of every size and type used on the project.

STANDARD SPECIFICATION
FOR
ELECTRICAL - SAFETY SWITCHES

SECTION 5-6

Safety switches shall be stainless steel. Switches located in wet areas, potential washdown areas, or outdoors shall be stainless steel NEMA 4X. The switches shall be located immediately adjacent to the equipment which they control. Mount switches in an area where they can be clearly seen and can be conveniently and quickly operated when needed. Mount switches in a location where it is clearly and obviously understood which specific piece of equipment they apply to so they can be quickly operated in an emergency. Provide rigid support via stainless steel or aluminum members. Do not install bracing in a manner that creates a potential tripping hazard. Provide permanent engraved labels on all switches clearly identifying the equipment they serve.

Safety switches shall be sized for the loads, including motor loads, that they serve. Size switches sufficiently large to serve future loads where shown and required. Switches shall be rated for load break. Switches shall be padlockable in the off position. Switches shall be UL listed.

Safety switches shall be provided with auxiliary contacts as shown in the drawings or as required. Safety switches for VFD circuits shall have an auxiliary contact for the VFD control circuit that opens prior to the power contacts opening and closes after the power contacts have closed.

Provide fuses and spares for all fused safety switches.

STANDARD SPECIFICATION
FOR
ELECTRICAL - TRANSFORMERS

SECTION 5-7

The Contractor shall provide transformers of the capacity and type shown in the drawings. All transformers shall be UL approved.

Transformers installed outdoors (including those under canopies) shall be rated NEMA 3R. They shall have a rainshield and be designed for outdoor use. Provide taps to allow compensation for actual input voltage and to allow control of output voltage. Transformers shall have noise and vibration isolation pads. As a minimum, transformers shall not exceed allowable NEMA noise levels. Transformers used indoors shall be manufactured with a noise level that is a minimum of 3 dB less than NEMA standards.

Transformers shall be installed on reinforced concrete housekeeping pads. For indoor transformers, special consideration shall be given to installing the transformer in a method that minimizes audible noise. Use flexible conduit to make connections to transformers. All components of the flexible conduit, including the connectors at each end, shall be corrosion-proof.

STANDARD SPECIFICATION
FOR
ELECTRICAL - GROUNDING AND BONDING

SECTION 5-8

Switchgear, Switchboards, MCCs, Control Panels, Pump Panels, Power Panels, Lighting Panels, Transformers, Service Entrance Equipment, Manufacturer-provided panels, steel columns, non-current carrying components of electrical equipment (including but not limited to panels and boxes, etc.) and handrails shall be grounded. The resistance to ground shall not exceed 5 ohms.

Switchgear and larger power panels shall be grounded with #4/0 minimum. Miscellaneous small controls panels may be grounded with #4. Provide larger wiring where called for in the plans.

All grounding and bonding material and equipment shall be meet UL 467 requirements. All work shall be performed and all materials used shall be in accordance with the National Electrical Code. The work shall be acceptable to the AHJ.

A buried #4/0 bare copper ground ring shall be installed at the bottom elevation of the footings around all structures and buildings. If the footing is less than 30" deep, then bury the copper at a minimum depth of 30". Copper ground rod (a minimum of 10' long) triads shall be installed at all corners of the ground loops. A #4/0 bare copper conductor shall be connect all ground rings around buildings and structures and shall be run with all duct banks and connected to all switchboards, MCCs, Control Panels, Pump Panels, Power Panels, Lighting Panels, the reinforcing steel in every concrete footing, etc., as well as at other locations called for in the drawings. The above described grounding components shall be continuous throughout the project. Below ground connections shall be made by exothermic welding.

A green insulated equipment grounding conductor shall be run with all circuits to all equipment. It shall be continuous through all conduits.

Where shown in the drawings – in addition to the equipment grounding conductor installed with the circuit conductors – a separate equipment grounding conductor shall be installed from the indicated equipment to the grounding electrode system.

For exterior metal or concrete light poles – in addition to the equipment grounding conductor installed with the circuit conductors – a separate equipment grounding conductor shall be installed from the light pole to the grounding electrode system.

Bond the electrical system grounding system with the Lightning Protection System in accordance with UL 96 and NFPA 780.

Install all grounding components in an effective manner. Clean surfaces to be connected. Remove paint, grease, plastic, and any substances from surfaces that may interfere with the conductivity of the grounding connection.

All ground conductors and associated components shall be installed in a manner such that they will be protected from damage during construction and for the life of the WTP, WWTP, Pumping Station, or other structure. All installation shall be in a manner such that no potential tripping hazard will be created. Install in concealed conduit where applicable to avoid creating a potential tripping hazard.

Prior to final inspection provide a written report from the Electrical Subcontractor certifying that the grounding and bonding system has been installed in accordance with the NEC and project requirements, has been properly tested, and is suitable for normal and safe usage.

Perform a grounding system test by using the rate-of-fall of potential test. The resistance to ground shall not exceed 5 ohms.

The Electrical Subcontractor shall completely test the grounding system from all equipment (motors, lights, panels, etc.) to the grounding electrode system and shall provide written certification that all ground connections have been properly made and provide minimal resistance.

Provide a written report to the Owner listing individually all circuits tested, the type of test, the results, and certifying that all circuits passed the testing. The report shall be in a format acceptable to the Owner.

STANDARD SPECIFICATION
FOR
ELECTRICAL - VARIABLE FREQUENCY DRIVES

SECTION 5-9

1.0 GENERAL

The "ALL EQUIPMENT" specification – Section 1 of the Equipment Specifications - shall fully apply to all the equipment in this specification section and to all equipment provided on this project. Refer to the "ALL EQUIPMENT" specification for additional requirements not contained in this specific equipment specification.

Each VFD shall be furnished with fusing as required to meet U.L. Listing, the NEC, and/or the required short circuit current rating (SCCR). The required SCCR for the VFD shall be as shown on the drawings (if shown), but in no case shall be less than the SCCR of the panel, MCC, etc. that it is mounted within or directly powered from. Any fusing required for these purposes shall not become a substitute for breakers shown or called for in the Contract Drawings. In all cases, fusing and breakers shall be sized by the VFD manufacturer to ensure proper protection for the VFD and compliance with U.L. and the NEC (including disconnect requirements). The disconnect means for the VFD shall be capable of being padlocked in the open position. If fusing and a breaker are provided for the VFD, the breaker shall be selected and set-up to trip during an overcurrent condition prior to the fuses blowing.

The VFD system shall be designed for and shall provide reliable and trouble-free service.

The VFD shall accept and provide all signals listed in the plans and specifications. See other sections of the specifications and the plans for these signals. As a minimum, it shall accept the following inputs: SCADA permissive (to allow the SCADA to inhibit starting), run command, speed setpoint. As a minimum, it shall output the following: running indication, speed, stopped, alarm, failed.

The VFD shall be designed for the capability, algorithms, and control logic, etc. to allow control for constant torque loads and variable torque loads including centrifugal pumps. The VFD shall perform equally well on either constant torque or variable torque loads. The VFD shall be furnished with software selectable, if chosen by the Owner, specifically for centrifugal pumps.

As a minimum, the VFD shall be sized based on a design amp rating equal to 1.15 times the full load amps (FLA) of the motor that it is driving. (If the FLA rating of the motor is not stated, it shall be no less than the fully rated amps published in the motor manufacturer's literature.) This 1.15 represents a motor variability factor established by the Owner to allow (1) for a higher current motor than planned during design, or (2) for a rebuilt motor that may have a higher current than when it was new, or (3) for a replacement motor from a different manufacturer which may have a higher FLA than the initial motor. This motor variability factor should not be confused with any percentages published by or used by the VFD manufacturer. This motor variability factor has no relation to any percentages or

similar factors used by the VFD manufacturer. Therefore the required amperage rating of the VFD is not a function of the amperage actually drawn by the motor during normal operation. The published amperage rating of the VFD shall be equal to or greater than the product of (1) the FLA of the motor times (2) the motor variability factor stated above.

In addition, the VFD shall be designed to handle a one minute (i.e. 1 minute out of 10 minutes) overload where the VFD amperage is 150% of the motor full load amps. This capability shall be clearly shown in the motor manufacturer's normally published literature available to the general public. Special ratings shall not be allowed. Further, the VFD as a minimum shall be identified by the VFD manufacturer as "Heavy Duty" for the motor's full load nameplate horsepower.

If in the Owner's opinion there is any ambiguity in the manufacturer's literature regarding whether the proposed VFD meets the requirements of the Contract, the submittal may be rejected or the Owner may allow the manufacturer to submit a larger VFD that clearly meets the requirements.

Provide with a "Permissible" or "Enable" circuit that can be routed through auxiliary off contacts mounted to "on-off" switches and E-Stops etc. to positively prevent the VFD from being operated in a "Local" or "Hand" or "Keypad" mode, etc., whenever any switch etc. through which the circuit is wired is in the "Off" or "Stop" position. This is a required safety feature to insure the VFD cannot be started by any means when any of the stop or off switches are in the stop or off position.

The VFD shall be packaged from the vendor with input line reactors and output filters. The reactors and filters furnished shall be as recommended by the VFD vendor to reduce harmonics and other VFD-related problems. The line reactors shall have 5% impedance unless the VFD supplier specifically recommends in writing that 5% reactors should not be installed and states valid reasoning for his recommendation. (In such a case, 3% line reactors shall be installed.) The line reactors shall also provide protection from incoming surges. DC chokes may be used in addition to line reactors but shall not be used in lieu of line reactors. The reactors and filters shall as a minimum have the same amperage rating as the VFD. The line reactors and output filters shall be manufactured by MTE. They shall be completely compatible with the VFD utilized and its load and shall be selected and coordinated by the VFD manufacturer.

The line reactor shall be mounted on the line side of the VFD. The filter shall be mounted on the load side of the VFD.

The VFD shall have both scalar and vector control modes.

The VFD must fit in the available space as shown on the drawings. If necessary, the VFD manufacturer shall provide (at no extra cost) a custom designed unit that will fit in the available space.

The VFD shall be a 6-pulse drive. The VFD shall be designed to operate with input power between 460 volts and 480 volts but shall also properly operate down to 10% lower than the above minimum and up to 10% higher than the maximum.

The carrier frequency shall be adjustable so that it can be adjusted as necessary to minimize the audible noise generated by motors driven by VFDs. The VFD shall be oversized as necessary to accommodate the adjustments needed to minimize the audible noise. This capability shall be especially important for motors located outdoors where neighbors may be disturbed by the audible motor noise.

The VFD shall have a minimum efficiency of 0.98 at nominal load. It shall provide a minimum power factor of 0.98 at nominal load. It shall be rated for operation from 5°C to 40°C. The VFD enclosure, including its cabinet or panel or MCC etc., shall be designed with adequate cooling provision for the location where it will be installed.

The VFD shall as a minimum be provided with the following LED indicator lights: On, Off, Alarm. Additional indications shall be provided as shown in the drawings (including the control diagrams) or as desirable for safety and ease of diagnosis.

The VFD shall provide Ethernet communications with the SDADA system utilized where the VFD is installed. Completely coordinate with the SCADA system manufacturer to provide matching interface. Provide all required adaptors and appurtenances, etc. needed for effective communication. Provide 4-20 mA inputs and outputs if shown on drawings or required for functionality. Provide any supplemental or additional hard wiring communication interfaces as shown on the drawings.

The Ethernet link shall communicate all available data to the SCADA system including but not limited to such parameters as speed, frequency, voltage (phase to phase and phase to ground, etc.), amperage (per phase), KW, KVA, and power factor. It shall accept inputs from the SCADA system for the speed setpoint as a minimum. Provide addresses and other information to the SCADA provider to allow him to easily access all the available data. Cooperate and communicate with the SCADA system prior to making the first VFD submittal and include complete documentation in the submittal demonstrating that the data exchange will be readily accomplished. See the SCADA I/O schedule for other required inputs from the SCADA to the VFD and outputs from the VFD to the SCADA. Where shown or called for, provide Ethernet connections to other panels, such as the pump control panel, in addition to the SCADA link. Discrete start-stop commands and 4-20 mA signals for speed control and output shall be provided in addition to the Ethernet communications.

Provide appropriate warning labels for potential safety issues on the outside of the enclosure. This shall include but not be limited to warnings regarding stored energy and power supplied by more than one source such that turning off the main breaker does not interrupt all power.

The VFD manufacturer shall coordinate with the manufacturer of the VFD cable and provide clearly written recommendations – including but not limited to a schematic – showing how to terminate and ground all wires and shields in the VFD cable.

The manufacturer of the VFD shall design and manufacture the VFD with protective features for the safety of operation and maintenance personnel. Provide barriers and other protective features as needed for safety.

The "All Equipment" specification for this Contract applies to the VFD and all associated components, including but not limited to reactors and filters, etc. Provide all components and miscellaneous appurtenances, etc. as needed for a complete and properly functioning system meeting all the requirements of the plans and specifications.

HMIs shall be mounted through the exterior door of the MCC or panel for ease of viewing and accessibility. The HMIs shall be mounted at a height that is convenient for operators of all heights. Coordinate exact mounting height with Owner prior to the submittal phase. The HMIs shall be color, 12" TFT, and have a minimum resolution of 1024 x 768. If this size HMI will require an increase in panel size beyond that shown in the drawings, coordinate with the Engineer prior to making the first submittal.

The VFDs shall be manufactured by ABB, Cutler Hammer, or Square D. The VFDs shall be UL Listed.

2.0 INSTALLATION AND START-UP

Properly store the VFD as described in other specifications. The VFD shall not be installed until adequate protection is in place. After the VFD has been installed, provide supplemental heating and other protective features as required or recommended by the VFD manufacturer.

At equipment start-up, a knowledgeable and experienced representative of the VFD manufacturer shall be present to assist with setting up the VFD. He shall lockout any frequencies where the resulting speed is not desired. He shall set the minimum speed in accordance with motor manufacturer recommendations and process recommendations. He shall set the maximum speed to prevent overspeed, motor overload, and to satisfy process considerations. He shall make all appropriate adjustments and settings. He shall train the operators regarding safe operation and maintenance.

STANDARD SPECIFICATION
FOR
ELECTRICAL - LIGHTING AND APPLIANCE BRANCH
CIRCUIT PANELBOARDS - 480/277 VOLT MAX

SECTION 5-10

1.0 SECTION INCLUDES

Lighting and Appliance Panelboard - Furnish and install lighting and appliance panelboard(s) as specified herein and where shown on the associated schedules and drawings.

2.0 REFERENCES

The panelboard(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following specifications.

1. NEMA PB 1 - Panelboards
2. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
3. NEMA AB 1 - Molded Case Circuit Breakers
4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
5. UL 50 - Enclosures for Electrical Equipment
6. UL 67 - Panelboards
7. UL 98 - Enclosed and Dead-front Switches
8. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures
9. CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards
10. CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers
11. Federal Specification W-P-115C - Type I Class 1
12. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service
13. NFPA 70 - National Electrical Code (NEC)
14. ASTM - American Society of Testing Materials

3.0 SUBMITTAL AND RECORD DOCUMENTATION

Approval documents shall include drawings. Drawings shall contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. In addition, the drawing shall illustrate one line diagrams with applicable voltage systems.

4.0 QUALIFICATIONS

Company specializing in manufacturing of panelboard products with a minimum of fifteen (15) years documented experience.

Panelboards shall be manufactured in accordance with standards listed Article 2.0 - REFERENCES.

5.0 DELIVERY, STORAGE, AND HANDLING

Inspect and report concealed damage to carrier within their required time period.

Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.

Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

6.0 OPERATIONS AND MAINTENANCE MATERIALS

Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

7.0 WARRANTY

Manufacturer shall warrant specified equipment free from defects in materials and workmanship for one (1) year from the date of acceptance.

8.0 RELATED WORK

Transient Voltage Surge Suppression

9.0 MANUFACTURERS

Shall be Square D Company NF - Class 1670 or pre-approved equal.

10.0 LIGHTING AND APPLIANCE PANELBOARD TYPE

NF

1. Interior

    a. Shall be type NF panelboard for 480Y/277 Vac maximum. Continuous main current ratings, as indicated on associated schedules and drawings, not to exceed 600 amperes maximum for

main breaker panelboards and not to exceed 800 amperes for main lug panelboards.

b. Minimum Short Circuit Rating: 100,000 amps symmetrical amperes at 480Y/277 Vac or as indicated on the drawings.

c. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors limited to bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be tin plated copper. Bussing rated for 600 and 800 amperes shall be tin plated copper as standard construction. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.

d. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.

e. A solidly bonded copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided.

f. Split solid neutral shall be plated and located in the mains compartment up to 250 amperes so all incoming neutral cable may be of the same length. UL Listed panelboards with 200% rated solid neutral shall be tin plated copper for non-linear load applications. Panelboards shall be marked for non-linear load applications.

g. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.

h. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format. Each panel shall have an engraved nameplate with black lettering on a white field providing the panel designation.

i. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers over 125A shall be vertically

mounted. Sub-feed circuit breakers shall be vertically mounted. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.

j. Interior phase bus shall be pre-drilled to accommodate field installable options. (i.e., Sub-Feed Lugs, Sub-Feed Breakers, Thru-Feed Lugs)

k. Interiors shall accept 125 ampere breakers in group mounted branch construction.

2. Main Circuit Breaker

a. Shall be Square D or equal type circuit breakers.

b. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40°C ambient environment. Thermal elements shall be ambient compensating above 40°C.

c. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

d. Circuit breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings. All breakers to be equipped with padlock attachments to lock the breakers in the off position.

e. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.

f. Lugs shall be UL Listed to accept solid or stranded copper conductors. Lugs shall be suitable for 75°C rated wire. Lug body shall be bolted in place; snap-in designs are not acceptable.

g. The circuit breakers shall be UL Listed for use with the following accessories: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

3. Branch Circuit Breakers

a. Shall be Square D type circuit breakers. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the panelboard schedules and drawings.

b. Molded case branch circuit breakers shall have bolt-on type bus connectors.

c. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.

d. There shall be two forms of visible trip indication. The circuit breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red VISI-TRIP® indicator appearing in the clear window of the circuit breaker housing. All breakers to be equipped with padlock attachments to lock the breakers in the off position.

e. The exposed faceplates of all branch circuit breakers shall be flush with one another.

f. Lugs shall be UL Listed to accept solid or stranded copper conductors. Lugs shall be suitable for 75°C wire.

g. Breakers shall be UL Listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.

h. Breaker shall be UL Listed with the following ratings: (15-125A) Heating, Air Conditioning, and Refrigeration (HACR), (15-30A) High Intensity Discharge (HID), and (15-20A) Switch Duty (SWD).

4. Enclosures

a. Type 1 Boxes

1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.

2) Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.

3) Box width shall not exceed 26" wide.

b. Type 1 Fronts

1) Front shall meet strength and rigidity requirements per UL 50 standards. Shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2) Fronts shall be hinged 1-piece with door. Mounting shall be surface or flush as indicated on associated schedules and drawings.

3) Panelboards rated 250 amperes and below shall have MONO-FLAT fronts with concealed door hinges and trim screws. Front shall not be removable with the door locked. Panelboards rated above 250 amperes shall have vented fronts with concealed door hinges. Doors on front shall have rounded corners; edges shall be free of burrs.

4) Front shall have flat latch type lock with catch and spring loaded stainless steel door pull. All lock assemblies shall be keyed alike. Two (2) keys shall be provided with each lock. A welded metal frame directory card holder with clear cover shall be mounted on the inside of door.

c. Type 3R, 5, and 12

1) Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2) All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A welded metal frame directory card holder with clear cover shall be mounted on the inside of door.

3) Maximum enclosure dimensions shall not exceed 21" wide and 9.5" deep.

11.0 INSTALLATION

Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and NEC standards.

12.0 FIELD QUALITY CONTROL

Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.

The manufacturer to provide and apply all standard arc flash labeling.

All additional Arc Flash labeling detailed elsewhere shall be supplied by the equipment manufacturer and installed by the installing contractor.

Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

STANDARD SPECIFICATION
FOR
ELECTRICAL - LIGHTING AND APPLIANCE BRANCH
CIRCUIT PANELBOARDS - 240 VOLT AC MAX

SECTION 5-11

1.0 SECTION INCLUDES

Lighting and Appliance Panelboard - Furnish and install lighting and appliance panelboard(s) as specified herein and where shown on the associated schedules and drawings.

2.0 REFERENCES

The panelboard(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following specifications.

1. NEMA PB 1 - Panelboards
2. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
3. NEMA AB 1 - Molded Case Circuit Breakers
4. UL 50 - Enclosures for Electrical Equipment
5. UL 67 – Panelboards
6. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures
7. CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards
8. CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers
9. Federal Specification W-P-115C - Type I Class 1
10. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service
11. NFPA 70 - National Electrical Code (NEC)
12. ASTM - American Society of Testing Materials

3.0 SUBMITTAL AND RECORD DOCUMENTATION

Approval documents shall include drawings. Drawings shall contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. In addition, the drawing shall illustrate one line diagrams with applicable voltage systems.

4.0 QUALIFICATIONS

Company specializing in manufacturing of panelboard products with a minimum of fifteen (15) years documented experience.

Panelboards shall be manufactured in accordance with standards listed Article 2.0 - REFERENCES.

5.0 DELIVERY, STORAGE, AND HANDLING

Inspect and report concealed damage to carrier within their required time period.

Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.

Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

6.0 OPERATIONS AND MAINTENANCE MATERIALS

Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

7.0 WARRANTY

Manufacturer shall warrant specified equipment free from defects in materials and workmanship for the lesser of one (1) year from the date of acceptance.

8.0 RELATED WORK

- Remote Controlled Lighting Panelboard System
- Transient Voltage Surge Suppression

9.0 MANUFACTURERS

Shall be Square D Company NQOD – Class1630 or pre-approved equal.

10.0 LIGHTING AND APPLIANCE PANELBOARD TYPE

NQOD

1. Interior
   a. Shall be type NQOD panelboard rated for 240 Vac/48 Vdc maximum. Continuous main current ratings, as indicated on associated schedules and drawings, not to exceed 600 amperes maximum.

   b. Minimum short circuit current rating: 10,000 amps rms symmetrical amperes at 240 Vac or as shown on the drawings.

c. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be tin plated copper. Bussing rated for 600 amperes shall be tin plated copper as standard construction. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.

d. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.

e. A solidly bonded plated copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided.

f. Split solid neutral shall be tin plated copper and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length. UL Listed panelboards with 200% rated solid neutral shall be tin plated copper for non-linear load applications. Panelboards shall be marked for non-linear load applications.

g. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.

h. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format. A engraved nameplate with black lettering on a white field shall be provided for panel designation.

i. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers over 100A shall be vertically mounted. Sub-feed circuit breakers shall be vertically mounted. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.

2. Main Circuit Breaker

   a. Shall be Square D or equal type circuit breakers.

   b. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40°C ambient environment. Thermal elements shall be ambient compensating above 40°C.

   c. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

   d. Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.

   e. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.

   f. Lugs shall be UL Listed to accept solid or stranded copper conductors. Lugs shall be suitable for 75 C wire. Lug body shall be bolted in place; snap-in designs are not acceptable.

   g. The circuit breakers shall be UL Listed for use with the following accessories: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

3. Branch Circuit Breakers

   a. Shall be Square D type circuit breakers. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the associated schedules and drawings.

   b. Molded case branch circuit breakers shall have bolt-on type bus Connectors.

c. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.

d. There shall be two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red VISI-TRIP® indicator appearing in the clear window of the circuit breaker housing. Breakers shall be provided with handle lock off attachments as shown on drawings.

e. The exposed faceplates of all branch circuit breakers shall be flush with one another.

f. Lugs shall be UL Listed to accept solid or stranded copper conductors. Lugs shall be suitable for 75°C wire. Branch circuit breakers rated 30 amperes and below shall be UL Listed to accept 60°C rated wire.

g. Breakers shall be UL Listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.

4. Enclosures

a. Type 1 Boxes

1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.

2) Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.

3) Box width shall be 26" wide maximum.

b. Type 1 Fronts

1) Front shall meet strength and rigidity requirements per UL 50 standards. Front shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2) Fronts shall be hinged 1-piece with door. Mounting shall be flush or surface as indicated on associated schedules and drawings.

3) Panelboards shall have MONO-FLAT fronts with concealed door hinges and mounted with trim screws. Front shall

not be removable with the door locked. Doors on front shall have rounded corners and edges shall be free of burrs.

4) Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. Two (2) keys shall be provided with each lock. A welded metal directory card holder with clear plastic cover shall be mounted on the inside of door.

c. Type 3R, 5, and 12

1) Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2) All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. Two (2) keys shall be provided with each lock. A welded metal directory card holder with clear plastic cover shall be mounted on the inside of door.

3) Maximum enclosure dimensions shall not exceed 21" wide and 6.5" deep.

11.0 INSTALLATION

Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and NEC standards.

12.0 FIELD QUALITY CONTROL

Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.

Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

The manufacturer to provide and apply all standard arc flash labeling.

All additional Arc Flash labeling detailed elsewhere shall be supplied by the equipment manufacturer and installed by the installing contractor.

STANDARD SPECIFICATION
FOR
ELECTRICAL - MOLDED CASE CIRCUIT BREAKERS

SECTION 5-12

1.0 SECTION INCLUDES

Thermal Magnetic Molded Case Circuit Breakers - Furnish as specified herein and where shown on the associated schedule or drawing.

Electronic Trip Molded Case Circuit Breakers - Furnish as specified herein and where shown on the associated schedule and drawings

2.0 REFERENCES

The circuit breaker(s) referenced herein shall be designed and manufactured according to the latest revision of the following standards.

1. NEMA AB 1 1993 - (National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches
2. UL 489 - (Underwriters Laboratories Inc.) Molded Case Circuit Breakers and Circuit Breaker Enclosures
3. UL 943 - Standard for Ground Fault Circuit Interrupters
4. CSA C22.2 No. 5.1 - M91 - (Canadian Standard Association) Molded Case Circuit Breakers
5. Federal Specification W-C-375B/GEN - Circuit Breakers, Molded Case; Branch Circuit and Service
6. National Fire Protection Association NFPA - 70 (National Electrical Code)

3.0 SUBMITTALS

Provide outline drawings with dimensions, and ratings for voltage, amperage and maximum interruption. Include instructions for identification and receiving inspection, circuit breaker mounting, trip unit functions and adjustments, trouble shooting, accessories and wiring diagrams.

4.0 QUALIFICATIONS

To be considered for approval, the manufacturer shall furnish products listed by Underwriters Laboratories Incorporated (UL), or testing firm acceptable to the authority having jurisdiction as suitable for application specified.

The overcurrent protection device manufacturing facility shall be Registered by Underwriters Laboratories Inc. to the International Organization for Standardization ISO 9000 Series Standards for quality.

5.0 MANUFACTURERS

Shall be Square D Company or equal Molded Case Circuit Breakers.

6.0 MOLDED CASE CIRCUIT BREAKERS

Molded Case Circuit Breaker Characteristics - General

1. Circuit breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.

2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.

3. The circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication. Circuit breaker escutcheon shall be clearly marked ON and OFF in addition to providing International I/O markings.

4. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.

5. Each circuit breaker shall be equipped with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit breaker tripping mechanism for maintenance and testing purposes except unit mounted type QB, QD, QG AND QJ.

6. Circuit breakers shall be factory sealed with a hologram quality mark and shall have date code on face of circuit breaker.

7. Circuit breaker/circuit breaker combinations for series connected interrupting ratings are not acceptable, a fully rated devices shall be utilized.

8. Manufacturer shall provide electronic and hard copy time/current characteristic trip curves and Ip & I^2t let through curves for current limiting circuit breakers for each type of circuit breaker.

9. Circuit breakers shall be equipped with UL Listed electrical accessories as noted on the associated schedule and drawings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON and OFF position.

10. All circuit breakers shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.

11. Circuit breakers shall be I-LINE - up to 1200 Amp maximum construction with factory installed mechanical lugs. All circuit breakers shall be UL Listed to accept field installable/removable mechanical type lugs (except type QB, QD, QG and QJ). Lug body shall be bolted in place; snap in design not acceptable. All lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper conductors only. Lugs shall be suitable for 75° C rated wire or 90° C rated wire, sized according to the 75° C temperature rating in the National Electrical Code.

12. All circuit breakers shall be capable of accepting bus connections.

Thermal-Magnetic Circuit Breakers

1. Shall be Square D type: FY, FA, FH, FC, FI, QB, QD, QG, QJ, KA, KH, KC, KI, LA, LH, LC, LI, MA, MH, PG, PJ, RG, RJ, PA, PH, PC or pre-approved equal.

2. Circuit breakers shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.

3. Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true rms sensing and thermally responsive to protect circuit conductor(s) in a 40° C ambient temperature.

4. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker (except type QB, QD, QG and QJ).

5. Standard two- and three-pole circuit breakers up to 250 amperes at 600 VAC shall be UL Listed as HACR type (except type FC, FI, KC, KI, QB, QD, QG and QJ).

Equipment Ground Fault Protection (Thermal Magnetic Circuit Breakers)

1. Circuit breakers 250 amperes and less shall be Square D or equal type: FA, FH, FC, FI, KA, KH, KC, KI or pre-approved equal, and shall be equipped with a Ground Fault Module (GFM) or pre-approved equal.

2. Ground fault sensing system shall be modified zero sequence sensing type.

3. The ground fault system shall require no external power to trip the circuit breaker.

4. Companion circuit breaker shall be equipped with a ground-fault shunt trip.

5. The ground fault sensing system shall be suitable for use on grounded systems. The ground fault sensing system shall be suitable for use on three-phase, three-wire circuits where the system neutral is grounded but not carried through the system or on three-phase, four-wire systems.

6. Ground fault pickup current setting and time delay shall be field adjustable. A switch shall be provided for setting ground fault pickup point. A means to seal the pickup and delay adjustments shall be provided.

7. The ground fault sensing system shall include a ground fault memory circuit to sum the time increments of intermittent arcing ground faults above the pickup point.

8. A means of testing the ground fault system to meet the on-site testing requirements of NEC Section 230-95(c) shall be provided.

9. Local visual ground fault trip indication shall be provided.

10. The ground fault sensing system shall not affect interrupting rating of the companion circuit breaker.

Electronic Trip Circuit Breakers With Standard Function Trip System

1. Shall be Square D or equal Standard Function type: LX, MX, PG, PJ, RG, RJ, PX, or current limiting Standard Function type LXI or pre-approved equal.

2. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules and drawings.

3. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.

4. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and adjustment positions shall be clearly marked on the face of the circuit breaker.

Circuit breakers shall be UL Listed to carry 80% of their ampere rating continuously.

5. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.

Long Time Pickup	Instantaneous Pickup
Long Time Delay(I^2t IN/OUT)	Ground Fault Pickup
Short Time Pickup	Ground Fault Delay (I^2t IN/OUT)
Short Time Delay(I^2t IN/OUT)	

6. A means to seal the trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.

7. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.

8. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in true rms with 2% accuracy.

9. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.

10. The trip system shall include a Long Time memory circuit to sum the time increments of intermittent overcurrent conditions above the pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.

11. Circuit breakers (except LX, LXI) shall be equipped with back-up thermal and magnetic trip system.

12. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

Electronic Trip Circuit Breaker with Full Function Trip System

1. Shall be Square D or equal Full Function type: LE, ME, PJC, PGC, RJC and RGC or pre-approved equal.

2. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules and drawings

3. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.

4. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and switch adjustments shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 100% of their ampere rating continuously. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.

Long Time Pickup	Instantaneous Pickup
Long Time Delay(I^2t IN/OUT)	Ground Fault Pickup
Short Time Pickup	Ground Fault Delay (I^2t IN/OUT)
Short Time Delay(I^2t IN/OUT)	

5. Circuit breakers with adjustable short-time function shall be provided with defeatable instantaneous adjustment and 30 cycle short-time withstand ratings. Short-time withstand ratings shall be specified in rms symmetrical amperes, as shown on the drawings and schedules.

6. A means to seal the rating plug and trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.

7. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.

8. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in True rms with 2% accuracy.

9. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.

10. The trip system shall include a Long Time memory circuit to protect against intermittent overcurrent conditions above the long time pickup point.

Means shall be provided to reset Long Time memory circuit during primary injection testing.

11. Circuit breakers shall be equipped with back-up thermal and magnetic trip system.

12. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

13. Communications capabilities for remote monitoring of circuit breaker trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings, and trip history information shall be provided.

14. Circuit breakers shall be provided with Zone Selective Interlocking (ZSI) communications capabilities on the short-time and ground fault functions compatible with all other electronic trip circuit breakers and external ground fault sensing systems as noted on drawings and schedules.

Insulated Case Circuit Breaker with Full Function Trip System

1. Shall be Square D or equal Insulated Case type: Masterpact or pre-approved equal. Circuit breaker shall be Fixed, Individually Mounted or Drawout, Individually Mounted construction as indicated on the schedules and drawings.

2. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules and drawings.

3. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.

4. Circuit breakers shall be equipped with back-up thermal and magnetic trip system.

5. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and switch adjustments shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 100% of their ampere rating continuously.

6. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent from all other adjustments.

Long Time Pickup	Instantaneous Pickup
Long Time Delay(I^2t IN/OUT)	Ground Fault Pickup
Short Time Pickup	Ground Fault Delay (I^2t IN/OUT)
Short Time Delay(I^2t IN/OUT)	

7. Circuit breakers with adjustable short-time function shall be provided with defeatable instantaneous adjustment and 30 cycle short-time withstand ratings. Short-time withstand ratings shall be specified in rms symmetrical amperes, as shown on the schedules and drawings.

8. A means to seal the rating plug and trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.

9. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.

10. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in True rms with 2% accuracy.

11. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.

12. The trip system shall include a Long Time memory circuit to protect against intermittent overcurrent conditions above the long time pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.

13. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

14. Communications capabilities for remote monitoring of circuit breaker trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings, and trip history information shall be provided.

15. Circuit breakers shall be provided with Zone Selective Interlocking (ZSI) communications capabilities on the short time and ground fault functions

compatible with all other electronic trip circuit breakers and external ground fault sensing systems as noted on schedules and drawings.

16. True two-step stored energy mechanism with five (5) cycle closing time shall be provided. All circuit breakers shall have multiple CHARGE/CLOSE provisions allowing the following sequence:

CHARGE, CLOSE, RECHARGE, OPEN/CLOSE/OPEN

17. Local control pushbuttons to OPEN and CLOSE circuit breaker shall be provided. Color coded visual indication of contact position (OPEN or CLOSED) shall be provided on the face of the circuit breaker. Local manual charging following CLOSE operation shall be provided. Color coded visual indication of mechanism CHARGED and DISCHARGED position shall be provided on the face of the circuit breaker. Visual indicator shall indicate CHARGED only when closing springs are completely charged.

18. Each circuit breaker shall be electrically operated to permit remote CHARGE, CLOSE, and OPEN capabilities. Electrically operated circuit breaker shall be equipped with charge contact switch for remote indication of mechanism charge status.

19. All circuit breakers shall be equipped with electrical accessories as noted on schedules and drawings

20. Provide the following interlocking capabilities:
    a. cell door interlock
    b. key interlock for main-tie-main
    c. lock off

Equipment Ground Fault Protection (Electronic Trip Circuit Breakers)

1. Equipment shall be Square D or equal.

    a. Standard Function - True RMS Sensing type: LX, LXI, MX, PJ, PG, RJ, RG, PX with ground fault option or pre-approved equal
    b. Full Function - True RMS Sensing type: LE, ME, PJC, PGC, RJC, RGC, PE, NW with ground fault option or pre-approved equal.

2. Circuit breakers shall be provided with integral equipment ground fault protection for grounded systems. The circuit breaker shall be suitable for use on three-phase, three-wire circuits where the system neutral is grounded but not carried through the system or on three-phase, four-wire systems.

3. A separate neutral current transformer shall be provided for three-phase four-wire systems as indicated on schedules and drawings.

4. Ground fault sensing system shall be residual sensing.

5. The trip system shall include a ground fault memory circuit to sum the time increments of intermittent ground faults above the pickup point.

6. A means of testing the ground fault system to meet the on-site testing requirements of NEC Section 230-95(c) shall be provided.

7. Local visual trip indication for a ground fault trip occurrence shall be provided.

7.0 INSTALLATION

Install circuit breakers in accordance with manufacturers instructions, the National Electrical Code and applicable local codes.

8.0 ADJUSTING

Circuit breaker pick-up level and time delay settings shall be adjusted to values indicated on the fault and coordination study and as required for proper operation.

STANDARD SPECIFICATION
FOR
ELECTRICAL – SURGE PROTECTIVE DEVICES

SECTION 5-13

1.0 SUMMARY

This section describes the quality, performance, and installation of Surge Protective Devices (SPDs) for this project.

2.0 QUALITY ASSURANCE

All Surge Protective Devices (SPDs) shall be tested and ***listed*** to ***ANSI/UL 1449 3rd Edition*** and Complimentary Listed to UL 1283 by an independent testing agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a Nationally Recognized Testing Laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction. This agency must comply with ANSI/IEEE C62.45 test procedures for all categories established in C62.41 (1991). "Manufactured in accordance with UL 1449" is not equivalent to being listed to ANSI/UL 1449 3rd Edition and does not meet this specification.

3.0 CODES AND STANDARDS

1. ANSI/IEEE Standards C62.41.1™ - 2002, IEEE Guide on the Surge Environment in Low- Voltage (1000 V and Less) AC Power Circuits.
2. ANSI/IEEE Standards C62.41.2™ - 2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.
3. ANSI/IEEE Standards C62.45™ - 2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits.
4. ANSI C84.1, American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hertz).
5. ANSI/IEEE Standard 1100-2005, IEEE Recommended Practice for Power and Grounding Electronic Equipment (Emerald Book) - Clause 8.6.1.
6. National Fire Protection Association (NFPA) 70 (N.E.C.) - 2002 - Article 285.
7. ANSI/UL Standards 1449 3rd Edition, UL 1283 Listed, CUL Listed and CE compliant "low-voltage directive."
8. C62.62-2010 - IEEE Standard Test Specifications for Surge-Protective Devices (SPDs) for Use on the Load Side of the Service Equipment in Low Voltage (1000 V and less) AC Power Circuits.

9. IEEE Standard C62.72™ - 2007 - IEEE Guide for the Application of Surge-Protective Devices for Low-Voltage (1000 V or less) AC Power Circuits

4.0 MANUFACTURER QUALIFICATIONS

All surge suppression devices shall be manufactured by an ISO 9001-2008 certified company normally engaged in the design, development, and manufacture of such equipment, with at least 10 years of engineering experience in the design and manufacture of permanently connected SPD devices.

The surge suppressor manufacturer shall provide unlimited free replacement of the entire SPD for all inoperable SPD units during the warranty period.

The listing of a manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any submittals made are for products that meet or exceed the specifications included herein. Subject to compliance with requirements, provide only products by the following manufacturers and models listed below:

- Surge Suppression Incorporated (Advantage Series (888-212-2728))
- Emerson (Liebert) Corporation (560xx16 and 570xx17 Series) / 614-888-0246, or
- CurrentTechnology (SL3 - 150 Series) / 800-238-5000.

5.0 SUBMITTALS

Surge suppression submittals shall include, but shall not be limited to the following items:

1. Complete schematic data for all suppressors indicating part numbers, conductor sizes, etc.
2. Dimensioned drawing of each suppressor type indicating mounting arrangement. Manufacturer's ANSI/UL 1449-2006 Third Edition listing classification page and listing number(s).
3. Manufacturer's UL 1283 listing classification page and listing number(s).
4. Certified test data documenting ANSI/IEEE C62.41-2002 performance and the ability of the device to meet or exceed all requirements of this specification. Include complete let-through voltage/measured limiting voltage test data (not Voltage Protection Rating), test graphs, and scope traces for each mode for each product submitted for Category's C, B, A (including Cat A, 2 kV, 67 A, 100 kHz ring wave at both 90 and 270 degree electrical phase angles**).**
5. Letter from manufacturer stating products are in strict compliance with the recommendations of IEEE Standard 1100-2005, Clause 8.6.1 and incorporate 10 individual dedicated discrete modes of protection for three-phase Wye systems, including direct line-to-line components. (Reduced-mode variations will not be accepted).
6. Certificate of declaration that product is CE low voltage directive compliant.

7. Statement of manufacturer's warranty duration and replacement policy.

6.0 REQUIREMENTS

The Surge Protective Devices (SPDs) shall be of a parallel-connected design using fast-acting transient energy protection components that will divert and dissipate the surge energy.

All SPDs shall be tested and listed to ANSI/UL 1449 3rd Edition and Complimentary Listed to UL 1283 by a Nationally Recognized Testing Laboratory (NRTL) (i.e. CSA, UL, etc). Type 2 SPDs shall be complimentary listed to UL 1283.

The SPD for the service entrance shall be a Type 1 or Type 2 SPD. All other SPDs shall be Type 2 SPDs; Type 4 SPDs are not permitted. (Definitions: Type 1 SPD – Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service equipment overcurrent device, as well as the load side, including watt-hour meter socket enclosures and intended to be installed without an external overcurrent protective device. **Type 2 SPD** – Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device; including SPDs located at the branch panel. **Type 4 SPD** – Recognized Component SPDs, including discrete components as well as component assemblies, which bear specific conditions of acceptability.)

The SPD shall be tested and listed by an NRTL as a complete assembly to a symmetrical fault current rating greater than or equal to the available fault current at the location of installation at the connected panel without the need for upstream over current protection, in accordance with NEC Article 285 and shall be marked with the Short Circuit Current Rating (SCCR). If the available fault current is unknown, then the SCCR of the SPD shall be 200 kAIC.

Permanently connected devices mounted parallel to the service, distribution, and sub panels are required. SPD device drawings shall be made available upon request. The service entrance SPD shall have a **Nominal Discharge Current (In)** of 20 kA. All other SPDs shall have a Nominal Discharge Current (In) of 10 kA. (The Nominal Discharge Current Test was designed to establish that the SPD remains functional after 15 surges at various currents (3 kA, 5 kA, 10 kA, and 20 kA) using the test procedure described in ANSI/UL 1449-2006.)

Fusing:

1. The SPD shall provide as a minimum, over-current, over temperature protection in the form of component-level thermal fusing to ensure safe failure and prevent thermal runaway. This component-level fusing shall be an integral part of the MOV itself and not silver wire (or other) independently laid across each MOV. SPDs without thermal fuses or disconnects, or SPDs with shared thermal devices that disconnect more than one MOV are not acceptable.

2. Surge protective devices shall contain integral short circuit current safety fusing within each device for over-current requirements of the NEC. This fusing will be independent of the "component-level" fusing and be

specifically for over-current protection and shall be constructed utilizing surge rated; cartridge fuses and not rated 'silver-fuse-wire' (or other).

3. Any SPD that is connected directly to the bus on a panel, panelboard, or MCC must have a properly sized breaker in the circuit between the SPD and the bus to permit the SPD to be serviced without the requirement to remove the power from the gear.

4. The fusing mechanisms employed must effectively coordinate their performance in conjunction with the high current abnormal over-voltage testing under ANSI/UL 1449-2006 (a.k.a. UL 1449 3rd Edition).

5. The use of any mechanical or electro-mechanical thermal/over- current protection (i.e. moving parts and/or springs and shutters)in combination with or for the protection of the suppression elements is expressly prohibited and will be rejected. Large-Block 34mm (50kA) square Thermal Protected MOVs are expressly prohibited and will not be accepted

MCOV: The SPD shall have a maximum continuous operating voltage (MCOV) capable of sustaining 115% of nominal RMS voltage continuously without degrading.

Component Limitations: The SPD shall only use solid-state clamping components to limit the surge voltage and divert the surge current. SPD components that "crowbar" short-circuit the AC power system (e.g. spark gaps, gas tubes, selenium cells, or SCR's) shall not be acceptable. Device circuitry shall be bi-directional, enclosed in a UL listed encapsulated thermal stress reducing compound, and be of a parallel design.

Per Phase Ratings: 'Per-Phase' ratings for a three-phase Wye-connected SPD are determined by multiplying the kA per mode times the number of **discrete modes of protection (directly connected suppression components)**, minus the value for the Neutral to Ground mode, divided by the number of phases.

Per-Phase = (((kA per mode) X (# of modes))-(N-G mode kA)) /
(# of phases)

Protection Modes: The SPD system shall provide (per IEEE Std. 1100-1999 8.6.1) dedicated, independent, distinct, individual protection circuitry for every possible mode in the electrical distribution system at the point of SPD application. For example, a 277/480V, 3-phase Wye, 4-wire plus ground system has **10 distinct modes** that require independent and dedicated protection (i.e., L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G). None of these modes of protection depend on protection elements purposed for other protection modes. Reduced mode SPD with only 3, 4, or 7 dedicated, distinct, independent protection modes are not acceptable and are not to be submitted. For 6 mode delta systems, 6

dedicated, independent, distinct protection modes are required (L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G). When a mode of protection is specified, the protective mode *must* be specifically included. Thus, Line-to-Neutral-to-Line is *not acceptable* where Line-to-Line is specified.

Frequency Responsive Circuitry (FRC) (a.k.a. Sinewave Tracking Capability): The service entrance as well as power panels and MCCs serving sensitive electronic equipment shall utilize voltage independent, dedicated Frequency Responsive Circuitry (FRC) intended to mitigate the effects of switching or ringing surges that is specifically designed so that it can survive the surge environment. EMI/RFI filtering specifically will not be considered as equal to FRC. The performance of FRC is defined by the level to which it mitigates Ring Wave transients and can be demonstrated in the test results of IEEE C62.41.2-2002, Category A 2kV, 30 Ohm Ring Wave.

To demonstrate the FRC capability of the submitted devices, manufacturers shall submit 3rd party, independent tests results for units claiming FRC capability. Such tests shall include testing under the standards of ANSI/IEEE C62.41 and C62.45 category A (2kV,67A, 100kHz ring wave) applied at the 270 degree phase angle, positive polarity as applicable on each of the following modes: line-to-neutral, line-to-ground, and line-to-line (dynamic tests with normal voltage applied to the unit under test), and neutral-to-ground (static test with no normal voltage applied to unit under test). The "let-through voltage" derived from each of these tests shall have a maximum amplitude of less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient. Measurement of the let-through voltage shall be made with six-inches of lead length external to the SPD housing in accordance with ANSI/UL 1449-2006. Performance requirements are as stated in the table in Section 8 below (ANSI/IEEE C62.41 Let-Through Voltage) at Test Category A Ring Wave (2kV).

Status Indicators: SPD units shall have panel front status monitors as a minimum to indicate a continuous positive status of each protected phase. A remote audible alarm option must be supplied where the specifying engineer deems it necessary and cost effective under the circumstances. Install in a manner so that the indicator lights are promptly and easily visible. Refer to the appropriate drawings and schedules for these details. Provide dry contracts for indication of SPD failure on all SPDs, regardless of whether or not shown in drawings or schedules. Provide remote indicator lamps where needed for ease of viewing.

Equipment Certification: Items shall be listed to ANSI/UL 1449-2006, shall bear the seal of the NRTL, shall bear the Marking "Listed to UL 1449", shall have been tested under ANSI/UL 1449-2006, and shall be marked in accordance with the referenced standard. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly. All surge suppression devices shall be manufactured by an ISO 9001-2008 certified company normally engaged in the design, development, and manufacture of such equipment.

Circuit Configuration: The circuit configuration of the suppression units shall be bi-directional, thermal stress reducing, encapsulated, custom parallel connected, and solid

state. (Series units or units equipped with "load carrying" components are expressly prohibited due to the possibility of single point series failures causing power interruption to protected loads.)

Enclosures: Unless otherwise noted, provide NEMA 1 or better enclosures for indoor mounting and NEMA 4 enclosures or better for all outdoor locations. All units shall contain Form C, N/O or N/C, dry relay contacts, and weatherproof fittings to maintain the required NEMA integrity.

Maintenance Restrictions: No suppression unit shall be supplied which requires scheduled preventive maintenance or replacement parts. Units requiring functional testing, special test equipment, or special training to monitor surge protection device (SPD) status are not acceptable. SPD shall require NO routine maintenance. SPD devices are considered non-repairable items and shall be fully replaced upon failure.

Commonality: All SPDs at the service entrance, distribution panels, and sub-panels shall be from the same manufacturer.

All SPDs shall meet or exceed the following performance criteria:

Service Entrance (Category C): The SPD shall provide a minimum protection of **300kA per phase** (three-phase Wye), be of frequency responsive design, and be capable of meeting the Category C-High Let-Through Voltage criteria as shown in the Section 7.0, below.

Building Distribution Panels (Category B): The SPD shall provide a minimum protection of **180 kA per phase** and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section 7.0, below.

Branch Panels/Panelboards *(Non-Electronics)* (Category A): The SPD shall provide a minimum protection of **120kA per phase** and be capable of meeting the Category B-High Let-Through Voltage criteria as shown in the Section 7.0, below.

Branch Panels/Panelboards *(Electronics)* (Category A): The SPD shall provide a minimum protection of **120kA per phase**, be of **frequency responsive** design, and be capable of meeting the Category A Let-Through Voltage criteria as shown in the Section 7.0, below.

Per Phase Ratings: 'Per-Phase' ratings for a three-phase Wye-connected SPD are determined by multiplying the kA per mode times the number of discrete modes of protection (directly connected suppression components), minus the value for the Neutral to Ground mode, divided by the number of phases.

$$\text{Per-Phase} = (((\text{kA per mode}) \times (\text{\# of modes})) - (\text{N-G mode kA})) / (\text{\# of phases})$$

7.0 ANSI/IEEE C62.41 LET-THROUGH VOLTAGE

The SPD shall meet the Let-Through Voltage requirements shown in the tables below for voltage and locations specified. All voltages shall be peak (±10%), Positive Polarity, Time base = 10μS, Sampling Rate = 500 Megasamples per second to ensure maximum transient capture. [These settings assure Let-through Voltage test results are accurate]. Surge voltages shall be measured from the insertion of the surge on the sine wave to the peak of the surge. All tests are Static (unpowered), except for the 120V circuits that are Dynamic (powered). Let-through voltages on static tests calculated by subtracting sine wave peak from let-through measured from zero. All tests shall be performed in accordance with UL 1449 Third Edition with measurements performed at a point on the leads 15.24 cm (6 inches) outside of the device enclosure. No data measured at a module, lugs, component, or undefined location will be accepted. These settings assure Let-through Voltage test results are accurate. SPDs shall meet the following criteria:

- **Service Entrance** ANSI/IEEE **Cat. C Impulse Wave:** The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. C Impulse Wave (20kV, 10,000 amps) at the 90 degree phase angle, shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

Mode / Voltage	*120/208Y*	*277/480Y*	*480V, 3Ø*
L-N	**1,075V**	**1,340V**	**N/A**
L-L	**1,390V**	**1,990V**	**1,990V**
L-G	**1,060V**	**1,310V**	**2,150V**
N-G	**1,450V**	**1,730V**	**N/A**

- **Distribution and Branch Panels/Panelboards (Non-Electronics)** ANSI/IEEE **Cat. A Combination** Wave Impulse: Let-Through Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. A Combination Wave Impulse (6kV, 200 amps) at the 90 degree phase angle, shall be less than; (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sine wave to the peak of the transient):

Mode / Voltage	*120/208Y*	*277/480Y*	*480V, 3Ø⊗*
L-N	**315V**	**440V**	**N/A**
L-L	**470V**	**530V**	**505V**
L-G	**315V**	**430V**	**505V**
N-G	**596V**	**966V**	**N/A**

- **Branch Panels/Panelboards *(Electronics)*** ANSI/IEEE **Cat. A Ring Wave** Let-through-Voltage: The let-through voltage based on ANSI/IEEE C62.41 and C62.45 recommended procedures for the ANSI/IEEE Cat. A Ring Wave (2kV, 30 ohm ring wave) at the 270 degree phase angle, shall be less than (values are total let-through voltage (LTV) measured from the insertion point of the transient on the sinewave to the peak of the transient):

Mode / Voltage	*120/208Y*	*277/480Y*	*480V, 3Ø⊗*
L-N	**30V**	**65V**	**N/A**
L-L	**40V**	**110V**	**114V**
L-G	**50V**	**85V**	**1,605V**
N-G	**50V**	**65V**	**N/A**

8.0 ANSI/UL 1449-2006 VOLTAGE PROTECTIVE RATING

1. **Voltage Protection Rating (VPR)** is a rating selected from a list of preferred values as detailed in ANSI/UL 1449-2006 and assigned to each mode of protection. The value of a VPR is determined as the nearest highest value taken from a list of preferred values (as detailed in ANSI/UL 1449-2006) compared to the measured limiting voltage determined during the transient voltage surge suppression test using the combination wave generator at a setting of 6 kV, 3 kA.

2. The SPD shall have Voltage Protection Ratings (VPRs) no greater than those shown below:

Nominal System Voltage	*Mode*	*VPR*
Single-Phase 120/240	L-N L-G N-G L-L	600 V 600 V 700 V 1000 V
Three-Phase 120/240 Delta	L-N HL-N L-G HL-G N-G L-L HL-L	600 V 1200 V 600 V 1200 V 600 V 1000 V 1000 V

Nominal System Voltage	*Mode*	*VPR*
120/208 Wye	L-N L-G N-G L-L	600 V 600 V 600 V 1000 V
277/480 Wye	L-N L-G N-G L-L	1200 V 1200 V 1200 V 1800 V
480 No Neutral (Delta)	L-G L-L	1800 V 1800 V

9.0 WARRANTY

All SPD devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of twenty-five (25) years from date of final acceptance of the complete project.

Any SPD device that shows evidence of failure or incorrect operation, including damage as the result of lightning strikes, during the warranty period shall be replaced as a complete unit (not just modules, subassemblies, or components) by the manufacturer at no charge to the owner. Warranty will provide for multiple exchanges of any inoperable devices at any time during the warranty period that starts at the date of final acceptance of the complete project.

SPD manufacturers whose standard warranty does not meet the requirements listed above standard shall submit a letter extending the warranty to meet these standards with the product submittal. The form and content, etc., of the letter shall be acceptable to the Owner. The letter shall be signed by the President of the company. It shall be witnessed and notarized. If the letter is not acceptable to the Owner, the submittal shall be rejected.

10.0 INSTALLATION

GENERAL: These basic principles for the installation of SPDs in electrical panels shall be complied with. They are:

- For proper performance, the SPD must be installed with the wires as short and straight as humanly possible. Any sharp bend in the wire is unacceptable. This applies to phase, neutral, and ground leads. The objective is to reduce the lengths of wire provided on each unit, not add to it. The priority is to the phase leads, then the neutral, and then the ground lead.

- Install the breaker for the SPD close to the neutral bus, if present, on the neutral bus side of the panel. If no neutral circuit is present in the electrical panel, install the breaker close to the ground bus if possible.
- Install the SPD on a dedicated breaker. If the unit is piggybacked on a breaker that feeds other equipment, when that breaker is turned off to service the other equipment, you have lost the surge suppression for that panel.
- Mount the SPD directly across from the breaker. While holding the SPD on the wall or side of the panel, determine the shortest distance between the hub on the SPD and the hub to be installed on the panel. If using the flexible conduit supplied with the SPD, cut the flexible conduit to the shortest length possible to fit securely over both hubs. Twist the trimmed flexible conduit onto the extra hub. Slide the conduit and hub over the wires of the SPD and twist the conduit onto to the hub of the SPD. Connect the extra hub to the panel and mount the SPD to the wall or the panel.
- The breaker, the neutral bus, and the SPD should be close together to keep the wires as short and straight as humanly possible. Twist the phase and neutral wires together for 2 or 3 twists between the SPD and the breaker. Then these wires should be cut short as possible and connected to the breaker or the neutral bus, as appropriate, with no sharp bends in the wire.
- The ground wire should be connected to the panel ground bus if it is close to the SPD. If this is not possible, connect the ground wire to a ground lug installed near the SPD in the can or frame as they are grounded. If necessary, once this is done, the ground wire can be extended from the lug to the ground bus if the AHJ requires this connection.
- These same principles apply to installation on switchboards and MCCs, etc. On MCCs, try to locate the SPD as close to the main bus as possible so that the lead lengths are short. If possible, when installing an SPD in an MCC, install it in a bucket with a feeder breaker and use a remote light mounted on the door. The Remote Light Kit (option –LP) must be ordered with the SPD. It cannot be ordered to add to the SPD as an in-the-field modification.

SPECIFICS:

1. Provide surge suppressor at each building service entrance and at other distribution and panelboard locations as indicated on the drawings or as called for in the schedules. The SPD shall be located immediately adjacent to the switchboard or panelboard being protected (close-nipple to panel-boards). The SPD may not be located integral (switchgear manufacturer installed) within the switchboard or panelboard(s) unless the switchgear manufacturer providing such SPD products expressly meets or exceeds ALL parameters of this specification for the SPD. These SPDs shall be individually tested and Listed to ANSI/UL 1449-

2006 according to their type (Type 1 or Type 2) and not be listed solely as part of the larger assembly. SPD devices not meeting or exceeding the performance of this specification will be deemed unacceptable.

2. Do not energize or connect service entrance equipment and panelboards to their sources until SPD devices are properly installed and connected.

3. Do not perform insulation resistance tests of the distribution wiring equipment with the SPD installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

4. Install the SPD with #10 AWG minimum conductors to dedicated 30-amp breaker(s) in panel per manufacturer's installation instructions and close to the Neutral Bus. The dedicated breaker shall serve as a means of service disconnect for the SPD so that the electrical panel remains energized during SPD servicing. The installer may rearrange breaker locations to ensure the shortest and straightest leads to the SPD. If a dedicated breaker is not provided, an SPD with internal 30-amp fuse or a UL Listed disconnect switch shall be installed as a minimum. The conductors serving the SPD shall be twisted together (one twist per 12" of wire) to reduce the SPD system input impedance and shall be kept at the minimum length. The SPD shall be installed in strict accordance with the manufacturer's recommended practices and in compliance with N.E.C. requirements, State, and Local Codes.

5. If any lead lengths exceed 18", the Contractor responsible for installation ***must*** contact the specifying engineer and the surge suppression manufacturer or distributor for installation assistance.

6. The electrical contractor shall verify the proper application of the SPD (i.e., voltage, phases, etc.). The electrical contractor shall ensure that all Neutral conductors are bonded to the system ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD. The electrical contractor will ensure that neutral-to-ground bonds do not exist at locations that are not service entrances or newly derived power sources.

7. The electrical contractor shall furnish all labor, materials, equipment, and services necessary for and incidental to the installation of the SPD system components as specified herein.

8. The electrical contractor shall coordinate with other electrical work as necessary to interface installation of the transient voltage surge suppression systems with other work on the site.

9. The SPD installation shall be certified by a licensed electrician that the installation is in accordance with the manufacturer's recommendations, applicable electrical code requirements and the requirements of the specification above. Any deficiencies noted shall be corrected by the Contractor. Provide written documentation of this inspection as part of the closeout documentation

STANDARD SPECIFICATION
FOR
ELECTRICAL - CONTROL PANELS, CABINETS, AND COMPONENTS

SECTION 5-14

1.0 GENERAL

Furnish all labor, materials, equipment, and incidentals required to fabricate and startup, complete and ready for operation the panels listed in the specifications and as shown on the drawings where not specified in individual specifications. Panels are to be provided by Revere Control Systems, EMC, or Engineer approved equal. This Specification provides requirements common to all panels for the project and for miscellaneous Control/Power Panels required for the project.

Provide wall mounted, stanchion mounted, freestanding, or walk-in enclosures as required, specified, or shown on the Drawings. Provide NEMA 12 enclosures for control panels located indoors and NEMA 4X stainless steel for outdoor locations (except walk-in) unless otherwise noted. NEMA 4X SS enclosures shall have single handle operators (3-point latching) and integral drip shields. Provide fiberglass enclosures for enclosures located in chlorine or chemical atmospheres.

The Panel Supplier shall investigate the space allocated for control panels on the accompanying drawings and inform the Engineer as soon as possible of any potential problems or conflicts. Panels shall be engineered to fit in the space provided.

All control panels shall be manufactured by UL shops and shall carry a UL label which certifies the control panel meets the requirements of UL-508A (latest version). All panels shall meet the UL approval requirements of the Owner.

1.1 PLAN REVIEW

Equipment supplier is cautioned that the requirements for this work are found in the Plans AND Specifications. Suppliers and Contractor shall thoroughly review Plans and Specifications and shall supply a complete system, fully functional in all respects for performance as intended. Supplier's review of Plans and Specifications shall include Electrical and Control Drawings. I/O, control, and power requirements not shown in the Drawings shall be noted by the Supplier.

2.0 PANEL MATERIALS AND CONSTRUCTION

All Field panels shall be manufactured by Hoffman or approved equal.

In all enclosures, provide corrosion inhibitor blocks. In NEMA 4X enclosures, provide NEMA 4X rated devices on front of enclosure or mount devices on interior panel and provide door mounted tempered glass or polycarbonate viewing window. Freestanding enclosures shall be a minimum of 20-inches deep.

NEMA 12 and general purpose enclosures shall be fabricated from a minimum 14 gauge steel, unless noted otherwise, with all seams ground smooth, all corners rounded, and all flat surfaces smooth with no ripples, dimples, or surface imperfections and no screws, bolts, or nuts visible from outside. Provide panel stiffeners as required to provide a rigid, non-bowing surface.

For painted enclosures, thoroughly clean and degrease the steel shell before painting. Apply one coat of a rust inhibiting primer and two coats of air dry enamel or acrylic with flattening agent to produce a smooth semi-gloss finish. Colors are to be chosen by the Owner.

Freestanding enclosures shall have a continuous hinged front access door and a three-point latch. A single point latch is acceptable for wall-mounted enclosures. Door latches shall be all stainless steel, fast operating clamp assemblies that do not require bolts or screws to secure.

Field panels areas shall be fitted with pad lockable latch kits. All such panels shall be kept locked at all times. The contractor shall install the Owner's lock(s) simultaneously with the removal of his lock(s).

Panels shall be adequately sized to house instruments, power supplies, surge protection and appurtenant equipment. Sufficient space shall be provided for servicing instruments without removal of equipment from the enclosure. Sufficient space shall be provided to prevent excessive heat buildup inside the panel.

Each panel shall have a 24 Vdc Power supply able to supply the PLC, modem and loop power where required. The power supply shall be a minimum of 2.5 Amps and be Phoenix Contact or equal.

Each panel shall be provided with transformers as required for instrument power, Wiremold Company type 2100, or equal, plug mold raceway, with one outlet for each instrument plus 20 percent excess for future use.

Each panel shall be provided with an isolated copper grounding bus for all signal and shield ground connections. Shield grounding shall be in accordance with the instrumentation manufacturer' recommendations and with the requirements of the National Electrical Code.

The panel drawings refer to nameplates and service legends. Nameplates are defined as inscribed laminated plastic plates mounted under or near a panel face mounted instrument. Service legends are defined as inscribed laminated plastic integrally mounted on a panel face mounted instrument. Provide sufficient nameplates to clearly identify all switches, lights, knobs, and other devices, etc.

Service legends and nameplates shall be engraved, rigid, laminated plastic type with adhesive back. Unless otherwise noted, color shall be white with black letters and letter height shall be 3/16-inch.

Each panel shall be provided with a face mounted laminated nameplate as specified above. Unless otherwise noted, color shall be white with black letters 1/2-inch high.

All components provided under this section, both field and panel mounted, shall be provided with permanently mounted nametags bearing the entire tag number of the component. Panel mounted tags shall be plastic; field tags shall be stamped stainless steel. Field mounted tags shall be 16-gauge, 304 stainless steel with 3/16-inch high characters. Tag shall be affixed to instrument with stainless steel wire.

Nameplates shall be provided for flush mounted equipment. The nameplates shall be approximately 1-in x 3-in constructed of black and white laminated, phonemic material having engraved Helvetica letters approximately 1/4-in high, extending through the black face into the white layer. Nameplates shall be beveled and attached to panels by self-tapping stainless steel. Nameplates shall be exactly horizontal.

Where applicable, mount an engraved nameplate (white letters, red background) to read: "WARNING This panel energized by foreign control power sources. Equipment will be live with panel disconnect in either on or off position". Provide other warning signs as applicable.

Provide 20 percent spare, contiguous panel/sub-panel mounting area to accommodate future panel expansion, unless noted otherwise.

For panels with 120 VAC power supply, provide appropriately sized circuit breaker, single pole, 22,000 AIC, mounted in the rear of the panel to disconnect power.

Auxiliary Circuit Breakers: Provide a minimum of two 120VAC, single-pole molded case circuit breakers for field-connected devices. Breakers shall have a trip rating of 10 amps and interrupting rating of 10,000 amps. Provide a minimum of 200VA spare capacity in control power transformer to accommodate field-connected devices. Mount transformers on outside of panel and use SS transformers in wet or exterior areas.

Provide 1/4 x 12-inch copper ground bus bar(s) in the rear of the panel. All bus bars shall be bonded together. Ground bus shall be capable of accepting System Ground Grid connection and Power System Ground connection.

Provide a lamp test circuit with a single lamp test pushbutton mounted on the panel front. Pressing the lamp test pushbutton shall illuminate all indicator lights without interrupting control circuits. Provide high intensity LED type lamps.

Lamp Colors are to be coordinated during submittal phase. For the purpose of submittal preparation, colors shall be as noted. Colors shall be changed as noted on submittal.

- Red Stopped, Off, Closed
- Green Running, On, Open
- Amber Alarm
- Control Power, White

For all equipment control panels, panels greater than 24" x 24", and where specified or shown on drawings. Provide one 120 VAC duplex receptacle and fluorescent light(s). Incandescent lights may be used where panel size prohibits the use of fluorescent lights. Provide one standard on/off light switch for the lights. Receptacles and lights shall be provided with a separate circuit breaker and shall be fed from the 120 VAC power supply to the panel.

All non-relay PLC discrete outputs shall have interposing relays installed in the control panel. All other inputs and outputs shall be fused

DIN rail shall be aluminum.

Conduit and wiring installation and sealing is to be provided under Electrical Specifications.

Environmental Control

a. External sun shields or sunshades, if required, shall be constructed of the same materials as the associated enclosure, unless otherwise specified or mounted under a shading structure. Sun shields shall maintain internal panel temperatures within operating temperatures range of panel components. Provide sunshields on all exterior panels.

b. All FRP panels located in direct sunlight shall be provided with at least two coats of UV protective coating to prevent discoloration and cracking. All control panels shall be either pad lockable or have a lock installed in the door handle. All locks provided shall be keyed alike - consult with the Owner for preferred keying system.

c. If indicated in the contract drawings and for all exterior cabinets containing VFD drives, solid state starters and/or PLC's, control panels shall be provided with a drip shield and heat shield. A 304 stainless steel drip shield shall be provided to prevent ice buildup on the panel door, door hinges, and front of panel-mounted devices. Minimum overhang shall be one inch on the front and side of the panel. 304 stainless steel heat shields shall be provided to prevent excess heat inside the panel. Shields shall be provided for the top, front, back, and both sides of the panel. Shields shall be mounted to provide one-inch air space between the shield and the panel. Each shield shall have the same height and width as the panel side being protected. Cutouts shall be provided for access to front of panel-mounted devices.

d. If indicated on the drawings, and for all exterior panels with VFD drives, panel shall be provided with a closed loop air conditioning system, Hoffman or equal. Air conditioner enclosure to match type and rating of panel enclosure. Provide adjustable temperature switch with dry contact closures to be connected to SCADA to generate alarm on high intennas panel temperature condition. For other panels, provide oversize exhaust fans and inlet filters.

e. All external sample and process piping, including valves and appurtenances, shall be insulated with weatherproof insulation and heat-taped to prevent freezing. Heat taping shall be thermostatically controlled and self-regulating and shall adjust its heat output to the temperature of the lines.

f. Each panel shall have an enclosure combination heater / fan / thermostat equal to or greater than a Hoffman D-AH1001A 100 watts heater.

Internal Wiring

a. The System Manufacturer shall provide required hardware and labor for termination of new signals in existing termination cabinets where required. This hardware and workmanship shall match existing work with respect to method, materials, and workmanship.

b. Panel equipment shall be mounted and wired on or within the cabinet. Wiring shall comply with the National Electrical Code. Wiring within the panel shall be grouped together with harness or ducts and secured to the structure. Wiring shall be numbered in compliance with the numbering system used on the wiring/connection diagrams. Wiring and connection diagrams shall comply with ISA SS5.4 Instrument Loop Diagrams and shall be submitted by the manufacturer as part of the Shop Drawings for review by the Engineer.

c. Wire door mounted instruments and controls to stationary components with suitable flexible connections and protection where wiring crosses the hinge. Provide double or multiple doors as required for stability and smooth mechanical operation. Terminate all tubing and electrical connections at the bottom of the panel to bulkhead fittings and terminal

strips, with all external connections properly identified for field connections. Space shall be provided at the bottom of the panel for excess wiring to be laid out before landing on the associated field terminal strip. Space shall also be provided at the top and sides of the panel for routing cables entering from the top of the panel.

d. Conductors running from the field to the panels shall be continuous without splices, except at approved junction boxes. The junction boxes shall have terminal blocks with 20 percent spare terminals. Special care shall be exercised to carry grounding lines through such junction boxes with the least possible resistance. Cables entering panels shall be multi-conductor. Conduit and multi-conductor cables entering panels shall be sealed to prevent the intrusion of gas and moisture. Seal offs shall be as shown, specified, or as required for the application.

e. Panel wiring diagrams shall clearly identify wire numbers and types, terminal numbers, and tag numbers. Wiring diagrams shall show all circuits individually; no common diagrams will be allowed. Provide panel power wiring diagrams for all panels. The diagrams shall include the grounding requirements. Provide Interconnecting Wiring Diagrams. In addition to all incoming and outgoing wiring, these Diagrams shall show all component and termination cabinet identification numbers and external wire, fiber, and cable numbers. This diagram shall be coordinated with the electrical supplier and shall bear its mark showing that this has been done. The Interconnecting Wiring Diagram shall be thoroughly coordinated with all connecting wire, panels, electrical gear, and components, etc., prior to making the first submittal.

f. Install a minimum of #16 AWG copper stranded, 600 volt, extra flexible type for all control wiring 50 volts and above, and a minimum of #18 AWG twisted, shielded pair for analog signal conductors. Provide larger wiring where indicated on the plans or Electrical Schedules.

g. Mark all wires with approved wire markers at all terminations. Clearly mark all terminal blocks with typewritten or ink markings. Label all devices mounted on the steel sub-panel. All instrument and control devices (current switches, MiniCAS II relay modules, etc.) located inside control panels shall have engraved lamacoid nametag affixed on or near the device and shall bear the tag number and service description. Label all devices mounted on the panel front with engraved lamacoid nameplates, fastened with screws. Nameplates shall be three layer laminated plastic, black letters on a white background. Letter height shall be 1/8-inch for individual devices and 1/4-inch for panel designation.

h. Internal panel sub-feeds of 120 VAC power shall be divided into separate circuits protected by properly sized circuit breakers or fuses. The following separate circuit divisions shall be provided as a minimum:

1) Panel light(s) and panel fans (where used).
2) Each receptacle.
3) Power to the panel UPS (where supplied).
4) Thermostatically controlled heaters (where supplied).
5) Each power supply (including 24-volt power supplies, power supplies for PLC's, Power supplies for fiber optic transceivers, etc.).

i. Neatly bundle and secure all wiring with plastic ties. Route back-of-panel

wiring in slotted plastic wire ways with snap-on covers. Terminal blocks shall be provided for all field wiring connections to the panel. This includes shield terminals for shielded cables. Terminal blocks may be mounted horizontally or vertically and shall be easily accessed from panel door(s). Terminal blocks shall be DIN rail mounted, screw clamp, feed-through type with 600 volt minimum rating. A minimum of 20 percent extra terminals shall be provided on the terminal blocks. Each terminal shall be clearly and permanently marked. Provide fused terminal blocks for all 120 VAC discrete inputs and outputs. All terminal blocks shall be suitably sized for #12 AWG (minimum) stranded wire. All terminal blocks shall be grouped apart, depending upon type of signal per the following:

j. AC or DC power wiring shall not run in any raceway with any type of instrument wiring. Wiring is to be divided into categories and shall be carried in separate raceways. The minimum acceptable groupings are:

1) 120 VAC, 60 Hz AC power wiring and chart drive power wiring.
2) DC power to electronic instruments (does not include loop powered instruments), contact closure input and output wiring.
3) All wiring carrying pulsed information.
4). Standard range analog DC signals, thermocouple and up to 200 mV DC signals.

Thoroughly and completely shop-test the completed panel. Confirm that all lamps burn. Provide written certification, signed by the responsible person stating that the panel performed properly, etc. Remove, box, and label all parts that may come loose or detached in shipment, so that after installation they may be easily replaced. Perform preliminary calibrations in the fabricator's shop, and final calibrations at start-up by qualified personnel.

k. Multi-conductor cable shall be used between junction boxes and the panels.

l. The panels shall be completely fabricated; instruments installed and wired, at the suppliers facilities.

m. All components shall be mounted in a manner that shall permit servicing, adjustment, testing and removal without disconnecting, moving or removing any other component. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is required otherwise by the manufacturer to protect equipment from vibration. Components mounting shall be oriented in accordance with the internal components shall be identified with suitable plastic or metal engraved tags attached with drive pins adjacent to (not on) each component identifying the component in accordance with the drawing, specifications.

n. All panel-mounted equipment shall be installed with suitable gaskets, faceplates, etc. required to maintain the NEMA rating of panel.

o. Power wire shall be 16 AWG (minimum) Type THWN stranded and shall be insulated for not less than 600 volts unless specified otherwise. All interconnecting wiring, except for electronic circuits, shall be rated for not less than 90 degrees C. Interconnecting wiring shall not be smaller than the sizes shown in the Electrical Schedules in the drawings.

p. Wiring shall terminate at a master terminal board, rigid type and numbered. The master terminal board shall have a minimum of 25 percent spares.

q. Terminal blocks shall be barrier type with the appropriate voltage rating (600 volts minimum). Terminal strips shall be provided for the purpose of connecting all control and signal wiring. They shall be the raised channel mounted type as manufactured by Square D or equal.

r. Wiring trough for supporting internal wiring shall be plastic type with snap on covers. The sidewalls shall be open top type to permit wire changing without disconnecting. Trough shall be supported to the Subpanel by stainless steel screws. Trough shall not be bonded to the panel with glue or adhesives.

s. Wire connectors shall be the hook fork types with insulated barrel for crimp type compression to the wire.

t. Each wire shall be provided with numbered heat shrink tubing identification markers at both ends and the numbering shall be in accordance with the Control Panel Drawings. Identification markers shall be pre-typed. Handwritten markers or paper markers will not be permitted.

u. Direct interlock wiring between equipment will not be allowed. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6-inches of the side panel or adjacent terminal.

v. Wiring trough shall not be more than 60 percent visible fill. Wiring trough covers shall be match marked to identify placement. If component identification is shown on covers for visibility, the IF shall also appear on the mounting sub-panel.

Surge Suppression

a. The Control Panel Supplier shall provide appropriate protection against transients and surges for all field wiring, interfacing with the control panels. This protection equipment shall reside in the appropriate control panel. All instrument analog signal wiring, data transmission wiring, and 120 VAC power supply wiring shall be protected against lightning strikes, and other transient surges at all control panel termination points. All control power wiring, AC control power wiring, I/O cabinet discrete input wiring and discrete output wiring which is routed outside of buildings shall be protected against lightning strikes, and other transient surges at all control panel termination points. Lightning and surge devices shall protect the system from induced surges in analog, discrete and control circuitry and power supply lines. Surge suppression devices shall be as manufactured by Surge Suppression, Inc.

b. The protective devices shall not interfere with the normal operation of the panel hardware and shall be designed not to have a maximum clamping voltage in excess of what the protected device is capable of withstanding. Protection devices for all internally mounted power supplies shall be installed on individual 120 VAC supply wiring. Each surge/lighting protector shall be independently grounded to the panel ground bus. Protector mounting rail shall not be used to ground the protector.

c. All external wiring that the electrical contractor must provide and install shall be shown as a dashed line. Special cables that are provided with the instrument shall be clearly identified.

d. Each panel shall be provided with surge suppression protection (electrical transients) for connections between AC power systems and electrical and electronic

equipment.

e. All radio, modem, and telephone lines, etc., shall be protected by appropriate surge protectors. Surge suppressor grounding shall be in accordance with the manufacturer's recommendations.

f. All input and output modules shall be isolated. All input and output connections (DI, DO, AI, AO, data highway, etc.) shall have surge protection.

Field Instruments: All field instruments located indoors or out-of-doors provided by the Control Panel Supplier under this contract shall be supplied with surge protection for 120 VAC power to the instrument. Surge protectors shall include a combination of surge suppression technologies including metal oxide varistors, gas discharge tubes, diodes, and 3AG size fuses for line-to-line and line-to-ground protection.

a. Where Intrinsic Safety (IS) barriers have been supplied as a means of providing electrical hazardous area protection for the associated field device, all IS barriers and associated IS wiring shall be separated by at least two inches of air space from all regular non-hazardous wiring inside the control panel. Per NEC Article 504-30, grounded metal or other insulated partitions with lesser distance requirements shall be permitted. IS wiring entering the control panel shall be located in dedicated conduits, which also shall be separated from any non-hazardous wiring. IS Barriers shall be located in electrical non-hazardous areas. Conduits containing IS wiring where entering enclosures containing regular, non-IS wiring shall be externally sealed to prevent transmission of gases from hazardous areas.

b. Installation: Locate field instruments so they are accessible for maintenance and orient so that indicators are readily visible. Unless otherwise indicated, mount instruments 36 to 60-inches above work surface Provide 2-inch diameter, 304 stainless steel, Schedule 10 pipe welded to a 10-inch square by 1/4-inch thick stainless steel base plate for support unless wall or other mounting arrangement is indicated. Space instruments at least 1/2-inch off concrete walls by stainless steel channels or phenolic spacers. Provide stainless steel or aluminum sunscreens or shades for all electronic instruments located outdoors. Provide stainless steel identification tags attached with stainless steel wire or screws for all field instruments.

c. Tests and Calibration:

1. Perform continuity and insulation resistance tests on instrumentation conductors to insure proper installation and performance.

2. Calibrate each instrument to its published accuracy. Submit calibration sheets including the instrument tag number or name, the date, name of individual performing calibration, procedures and equipment used, and results obtained.

d. Spare Parts: Provide spare card of each type required for all transmitters. Provide spare signal isolators. Provide other spare parts of all items whose failure is not surprising in a five-year period. Provide 2 spare general purpose relays representative of those in project.

Miscellaneous Panel Components: In all cases, NEMA versus IEC rated components are required. The following components shall be used unless otherwise agreed upon by the owner:

EQUIPMENT	*MANUFACTURER/MODEL*	*SPECIFIC CRITERIA*
Light, Switch, Receptacle	Hoffman	
Pushbuttons	Square D	
Selector Switches	Square D	
Pilot Lights	Square D	
Circuit Breakers	Square D	
Interposing Relays	Square D	
Terminal Blocks	Square D	
Surge Arrestors	Surge Suppression, Inc.	
Radios	MDS iNET	
12/ 24 Vdc Power Supplies	Omron, Phoenix Contact	
Ethernet Switches	Hirschman	
Nameplates	Custom	
Terminal Blocks	Square D	
Wiring	Panduit	
Fuses	Bussman	

Design for maximum reliability and redundancy so that all equipment can be maintained in service to maximum extent possible.

2.1 CONTROL PANEL FUNCTIONAL REQUIREMENTS

Additional control panel functional requirements for specific pieces of equipment are contained within individual specifications and contract drawings in addition to this specification.

2.2 PANELS SERVING MOTOR DRIVEN EQUIPMENT

In addition to requirements of other sections, panels serving motor driven equipment shall have the additional functionality in this section.

The panels shall contain the following minimum logic devices for proper operation of the equipment. Individual specifications contain additional requirements.

1. Hands-Off-Auto Selector Switch.
2. Run Time Meter.
3. Fault Reset Button.
5. Emergency Stop Button.
6. Indicating Lights with a single Test Pushbutton.
7. Relays.

A padlockable main disconnect switch matching supply voltage and phase, circuit breakers, non-reversing motor starter(s), (where indicated) motor current monitor (where indicated), and step-down transformers shall be provided in the panel as required.

A fault condition (motor overload, motor high temperature (where applicable) or motor current overload) shall disable the unit, illuminate a Fault lite, and provide remote alarm indication on the SCADA System.

The control panel shall be designed by the manufacturer for the proper and safe operation of the equipment. The control panel shall also have the following features:

1. The panel shall utilized fully rated NEMA components. IEC components shall not be acceptable.

2. A step down control power transformer shall be provided inside the control panel to provide the necessary 120 VAC power for the panel, relays, starters, and other equipment. The primary side of the control transformer shall be protected by a thermal magnetic circuit breaker properly sized for the power requirements of the transformer. Provide fuses in addition to the circuit breaker if required for the protection of the transformer or controls.

3. Where shown in the Control Diagram or specified, each individual piece of equipment controlled by the panel shall have its control circuit routed through a set of dry contacts known as "Permissive Contacts" located in the PLC panel or RTU. These contacts shall be controlled by SCADA to stagger equipment restart after power outage. The permissive contacts can also be used for load shedding.

4. Where permissive contacts are required, the panel shall have a bypass selector switch to allow the Permissive Contact in the RTU to be bypassed if desired by the system personnel. When in the bypass position, the panel shall power an amber light on the front of the panel.

5. All other features of the panel shall be such that the equipment shall restart when called for (without having to be manually reset) after a power outage. The automatic restart shall not be provided where it could cause a potential safety problem.

6. The panel shall have one dry fail contact for utilization by the plant I/O SCADA System. The fail contacts shall close whenever any of the circuit breakers (main or branch) trip, whenever any of the motor overloads trip, whenever thermal devices in the motor windings give indication of excessive heat, whenever overload sensors are activated, or whenever other failure or alarm conditions occur. Separate alarm lights on the front of the panel and with labels shall be provided for each branch circuit breaker trip, each motor overload, motor thermal windings, and all other overload or alarm devices. Such failure lights shall be amber. The circuit breaker trip indicators shall be activated only on trip, and not on selecting the "Off" position. All overloads shall have reset buttons on the outside of the panels.

7. Dry contacts shall be provided for run indication of each piece of equipment controlled from the panel.

8. The control panel manufacturer shall thoroughly coordinate with the manufacturer of all interconnecting panels, MCCs, and PLC Panels. RTUs to insure complete compatibility of controls and signals. Complete coordination shall be done prior to making the first submittal.

9. The panel shall be fully and completely tested to verify proper performance of all features prior to shipment. Test all failure and alarm conditions to simulate the most realistic and representative conditions possible (vs. simply checking the only the wiring). Written certification shall be issued of the performance test and shall state that the test demonstrated panel compliance with all specifications.

10. All panel features shall be demonstrated after installation. Appropriate adjustments shall be made.

11. Provide safety and warning labels on the outside of the panel. Where applicable, include a warning that live power can exist inside the panel even when the main circuit breaker is off.

12. Two complete control schematics shall be mounted inside in the panel door. One of the two shall be laminated.

13. Circuits to interconnected panels and the Scada System shall be 24 volt d.c. (direct current) where shown.

14. Panel design shall be the responsibility of the panel manufacturer/equipment manufacturer.

15. Coordinate with other specs, drawings, electrical schedules, and instrumentation requirements for additional requirements.

16. Any stop button or switch including any remote switch shown in plans stops the equipment.

17. The ETM, Run Lites, and Run Indication shall come off an auxiliary contact on starter (vs. the call-to-run signal).

18. The panel shall be designed to allow components and controlled equipment to be removed from service while other remains in service.

19. Where more than one piece of equipment is controlled from the panel, each piece of equipment shall have its own circuit breaker.

20. Where the circuit breaker for a piece of equipment is turned off, it shall also interrupt other features associated with that equipment such as current sensors, etc.

21. Coordinate with drawings for other details and requirements.

22. Submit sufficient information for the reviewer of the submittal to fully determine if all plans and/or specifications are being fully complied with. Provide a detailed, item-by-item description of the panel's control functions, relay purposes, sequences, interlocks, performance, alarm conditions, etc., including but not limited to coordination with all interconnected equipment.

23. Submit a written list of all variations, discrepancies, or exceptions to the plans and/or specifications.

24. Comply with electrical requirements shown elsewhere in plans and specifications.

25. The submittal shall contain a legend for all symbols and abbreviations used, including those in wiring and control diagrams.

26. For panels with many alarms, etc., provide a general trouble alarm.

27. Provide a CB or fuse for any power circuit leaving the panel, including any circuits supplying any other panel, etc.

28. In the submittal, provide a complete interconnect diagram clearly showing all external connections, circuit types, and wire types. Coordinate with all

interconnecting equipment prior to making the first submittal. Clearly show which panel is supplying power for circuits connecting with other panels or equipment.

29. Panel doors shall open 120° minimum and stay open without being held open by a man. Provide latch if necessary. Inner doors shall also remain open a minimum 120° without being held open.

30. For circuit breakers, MCPs and starters, provide manual trip devices with contacts that are activated on manual as well as automatic trip. This is to allow alarm simulation.

31. If additional auxiliary running and fail contacts are required for the SCADA System or other interconnecting panel either controlling, being controlled by, or communicating with this panel, they shall be provided.

32. Provide time delays where appropriate to avoid nuisance alarms or tripping at startup or similar transient conditions.

33. Where fuses are used to power equipment, protection against single phasing shall be provided.

34. Operator interface screens shall be full color - - Not monochrome.

35. On each panel, install 2 spare relays to be used if required due to changes/additions during construction.

36. On all 3 phase panels provide phase protection relay motor saver or equal. Phase failure relay shall be interlocked with control circuit to prevent equipment from operating when a phase loose occurs. Provide restart timer to limit time between starts frequency. Provide phase loss indicator light on panel and dry contacts for failure indication to SCADA.

An operation and maintenance manual shall be provided which explains all lights, alarms, switches, panel functionality, safe operation, and other features of the control panel.

Provide an O & M Manual that includes, as a minimum, warnings regarding safe operation and maintenance of the panel and an elevation view of the panel showing and explaining all controls, lights, switches, pushbuttons, breakers, etc. The manual shall also discuss the control methodologies for the various modes of operation (automatic, manual, etc.)

Set all timers, alarms control etc. appropriately.

3.0 PROGRAMMABLE LOGIC CONTROLLERS

Acceptable Manufacturers:

1. Programmable logic controllers shall be manufactured by Allen Bradley. All PLCs on the project shall be Allen Bradley for consistency.

2. Program development software shall be as distributed by the PLC manufacturer.

3. PLC's are allowed only when specified in individual sections or shown on the drawings.

General Requirements:

1. The Contractor shall furnish programmable controllers (PLC's) as

specified herein and as shown on the Drawings. PLC's shall be provided complete with, power supply, special function cards, instructions, memory, input/output capacity, gateways required by connecting equipment, and appurtenances to provide all features and functions as described herein. No substitutions will be permitted.

2. All components in the PLC system shall be the product of a company who regularly manufactures and services this type of equipment. Wherever possible, all assemblies and sub-assemblies performing similar functions in separate controllers purchased under this Section shall be interchangeable.

3. All components of the PLC system shall be of the same manufacturer, who shall have fully tested units similar to those being furnished in an industrial environment with associated electrical noise. The PLC system shall have been tested to meet the requirements of NEMA Standard ICS 2-230 (Arc Test) and IEEE C37.90.1 (SWC). The processing unit shall perform the operations functionally described herein based on the program stored in memory and the status of the inputs and outputs.

4. External power supplies shall be provided with the PLC as required to meet specified installed I/O power requirements plus spares. Power supplies shall be modular units, shall be fully redundant and shall alarm the PLC upon failure. Power supplies shall have a line regulation of 0.05% and meet the environmental and power requirements specified herein for the PLC. Power supplies shall be protected by surge protectors.

5. Components shall be in compliance with normally recognized industry standards and regularly sold to heavy industry installations. All connecting cables shall be constructed so as to withstand, without damage, all normal use and handling.

6. The PLC system shall be of a modular design with a plug-in processing unit, input/output frames or assemblies, and plug-in peripherals. All necessary cables shall be included. Mark all major assemblies, sub-assemblies, circuit cards, and devices with the manufacturer's part or identification number.

7. The programmable controller shall be designed to operate in an industrial environment. The PLC shall operate in an ambient temperature range of 0°-55°C and a relative humidity of 5-95 percent, non-condensing. The PLC shall operate on supply voltages of 90-132 Vac at 47-63 Hertz or 24 VDC if provided with a battery backup system. An integral fuse shall be provided on the power supply for short circuit protection and shall be front panel accessible. Integral over current and under voltage protection shall be provided on the power supply.

8. Each controller, including output devices, shall orderly shut down and alarm in the event of a disruption of program execution or scan, a loss of logic power, loss of communication between controller essential devices, or a memory error. A failure of one controller shall not disrupt operation of other controllers in the system.

9. Each control shall be capable of communicating Modbus over Ethernet IP. I/O Modules shall be Hot-Swappable without affecting the CPU performance.

10. All PLC modules including the CPU, shall be Hot swappable.

Central Processing Unit (CPU)

1. The CPU shall contain the program memory in static RAM, PROM, or a combination of both. CMOS or RAM shall have a battery backup system capable of retaining

all memory for a minimum of six months and shall require no external cooling or special vents. The backup battery shall be capable of being replaced without interruption of memory integrity with AC power off. Provide visual indication of backup battery status with alarm in the event of low battery voltage before battery failure. Provisions shall be made for connecting an external DC voltage to the system to provide auxiliary protection for CMOS RAM memories.

2. The program memory shall be capable of being expanded in the field by card exchange. At least 1,024 internal storage registers shall be available for data storage. These registers shall be independent of and in addition to program storage memory. Provisions shall be made for the processor to check all logic words for parity when read from memory. A parity error shall cause an immediate shutdown with alarm and visual indication.

3. The Processor program memory shall be a removable flash 10 meg memory card. The process shall be able to control a minimum of 4096 I/O points or greater if necessary due to the I/O Schedule, other Specifications, spare, etc. It shall also have built in 10/100 Base-T Ethernet channel supporting:

- < High speed communication using TCP/IP
- < Messaging capability with other commercially available Ethernet modules
- < SNMP for standard Ethernet Network Management
- < BOOTP for optional dynamic IP address assignment

4. Nominal memory scan time shall be no longer than 4 milli-seconds per 1 K of ladder logic memory. Only the portion of memory being used shall be scanned, and the memory shall be automatically repositioned up or down when contacts and rungs are added or deleted. Service each input on every scan.

5. The system shall have the capability of servicing the I/O at any point in the user program as many times as desired during a scan. Provide the capability of not servicing the I/O during a scan if the user so chooses. I/O Modules shall be Hot-swappable without affecting the CPU performance.

6. Software or key locking arrangement at the CPU shall prevent memory modification by unauthorized personnel. The processor unit shall be expandable to a minimum of 4,000 I/O points or as required for the level of functionality, dependability and redundancy specified. Any number of normally open or normally closed contacts shall then be available from these references for use in the program. Any internal coil shall be capable of assuming a relay, latch relay, one-shot, timer, or counter function.

7. The system software timers and counters shall be capable of the following:

a. Timers shall have a selectable time base of 0.01, 0.1, and 1.0 second, or 0.1 minutes. Each timer shall be capable of the maximum time preset. Both up-counters and down-counters shall be available. Each counter shall be capable of a fixed preset of at least 0-999 and at least a register preset of 0-65535.

b. Presets shall be from internal constants and internal storage registers. Timers and counters shall have the capability of being reprogrammed from the keyboard, as specified below, at anytime

without halting system operation.

c. Timers and counters shall be capable of causing an output relay operation, and display of the time or count through programming software. Timers and counters shall be capable of using the same contact for enable and reset functions.

8. The system shall have the following math capability available:

a. Math functions shall be a minimum of four digit (0-9999) addition, subtraction, multiplication, division, equality, greater than, and less than. In addition, signed addition and subtraction, and floating point addition and subtraction shall be available.

b. Include capability to handle data in lists or tables. These lists shall be a minimum of 16 bits wide, with capability of a length of 255. Include a sort function with a sort capability of 192 items, and the ability to generate FIFO and LIFO stacks.

c. The system shall have matrix logic capability up to 16 x 255. Matrix logic functions shall include AND, OR, XOR, and Compare.

d. The numerical data for a math function, data list, or matrix shall be input from timers, counters, keyboard entry, and other math functions, data lists, or matrices.

e. The system shall be capable of using the results from math functions, data handling functions, and matrix functions for presets to timers and counters, and for operating system outputs and CRT displays.

f. The status of latch relays and one-shots, and all data from timers, counters, and math functions shall be retained during any power outage as specified above.

g. The system shall have the capability to conditionally skip execution of all or part of the user program.

h. The system shall be capable of performing a minimum of 16 sub-routines. These sub-routines shall be called up by a programmed instruction at any time during the main body user program.

i. The system shall have a minimum of 16 priority interrupt inputs which will cause an immediate jump to the associated sub-routine of the main body user program.

Input/Output (I/O) Devices:

1. Discrete Inputs/Outputs

a. Discrete inputs shall be available in 24 and 115 VAC/DC. Discrete outputs shall be available in 24 VDC and 115 VAC. 2. Discrete inputs shall be guaranteed "on" if at least 78 percent of nominal voltage is present. Discrete inputs shall be guaranteed "off' if 20 percent or less of the nominal voltage is present. Minimum isolation between input/output and logic voltage shall be 1,500 V RMS per NEMA standards via opto-isolation.

b. AC discrete outputs shall be rated at 20 amps inrush, 2 amps continuous. DC discrete outputs shall have a 2 amp rating. All outputs shall have 3 amp normal fuse protection. 5. Each discrete input and output shall have an LED or other visible indication of on/off status.

2. Analog Inputs/Outputs

a. Analog inputs shall be available in 4-20 mADC, 1-5 VDC, and 0-10 VDC. Analog outputs shall be available in 4-20 mADC, 0-10 VDC, and -10 to +10 VDC.

b. All of the above inputs and outputs shall have at least 11 bit resolution with an accuracy of +1 percent over the rated temperature range. Minimum isolation between input/output and logic voltage shall be 1500 VDC per NEMA standards via opto-isolation.

c. All analog inputs interfacing with 120 VAC or 24 VDC (non-loop) powered devices shall be provided with isolated analog input modules. All analog outputs shall be isolated.

3. Chassis

a. Frames or racks for mounting all types of inputs and outputs shall be interchangeable, and inputs and outputs shall be interchangeable within the same frame.

b. All PLC terminal blocks shall be 300 V minimum NEMA rated, and accommodate no fewer than two #14 gauge wires. Marker strips shall be attached adjacent to the field wiring and the status indicating lights to allow easy identification of inputs and outputs by the user. These markers shall not change when devices are replaced during repair or maintenance. Color code marker strips according to voltage.

c. Field wiring shall not have to be removed in order to replace an I/O device during repair or maintenance.

d. Analog inputs shall have a shunt/channel built into the termination assembly, relay outputs modules shall have a fused on the termination assembly.

4. Data Processing

a. The controller system shall have the ability to perform the following data processing functions without significantly slowing down or interrupting the logic processing.

b. The controller system shall be capable of storing, displaying, and printing messages containing numerical information, including information from timers, counters, math functions, and analog functions. These messages shall contain the full range of alphanumeric characters and shall be capable of assuming user required formats. A minimum storage capacity of 64,000 characters in addition to program memory and storage registers shall be available for these messages.

c. Provide proportional, integral, derivative (PID) fixed point

control with ability to solve 32 PID loops with a repetition rate of one second.

d. The controller system shall have data storage capability which will allow the storage of recipes or other information in a structured file system. The file system shall be accessible from the user program.

5. Program Development Software

a. The PLC programming and configuration software shall be the manufacturer's latest version of Windows XP Professional-based programming software. The software package shall consist of all programming, configuration, and documentation software needed to place the control and information system in satisfactory operation. The software shall allow on-line and off-line program development and documentation. Programming shall be accomplished using IEC 61131 standard programming language, which consists of ladder logic, structured text, function block programming and sequential flow charts. PLC programming software shall include CD-ROM documentation.

b. Programming capabilities shall include the ability to alert the programmer to errors in order to prevent not closing logic circuits, entering non-allowable addresses, or missing addresses.

c. Programming field for each rung shall be 70 elements minimum. Program changes shall be allowed element by element such as adding, deleting, or reversing (NO to NC) contacts without replacing an entire rung. It shall be possible to delete or insert entire rungs inside the program.

d. A search feature shall allow the operator to call up any contact or coil in the program by reference. The search feature shall be provided by a special pushbutton on the keyboard.

e. The controller system shall allow an operator to override inputs and outputs on or off from the development software. The override function shall be provided by a special pushbutton on the keyboard.

f. The programming software shall have off-line, on-line, and monitor modes of operation, controlled by password to provide an additional tier of security. Normal programming shall be in the off-line mode. The PC shall not need to be connected to the control system for off-line programming. In the on-line mode, the programming device shall be connected to the control system, and the two-way communications shall exist between individual CPU's and the programming device. On-line programming shall include the ability to make program edits, upload data and download data while the CPU is running. The status of contacts and coils in the ladder logic program shall be displayed on the PC. The PC shall be able to display the current values of timers, counters, and internal registers, and the operator shall be able to modify these values through the development software while in the program display mode.

g. In the monitor mode the programming device shall be connected to the control system, and disabled communication shall exist from the CPU to the programming device. The programming device shall be able to read from but not write to the CPU. The status of contacts, coils, timers, counters, and registers shall be displayed on the PC,

6. The PLC programming and configuration software shall be the manufacturer's latest version. The software package shall consist of all programming, configuration, and documentation software needed to place the control and information system in satisfactory operation. The software shall allow on-line and off-line program development and documentation. Programming shall be accomplished using ladder logic and "C". PLC programming software shall include CD-ROM documentation.

7. Third-party programming software shall be acceptable if recommended by the manufacturer and if that software exceeds the capabilities of the PLC manufacturer's standard software package.

8. The Contractor shall provide all configuration and programming software along with all associated peripheral cables and hardware necessary to allow a notebook-type portable computer to perform PLC configuration and programming.

9. Installation: PLC equipment is to be mounted on the back panel of the local control panels, unless otherwise noted, and incorporated in the panel design by the System Manufacturer.

STANDARD SPECIFICATION
FOR
ELECTRICAL - SCADA SYSTEM

SECTION 5-15

1.0 GENERAL

The SCADA/Telemetry system at the Pump Station site shall be as designed and manufactured by High Tide Technologies, LLC to allow full, seamless integration into Alexander City's existing SCADA system. The SCADA work shall include, but not be limited to, the proposed SCADA panel (stainless steel NEMA 4X enclosure), antenna including corrosion resistant mounting appurtenances, and all other components necessary to ensure proper transmission of all I/O listed in the I/O table in the drawings and as required throughout the drawings and Specifications to the City's existing SCADA System.

The SCADA panel shall include an uninterruptible power supply (UPS) sized to power the SCADA panel for 24 hours minimum during a power outage. If the utility power fails, an alarm shall be issued over the SCADA network. If utility power is available but the UPS has failed, an alarm shall be issued over the SCADA network.

The SCADA panel shall be installed outside as shown at the pump station and shall include any climate control appurtenances necessary to ensure the panel temperatures/environmental conditions remain within satisfactory limits for all the panel components including the UPS.

The SCADA system at the pump station site shall be capable of communicating with the master SCADA panel at the WWTP either directly or through other remote terminal units (RTUs) in the system. The pump station SCADA panel shall be capable of monitoring all alarms, levels, controls, and direct pump control override based on Operator controls as indicated on the drawings and/or required in the Specifications. The alarm set points, controls, etc. shall be able to be changed and modified from the system control computer (SCC) via the SCADA/Telemetry System radio network at the Wastewater Treatment Plant.

All I/O for the pump station shall be integrated into Alexander City’s SCADA computer system such that operators can view all operational parameters, controls, and alarms for the Pump Station from the Owner’s remote locations. Additional computer display screens shall be provided on the Owner’s SCADA computer system as required to display all parameters and controls for the Pump Station.

The SCADA panel provided for the Pump Station shall be similar to and with similar components to other pumping station panels provided throughout Alexander City’s SCADA System. Coordinate with Owner/Engineer. The scada panel provided shall be (at a minimum) a series HTT-3100 as manufactured by High Tide Technologies or larger as recommended by the SCADA supplier.

2.0 COORDINATION

The SCADA system supplier/contractor shall comply with all FCC and UL regulations and acquire all necessary permits, waivers, licenses, etc. for the owner.

The SCADA System Supplier/Integrator shall fully advise the Contractor of the complete requirements of his system with respect to equipment, space requirements, delivery times, schedules, etc. including signal and power circuits in order that he may properly prepare his bid.

The SCADA System Supplier/Contractor shall be solely responsible of the design of the complete SCADA system and appurtenances. The SCADA System Supplier/Integrator shall fully coordinate all components and details of the SCADA system and instruments with all other equipment on the project. The SCADA system shall be reliable and trouble-free. During and after start-up, the SCADA System Supplier/Integrator shall adjust the system to fine-tune the system to the satisfaction of the Owner and Engineer. All nuisance alarm, trips, and faulty signals/readings shall be promptly corrected to the satisfaction of the Owner and Engineer. Alarms shall have adjustable setpoints for analog signals and for selected status (discreet) signals.

3.0 START-UP ASSISTANCE

High Tide Technologies, LLC shall be responsible for the furnishing of a qualified technical representative who shall supervise the installation of equipment and/or install equipment, and who shall test, adjust, field calibrate, and fully commission the instrumentation equipment, control equipment, and accessories included in the Project that are monitored by the SCADA system since all are integral components of the complete SCADA system. The commissioning will be deemed to be complete only after the SCADA system is found to be performing satisfactorily and communicating trouble-free with Alexander City's existing system-wide SCADA system.

4.0 WARRANTY

The Contractor/SCADA supplier shall warrant all parts to be free from defects in materials and workmanship for a period of one year after the date of final acceptance. The Contractor shall furnish replacements parts to the Owner at no cost to the Owner for any items found to be defective within the one-year warranty period. This warranty shall be in addition to all equipment/instrumentation warranties provided by Others for the components of the system.

5.0 SCADA I/O LIST

SEE DRAWINGS AND SPECIFICATIONS FOR ALL I/O REQUIREMENTS

EQUIPMENT SPECIFICATIONS

SPECIFICATION
FOR
ALL EQUIPMENT

SECTION 1

1.0 GENERAL

The requirements in this "ALL EQUIPMENT" Specification apply to all equipment provided for this project. Where more stringent requirements for a piece of equipment are contained in the Contract, the more stringent requirements shall apply. **The requirements in this "ALL EQUIPMENT" specification apply to all equipment and all specifications for all equipment** and this "ALL EQUIPMENT" Specification shall be considered to be an integral part of all other equipment specifications.

The requirements in this "ALL EQUIPMENT" Specification also applies to all Electrical equipment and all SCADA equipment provided for the project. The requirements in this **"ALL EQUIPMENT"** specification shall be considered an integral part of all Electrical and all SCADA specifications.

The Contractor shall provide all labor, material, equipment, and incidentals, etc. to furnish, install, and place into proper operating condition all the equipment and appurtenances as shown on the Drawings or described in the Specifications. The equipment manufacturer shall completely design and furnish a coordinated and completely engineered system to meet all the conditions required by the project.

The General Specifications contain extensive, detailed submittals, shop drawing, and O&M Manual submittal requirements. The Contractor shall require all equipment manufacturers and suppliers to understand and fully comply with all shop drawing, submittal, and O & M Manual requirements in the General Specifications. The Contractor shall carefully review and comply with all Submittal and Shop Drawing requirements, including O & M Manual requirements, as per the General Specifications. **All exceptions to the project requirements must be listed on the "EXCEPTIONS" sheet included with the submittal.**

In order to assure standardization, uniform quality, ease of maintenance, and minimal parts storage, all equipment called for under individual equipment specifications shall be supplied by a single manufacturer who, through the Contractor, shall be fully responsible for its design, coordination, and performance.

No equipment shall be supplied by any manufacturer not regularly engaged in the manufacturing and production of equipment for the same purposes as used on the project. The manufacturer shall have installed and had in satisfactory use for a period of not less than five (5) years a minimum of ten (10) installations of similar size as shown in plans for this project comparable to the units specified. No consideration will be given to an individually sized equipment that has not been commercially available for five (5) years.

The equipment assemblies shall include all necessary equipment and appurtenances. Standard manufactured equipment shall be modified if necessary to meet all requirements of the plans and specifications. The equipment is designed around the first manufacturer listed on the List of Material Suppliers and Equipment Manufacturers, where applicable. If changes in the project are necessary due to the use of equipment of a different manufacturer, the Contractor shall submit such changes to the Engineer. The Contractor shall

bear all costs associated with such changes. The listing of a manufacturer, whether in the plans, specifications, bid documents, or contract documents, in no way relieves that manufacturer from meeting all the requirements of the plans and specifications. Note that the equipment specified herein may be non-standard or non-typical.

All equipment shall be designed and manufactured for reliable and trouble-free performance. All equipment shall provide dependable and trouble-free operation.

The Drawings and Specifications illustrate and specify functional and general construction requirements of the equipment and do not necessarily show or specify all components, wiring, piping, or accessories, etc. required to make a completely integrated system. The drawings do not show all details of all equipment or installation requirements. The Contractor shall provide all components, piping, wiring, mounting devices, supports, accessories and labor, etc., required for a complete, workable and integrated system. The Contractor shall coordinate these with the actual equipment manufacturer who provides the equipment and shall install all components in accordance with the manufacturer's requirements except where the requirements of the contract drawings or specifications are more stringent, in which case they shall be followed.

All equipment (including, but not limited to, motors, drive equipment and components, electrical components, controls, and control panels) shall be designed for and have a long trouble-free life and perform reliably and properly in the environment in which it will be installed. Where equipment or control panels are installed outdoors, it will be subject to ambient temperatures from minus 10 to plus 110 degrees, direct sunlight, blowing rain, nearly continuous high relative humidity, periodic icing, corrosive atmospheres and splashing typically associated with sewage. Equipment may be operated intermittently, continuously, or in a standby mode.

All equipment, etc., shall be manufactured to fit within the space allocated on the drawings. No additional space shall be available or provided. This also includes control panels, electrical appurtenances, and piping, etc. Provide special designs if needed to fit in available space. Coordinate with available space.

The equipment shall be powered by the electrical sources shown in the electrical drawings for the project.

All electrical panels, boxes, conduits, unistrut, hardware, components, and appurtenances, attachments, etc., shall be stainless steel or aluminum and shall be corrosion resistant. Coated steel components are permitted only where noted.

All pipe hangers, unistrut, hardware, components, and appurtenances, attachments, etc., shall be stainless steel or aluminum and shall be corrosion resistant. Provide non-metallic components where called for in the drawings.

Orient all flowmeters, pressure gauges, light, and other instrumentation, etc. such that is it promptly and easily visible and readable.

When PLCs are included in a submittal, provided and whenever else requested, submit descriptions of the control methodology that will be employed. This shall include a description of operation, interlocks, and other features to fully understand the functioning and control of the system. Manufacturer-provided panels shall meet all requirements of Control Panel Specifications (in other specifications sections). Such panels shall have a main, pad-lockable circuit breaker. Prior to making the first submittal, all panels shall be completely and thoroughly coordinated with all other project equipment, controls, and SCADA system, etc.

The submittal may be rejected without review if it appears that careful and comprehensive coordination was not performed by the Contractor or Manufacturer, etc.

All equipment shall be designed solely by the Manufacturer with all safety features and guards, etc., as required to meet all standards of OSHA and all applicable codes, etc. The Manufacturer shall design all equipment to allow for safe and convenient operation and maintenance, etc. The manufacturer shall design and provide all safety features and guards, etc., as desirable or recommended for the safety and protection of operators, maintenance personnel, and others.

All panels shall be designed by the Panel Manufacturer to meet the requirements of the project and of the installation. If control drawings are included in the plans, the manufacturer shall consider those as conceptual drawings showing only minimum requirements. The detailed design is the responsibility solely of the panel manufacturer who shall include additional features as desirable for trouble-free, reliable operation. Include appropriate surge protection. Where located outdoors or in non-conditioned space, panels shall be furnished with condensation heaters. NEMA 4 or 4X panels shall be furnished with 3-point latches. Clips or similar closure devices shall not be permitted.

Miscellaneous hardware, nuts, bolts, etc., shall be stainless steel when the equipment will be located outdoors, or in non-conditioned space, or in humid areas.

All control panels shall be fully tested prior to shipment from the manufacturer. Written certification shall be provided to the Engineer certifying that the testing demonstrated that all contract requirements were complied with. Mechanical equipment shall be tested prior to shipment to the extent practical or required.

Spare parts shall be boxed separately from the regular items. A separate packing list clearly labeled "SPARE PARTS" is required for inventory purposes. Package each part individually or in sets in moisture proof containers or wrappings, clearly labeled with part name, manufacturer's parts/stock number, and the equipment it is provided for.

Provide all the spare parts recommended by the manufacturer for the number of units and equipment installed. Provide any special tools required to install, operate, or maintain the equipment. All spare parts shall be delivered to the Owner, in the presence of the Engineer, at the end of construction and in one occurrence (i.e. one transfer for all spare parts). The Contractor shall prepare a detailed list of all the spare parts for the project, and the Owner shall sign for the spare parts received.

The Contractor shall inspect all equipment and materials against reviewed shop drawings at the time of delivery. Equipment and materials damaged or not meeting the requirements of the reviewed shop drawings shall be immediately returned for replacement or repair.

All equipment and its components shall be properly stored in a manner that will protect the equipment and insure long life. As a minimum, all equipment shall be stored in accordance with the equipment manufacturer's recommendations, unless more stringent requirements are contained in the plans or specifications. All equipment shall be properly stored and maintained during storage. All storage requirements also apply to equipment that has been installed but is not in full time normal operations.

The Contractor shall thoroughly coordinate all dimensions for equipment with other shop drawings and with the plans and submit to the Engineer any required changes in concrete or piping dimensions, etc., that may be needed to allow the equipment to fit, to perform properly, and to be maintained or replaced. Concrete and appurtenances shall be

placed by the Contractor well within the manufacturer's required construction tolerances. Templates provided by the manufacturer shall be utilized to set embedded anchor bolts.

Comply will all painting requirements as contained in the "Standard Specifications for Painting". Refer to and understand all the "Standard Specifications for Painting" for the project. Provide the primer specified in the "Standard Specifications for Painting". Finish field preparation and painting shall be performed as specified in the Painting Section. The Contractor shall touch-up all shipping damage to the paint as soon as the equipment arrives on the job site. The equipment should be totally re-coated if needed for a uniform and pleasing appearance.

All equipment, etc., shall be manufactured to fit within the space allocated on the drawings. No additional space shall be available or provided.

Refer to and comply with all other sections of the specifications including but not limited to electrical, controls, control panels, instrumentation, and motors, etc..

Fully coordinate all equipment requirements, controls, and connections, etc. in a timely manner. Coordinate supports and piping, etc.

Provide all miscellaneous accessories, brackets, supports, instrumentation, appurtenances, and adaptors, etc. that are required for the specific installation on this project. If the equipment manufacturer recommends that the water pressure of connecting water lines be limited, he shall provide a water pressure regulator.

Where initial maintenance (oil changes, tightening belts or chains, etc.) are recommended to be performed at 6 months or less after startup, such maintenance shall be performed by the Contractor utilizing factory authorized personnel.

All anchor bolts shall be stainless steel and shall be provided by the equipment manufacturer who shall select the bolts based on the maximum possible loading for the equipment.

For all electrical, control, or instrumentation panels, the colors of indicator lamps shall be consistent throughout the project and plant. Swap or replace lamps and LEDs at startup as needed for consistency.

Prior to assembly, all stainless steel bolts and nut threads shall be coated with a non-seizing compound by the Contractor.

The Contractor shall install all project components and all equipment in strict accordance with manufacturer recommendations. The Contractor shall carefully follow all manufacturer safety recommendations and shall continuously utilize effective safety practices.

The Contractor shall install all project components and all equipment in strict accordance with manufacturer recommendations. The Contractor shall carefully follow all manufacturer safety recommendations and shall continuously utilize effective safety practices.

The manufacturer shall include in his price and schedule trips to the project site as needed for equipment installation, start-up assistance, inspection of installed equipment for proper operation as noted below, and operator training, etc. The manufacturer's representative shall be from the factory and shall have a minimum of 10 years of meaningful and acceptable experience starting up such equipment. The representative shall be well qualified to perform the startup and training. The Contractor shall submit the representative's qualifications for review and approval prior to scheduling the visit.

After the Contractor has installed the equipment and it is capable of being operated, the equipment manufacturer shall furnish a qualified representative meeting above stated requirements to inspect the equipment and to supervise field testing and start-up.

Install equipment and accessories in accordance with the drawings, approved shop drawings, and the manufacturer's installation instructions and recommendations. All final electrical connections shall be made by the electrical sub-contractor. The Contractor shall make adjustments including but not limited to level, plumbness, and alignment, provide lubricants, lubricate all equipment, and adjust all controls, equipment, and appurtenances in accordance with the manufacturer's instructions and leave equipment in proper working condition. He shall carefully test all safety equipment and insure it operates as recommended. Where required for proper installation, the Contractor shall install non-rusting, non-shrink grout. The Contractor shall verify that the electrical power available is proper and that motor rotation is correct. Unless otherwise allowed, new or rebuilt equipment shall be started up on a Monday, Tuesday, or Wednesday to allow some time for malfunction to occur prior to the weekend. Where desirable for the project, new or rebuilt equipment shall be started up in the morning. The Contractor shall demonstrate all features of the equipment and its controls and demonstrate that the equipment operates properly under all types of conditions including but not limited to high speed and low speed, etc. Where units are furnished with more than one pulley combination for speed changes, the Contractor shall demonstrate that the equipment operates properly at all speeds provided. The Contractor shall coordinate with the Engineer to determine which set of pulleys should be left on the equipment at the conclusion of testing and demonstration. The testing shall also include safety features, operation from local and remote control stations, and local and remote alarm simulation.

The Contractor shall conduct testing to demonstrate to the Owner's satisfaction that the equipment performs as required. Performance and/or installation testing shall be repeated at no cost to the Owner if requested by the Owner after experiencing problems with the equipment or after repairs or after any indication that the testing may potentially not be representative.

After testing, the Contractor, in conjunction with the manufacturer's representative, shall make whatever adjustments are required for the anticipated operating conditions.

The Manufacturer's representative shall sign a Certificate of Compliance on a form provided by the Engineer stating that he has thoroughly reviewed the equipment and its installation and it meets the requirements of the Manufacturer. All written certifications shall be delivered to Engineer before startup item is paid. All certifications shall be delivered concurrently with the performance of the work being certified and again at project completion in one single three-ring binder with a Table of Contents listing each certification contained in the binder.

A qualified and experienced technical representative of the manufacture shall provide operator training for Owner's personnel after system is operational. He shall be from the factory and shall have a minimum of 10 years experience with the equipment. If time and conditions permit, training may take place while manufacturer's representative is at the job site for inspection. All training shall occur at a time that is convenient for the Owner, operators, and Engineer. Training may be videotaped or otherwise recorded by the Owner, operator, or Engineer if they wish even if prior approval or arrangements have not be made. For operating facilities, it may be necessary to conduct the training in two separate independent sessions so that all operators can attend. If training is conducted before equipment fully and properly operational, it may be necessary to repeat the training after the equipment is fully and properly operational.

No warranty period shall begin prior to the final acceptance by the Owner.

All equipment shall be warranted by the manufacturer for a period of one (1) year from the date of final acceptance by the Owner. Longer warranty periods are required where noted in individual equipment specifications. Warranties shall be non-prorated. Manufacturer warranties shall in no way relieve the Contractor of his warranty requirements established by the Contract Documents.

EQUIPMENT SPECIFICATION
FOR
SUBMERSIBLE SEWAGE PUMPS

SECTION 2

1.0 RELATED SPECIFICATIONS

This section contains references to other specifications. These references are not all inclusive and are provided as a convenience to the Supplier and the Contractor. All provisions of the Contract Specifications and Drawings apply whether or not they are referenced in this section. In case of conflicts between the requirements contained in any of the Specifications, or between the Specifications and the Plans, the more stringent requirement, as determined solely by the Engineer and the Owner, shall prevail.

- All Equipment.

2.0 GENERAL

The Contractor shall furnish and install submersible non- clog sewage pumps equal to ITT-Flygt Company's as shown on the plans. Each pump shall be furnished with a submersible electric motor suitable for operation on voltage shown in the plans, 60 hertz service, a cast iron discharge connection with anchor bolts, upper guide bar bracket, adequate length of stainless steel lifting chain, and adequate length of hypalon jacketed type SPC cable, P-MISHA approved and sized according to N.E.C. and ICEA standards. The pumps shall be capable of producing the following:

Primary Design Point	226 GPM @ 210' TDH
Maximum Design Point	800 GPM @ 55' TDH
Minimum Design Point	
Minimum Pump Shut-Off Head	264 Feet
Motor Voltage	480 Volt
Horsepower (minimum)	35 HP
Discharge Connection	4 inches

Drawings and performance curves shall be submitted to the Engineer for approval. The pumps shall be shipped assembled to the job site. The motors will be megged before start-up. Any motor showing insulation weakness will be replaced.

3.0 SUBMERSIBLE PUMP CONSTRUCTION

The pumps shall be capable of handling raw, unscreened sewage. The discharge connection elbow shall be permanently installed in the wet well, along with the discharge piping. The pumps shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter pump well. Sealing of the pumping unit to the

discharge connection elbow shall be accomplished by a simple linear downward motion of the pump. A sliding guide bracket shall be an integral part of the pump unit. The entire weight of the pump unit shall be guided by no less than two guide bars and pressed tightly against the discharge connection elbow with metal-to-metal contact. Sealing of the discharge interface by means of a diaphragm, 0-ring, or other devices will not be acceptable. No portion of the pump shall bear directly on the floor of the sump. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

The pump shall be suitable for use in raw sewage and be able to pass 3 inch solids. Major pump components shall be of gray cast iron, Class 35B, with smooth surfaces devoid of blow holes and other irregularities. Where watertight sealing is required, 0-rings made of nitrile rubber shall be used. All exposed nuts and bolts shall be of stainless steel 304. All surfaces coming into contact with sewage, other than stainless steel, shall be protected by an approved sewage resistant coating. Pump exterior shall be sprayed with an acrylic dispersion zinc phosphate primer with polyester resin paint finish on the exterior of the pump.

All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber 0-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces. This will result in controlled compression of nitrile rubber o-rings without the requirement of a specific torque limit. No secondary sealing compounds, rectangular gaskets, elliptical 0-rings, grease or other devices shall be used.

The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. The assembly shall bear against a shoulder in the pump top. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

The pump (15HP and below) shall be of low silhouette design to facilitate above and below ground handling. The lower bearing housing shall be oversized and designed to work as a heat sink with large multi-finned surface area. Heat shall be dissipated by means of external fins. (20HP and above) Each pump shall be provided with an adequately designed cooling system consisting of a water jacket which encircles the stator housing. Impeller back vanes shall provide the necessary circulation of the cooling liquid through the water jacket. The cooling media channels and ports shall be non-clogging by virtue of their dimensions. Provisions for external cooling and flushing shall also be provided.

Pump shafts shall be provided with a tandem mechanical rotating shaft seal system. Seals shall run in an oil reservoir. Lapped seal faces must be hydrodynamically lubricated at a constant rate. The lower seal unit, between the pump and oil chamber, shall contain one stationary and one positively driven rotating tungsten carbide ring. The upper seal unit, between the oil sump and motor housing, shall contain one stationary tungsten-carbide ring and one positively driven rotating tungsten carbon ring. Each interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: (1) shaft seals without positively

driven rotating members; or (2) conventional double mechanical seals containing either a common single or double spring acting between the upper and lower units. This conventional system requires a pressure differential to offset external pressure and to effect sealing.

Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall house a pressure equalizer ring filled with air for oil pressure compensation. The drain and inspection plug, with positive anti-leak seal, shall be easily accessible from the outside. Seal lubrication shall require an oil chamber capacity no greater than 2.3 liters.

The pump shaft (20HP and below) shall be AISI type 420 stainless steel, full diameter, with no stress concentrating steps or grooves. (25HP and above) The pump shaft shall be of carbon steel C-1035 and shall be completely isolated from the pumped liquid.

The impeller shall be of gray cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long thrulet without acute turns. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in normal sewage applications. When ever possible a full vaned, not vortex, impeller shall be used for maximum hydraulic efficiency. The pump manufacturer shall, upon request, furnish mass moment of inertia data for the proposed impeller. The impeller shall be capable of passing a minimum 3 inch solid sphere. The fit between the impeller and the shaft shall be a sliding fit with one key. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

A wear ring system shall be installed to provide efficient sealing between the volute and impeller. The wear ring shall consist of a stationary ring made of nitrile rubber molded with a steel ring insert which is drive fitted to the volute. The volute shall be of single piece design and shall have smooth fluid passages large enough at all points to pass any size solids which can pass through the impeller.

4.0 MOTOR DESIGN

The submersible pump motor shall be squirrel-cage induction shell type design, housed in an air-filled watertight chamber. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation which will resist a temperature of 155EC (311E F). The stator shall be dipped and baked three times in Class F varnish. The motor shall be designed for continuous duty, capable of sustaining a minimum of fifteen (15) starts per hour. The rotor bars and short circuit rings shall be made of aluminum. The motor shall not draw more than the previously specified KW at nominal voltage at utility supply quality.

The junction chamber containing the terminal board shall be sealed from the motor be elastomer compression seal (o-ring). Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board and thus perfectly leak proof.

A minimum of two thermal sensors shall be embedded in the stator winding end coils. These sensors shall be wired to the control panel for use in conjunction with the external motor overload protection.

A float leakage sensor (FLS) shall be provided to detect the presence of water in the stator chamber. When activated, the FLS will stop the motor and send an alarm both local and/or remote.

The pump motor cable, installed, shall be suitable for submersible pump application with P122-MISHA approval and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC Specifications for pump motors. The pump cable end will be sealed with a high quality protective covering to make it impervious to moisture or water seepage prior to electrical installation.

5.0 EXPLOSION PROOF CONSTRUCTION

All equipment installed in or exposed to the wet well (pump sump) environment shall be constructed to meet explosion proof requirements for use in hazardous locations defined as Class 1, Division 1, Groups C and D (gasses and vapors), Class 2, Division 1, Groups E and G (dusts), Class 3, Division 1, (fibers and flyings). All equipment shall be approved and labeled by Factory Mutual Systems or other engineer approved firm.

6.0 WARRANTY AND TESTING

The pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory:

(a) Impeller, motor rating and electrical connections shall first be checked for compliance to the customer's purchase order.

(b) A motor and cable insulation test for moisture content or insulation defects shall be made.

(c) Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.

(d) The pump shall be run for 30 minutes submerged, a minimum of six feet under water.

(e) After operational test d., the insulation test b. is to be performed again.

A written report stating the foregoing steps have been done shall be supplied with each pump at the time of shipment upon request.

The pump manufacturer shall warrant the units being supplied to the Owner against defects in workmanship and material for a period of five years or 10,000 hours. The manufacturer will supply the required number of submittal drawings, operation and maintenance instruction manuals and parts list.

The pump shall be tested at the site upon start-up and voltage, current, and other significant parameters recorded. The manufacturer shall provide a formal test procedure and forms for recording data. Only factory certified service personnel shall perform start-up service. Proof of certification shall be required prior to equipment approval.

7.0 ACCESSORIES

The Contractor shall furnish and install an access frame complete with hinged and flush locking mechanism, upper guide holder and level sensors cable holder. Frame shall be securely placed, mounted above the pumps. Frame shall be provided with sliding nut rails to attach the accessories required. Lower guide bar holders shall be integral with the discharge connection. Guide bars shall be of at least Schedule 40 stainless steel pipe of the size suggested by the manufacturer and shall not support any portion of the pump weight. The doors shall be of skid proof design and rated for 300 psf live load. The frame and guides shall be provided by the pump manufacturer or as indicated on drawings and coordinated by the Contractor.

In order to minimize difficulty in removing the submersible pumps specified herein, the manufacturer shall provide a lifting chain positive recovery system. The system shall enable the operator to remove either pump completely from the well in one lift. Short grabs of chain (slippery grips), intermediate tie off rings, and other methods requiring several lifts by the operator shall not be considered equal and shall not be acceptable. All hardware required shall be provided by the pump manufacturer and not the equipment supplier in order to achieve a workable, tested system. The supplier shall furnish data to the Engineer verifying the existence and satisfactory operation of the lifting system.

If called for on the Plans, a manually operated, portable hoist shall be furnished for lifting pumps from well. Unit shall consist of mast, boom, winch, cable, hook and chain assembly approximately 68" high, rated for up to 650 lbs. load. Weight of mast assembly shall be approximately 60 lbs. A platform type socket shall be provided for mounting the mast and the socket shall be securely anchored into the station top slab in a location shown on the Drawings or as directed by the Engineer.

8.0 CONTROLS

The Contractor shall furnish and install one duplex automatic, prewired pump control center suitable for voltage shown on the drawings, 3 phase, 60 hertz, 4 wire power supply. For each pump motor, there shall be included: a combination overload breaker with manual reset for dual protection against current overloads and short circuit protection; an overload relay to be precalibrated to match motor characteristics and factory sealed to insure trip setting is tamper proof; an across-the-line magnetic contactors; hand/off/automatic selector switch; and 120 volt control circuitry. If called for on the Plans, an automatic electric pump alternator for duplex stations shall be provided, providing alternating operation of pumps under normal conditions, or in case of high level, allowing both pumps to operate simultaneously. A terminal board for connection of level sensors shall be provided.

The panel shall be housed in a NEMA 4X and 316 stainless steel enclosure with locking hasp suitable for a padlock. A strobe light with red lexan globe and guard shall be mounted on the outside at the control enclosure, and shall be illuminated in event of a high water level. An adjustable condensation heater and thermostat shall be provided within the control enclosure. Elapsed time meters and pump run lights shall be mounted on the inner door. A lightning arrestor shall also be provided. Provisions shall be made for mounting of the panel to a pole or as shown otherwise on the Plans.

A dead front plate shall be installed such that the circuit breaker handles, switches, lights and overload resets are accessible to the operator when the outer door is opened. The dead front plate shall be removable to provide access to the components for service.

The alarm circuit shall activate a high intensity flashing alarm light mounted on top of the enclosures. The alarm light shall require manual reset.

Terminals shall be provided for connection of motor heat sensors and seal fail sensor when provided in the pump. When shown on the plans, the failure indication circuits shall include indication lights for each pump.

When shown on the plans, the control panel shall include a manual transfer switch connected to the incoming power and a receptacle for a portable stand by generator. The transfer switch can be a double throw switch interlock system and shall be NEMA rated. The receptacle will match the system's generator plugs and the transfer switch will be acceptable to the company who supplies the incoming power.

9.0 LIQUID LEVEL SENSORS

The Contractor shall furnish and install Flygt Model ENM-10 liquid level sensors as required on the plans, each with 30' of electrical cable. Level sensors shall be a nonfloating, displacement type. Level sensors shall be rated for operation at milliwatt levels.

10.0 MIX FLUSH VALVE DATA

If shown in the drawings, the pump volute shall be manufactured to accommodate a device designed by the pump manufacturer to produce a flushing action at the start of pump cycle. Water from the pump will be forced through the device into the wet well as a jet flushing stream. This device is mounted on the pump. It is based on the ejector principle with a ball as closing device. The operation is automatic and induced by the pump flow and pressure. Electrical components or cabling will not be accepted. The mix flush valve device shall be Flygt Model 4901 or approved equal.

EQUIPMENT SPECIFICATION
FOR
PUMP POWER AND PUMP CONTROL PANELS

SECTION 3

1.0 GENERAL

It is the intention that this specification shall cover a complete three (3) pump (tri-plex) sanitary sewer lift station control system (3rd pump is future) as hereinafter described and all necessary appurtenances which might normally be considered a part of the complete control system for this installation. There should be two separate panels provided as part of this specification. The Pump Power Panel shall generally consist of the 480V components, such as the breakers, motor protectors, filters, VFD,s, etc. and the Pump Control Panel shall generally consist of the 120V components, such as the pump controller, backup float controller, switches, lights, and other controls. These control panels shall be designed to automatically operate the pumps as described herein. The pumps shall operate in a specified sequence, in response to variations in the liquid level. The pressure transducer and all backup and alarm floats shall be provided as part of this specification.

Furnish all labor, materials, and incidentals necessary to provide one (1) Pump Power Panel and one (1) Pump Control Panel to power and control the submersible pumps. System shall be furnished complete in all respects and shall be capable of receiving incoming and outgoing signals for starting, stopping, and controlling pumps automatically from the pump controller and backup floats. System shall also monitor equipment for fault conditions, issue alarms, and perform other functions as specified or reasonably inferred from the specifications and contract documents.

1.1 RELATED SPECIFICATIONS

A. All Equipment
B. Electrical Specifications –
   All Sections
   Variable Frequency Drives
   Control Panels, Cabinets, and Components

1.2 SUBMITTALS AND PROJECT COORDINATION

Submittals shall be provided in full accordance with the General Specifications. See the General Specifications for submittal and O&M Manual requirements. Clearly show all interconnecting wiring as shown in schedules, in drawings, or as described herein. Fully coordinate with all interconnecting equipment, panels, and SCADA System prior to making the first submittal. If it is evident that the submittal has not been completely coordinated as required, it may be returned for re-submittal without any Engineer review comments.

1.3 MANUFACTURER REQUIREMENTS

The panel manufacturer shall maintain a qualified technical and support staff. The panel manufacturer shall employ a professional Control Systems Engineer or Electrical Engineer registered in Alabama to supervise or perform the work necessary to engineer, design, and manufacture the control panel covered by this Specification. The qualifications and experience of key project personnel shall be acceptable to the Engineer. The panel manufacturer shall employ competent service personnel to service and troubleshoot the control panels and shall have at least 15 years of experience with similar work. The panel manufacturer for the Pump Power Panel and Pump Control Panel shall be Electric Machine Control, Revere Control Systems, or Pre-Approved equal, subject to all the requirements contained in the "List of Material Suppliers and Equipment Manufacturers" (found in the Bid Documents for this project).

2.0 EQUIPMENT

All equipment in this section is to be provided by the panel supplier for installation by the Contractor or others as appropriate. The Panel Manufacturer/Supplier shall assume full responsibility for equipment compatibility, functionality and suitability for the intended purpose. Where equipment is specified that may be out of date, provide the most recent version provided compatibility with existing system is not compromised. See Related Specifications for additional requirements.

All components shall be factory assembled, wired, and tested by a panel manufacturer qualified and experienced in the assembly and integration of control systems of this nature. The panel manufacturer shall be responsible for verifying all equipment shall work together and communicate to achieve the desired controls.

Panel manufacturer/supplier shall reference the conceptual pump power panel and pump control single line and schematics included in the Contract Drawings.

Panels shall include all necessary power supplies, surge suppression, and other relays, etc. as required for a fully functional system. All components necessary for standard operation of control panel shall be mounted on the exterior of the deadfront door of the panel so that all components normally actuated by Operating Personnel are accessible without opening panel door. All major components and sub-assemblies shall be identified as to function with laminated, engraved bakelite nameplates, or similar approved means. All breakers, controls, switches, lights, and components located on the door and inside the panel shall be identified with engraved plastic nameplates. Pilot lights shall be transformed as required. Interior light(s) shall be provided in panels which are controlled by a door switch. A thermostatically controlled heater and fan shall be provided inside the panel(s). Each panel shall be designed to handle an ambient temperature of 110° F. It is the panel manufacturer's responsibility to properly size the heating and cooling systems to provide sufficient ventilation for the entire panel to handle the required ambient temperatures and maintain proper temperature for the heat sensitive components. The wiring shall be heavy wall thermoplastic machine tool wire. Control wiring shall be red and power wiring black. Thermoplastic wiring duct shall be used for interconnections. Connections to external devices shall be at terminal blocks. Each wire shall be marked on each end. All switches, lights, components, etc. shall be as indicated in the conceptual schematic and as required to meet the functional description provided herein.

2.1 PUMP POWER PANEL

The Panel manufacturer shall furnish a prewired, UL listed Pump Power Panel for the submersible pumps (3 - 50 Hp Submersible Pumps) for voltage shown on the Contract Drawings, 480V, 3 phase, 60 Hz, power supply. The panel must be assembled in a UL approved shop and have UL 508A Industrial Control Panel approval label for its intended use. The pump power panel shall have all components factory mounted and connected. The control panels must be assembled in a UL approved shop and have UL 508A Industrial Control Panel approval label for its intended use. The short circuit rating of the pump power panel shall not be less than 18 KAIC or as indicated on the Contract Drawings. Panel manufacturer shall reference the conceptual panel and pump control schematics included in the Contract Drawings.

The enclosure shall meet the requirements of NEMA construction and shall utilize all fully rated NEMA components. IEC components shall not be acceptable. The control panel enclosure shall be NEMA 4X stainless steel, air conditioned, generously sized by the panel manufacturer and designed specifically for mounting outdoors. All components necessary for standard operation of control panel shall be mounted on the interior door behind the deadfront doors of the panel. The panel enclosures shall have gasketed, hinged doors with locking capability, and three (3) point latches (for easy door operation) installed on all doors, no clamps allowed. The control panel shall include, but not be limited to, the following: a main panel disconnect with a door handle; surge protection device fed by circuit breaker on the incoming power (as recommended and manufactured by Surge Suppression, Inc.) with remote LED's (provided by SSI) mounted on the external face of the panel indicating the status of each power phase protected by the SPD; phase monitor; motor circuit protector (MCP) or breaker (sized by panel supplier); a heavy duty VFD for 2 – 50 Hp pumps (space in panel allowed for the 3rd VFD) (with VFD HMI located on the interior door face at convenient height for ease of viewing) capable of fully and accurately controlling premium efficiency inverter duty rated motors; spare breakers; air conditioner; transformer and 120 volt control circuitry (as required); a single lamp for power available signal on front of the deadfront door; all controls, signals to and from the Pump Control panel and SCADA panel; interconnecting wiring; and all items required and shown in the single line and control schematics.

The control panel shall be designed to handle an ambient temperature of 110° F. For the purposes of heat dissipation for this panel, the panel shall be provided with a thermostatically controlled air conditioner (A/C). It is the panel manufacturer's responsibility to properly size the A/C unit and provide sufficient ventilation for the entire panel to handle the required ambient temperatures and maintain proper temperature for the VFDs and other heat sensitive components.

Each pump shall have a Variable Frequency Drive (VFD) located inside the pump power panel. There shall be space allowed and allocated for the installation of a future 3rd pump VFD, filters, and all other components for the 3rd pump. The motor circuit protector/breaker for the 3rd pump shall be provided and installed in the panel. VFDs shall be sized by the panel manufacturer for 50 Hp pumps and coordinated with the pumping equipment supplied. VFDs shall be specifically designed for centrifugal pump operations and shall be sufficiently sized to allow the pump speeds to be modulated continuously without overheating the drive. All VFD drives shall have line reactors and filters (if required) as specified. The VFD's shall be provided with Ethernet communications for providing information and controls to SCADA panel. VFDs shall be as specified in the Variable Frequency Drive Specification.

The control panel shall be provided with a transformer and a 208/120V breakers as required to power panel light, receptacle, and other low voltage auxiliary loads. The low voltage breakers shall be properly sized for items they will power.

Payment for the panel shall not be made in full until the panel is fully installed, properly operating, and approved by the Engineer/Owner.

2.2 PUMP CONTROL PANEL

The Panel manufacturer shall furnish a prewired, UL listed Pump Control Panel for the control and communications of 3 submersible pumps (**all components and controls shall be provided as if 3 pumps were provided and installed**) and pump station controls. Power supply for panel shall be as shown on the Contract Drawings, 120V, 1 phase, 60 Hz, power supplied from LP-1. The pump control panel shall have all components factory mounted and connected. The panel must be assembled in a UL approved shop and have UL 508A Industrial Control Panel approval label for its intended use. Panel manufacturer shall reference the conceptual panel and pump control schematics included in the Contract Drawings.

The enclosure shall meet the requirements of NEMA construction and shall utilize all fully rated NEMA components. IEC components shall not be acceptable. The control panel enclosure shall be NEMA 4X stainless steel. The enclosure shall be generously sized by panel manufacturer and designed specifically for mounting outdoors. All components necessary for standard operation of control panel shall be mounted on the interior door behind the deadfront doors of the panel. The panel enclosure shall have gasketed, hinged doors with locking capability, and three (3) point latches (for easy door operation) installed on all doors, no clamps allowed. The control panel shall include, but not be limited to, the following: surge protection device on the incoming power (as recommended and manufactured by Surge Suppression, Inc.) with remote LED (provided by SSI) mounted on the external face of the panel indicating the status of phase; breakers (sized by panel supplier); power supplies; relays; timers; pump controller with LED display face, backup pump controller; HAND-OFF-AUTO selector switches; elapsed time meters; 120 volt (and 24 volt as required) control circuitry; shut-off control circuits for local E-stop which will instantly stop the pumps (no sequenced shutdown and/or ramp down of the pump). The local E-stop shall shut-off pumps under all circumstances regardless of which mode the pump or VFD is in; panel mounted (i.e. mounted on panel face) indicator lights for pump status and all alarm conditions; a single lamp test pushbutton for testing all indicator lights simultaneously (or push to test lamps); discrete general alarm outputs; discrete outputs to SCADA for pump's RUNNING status all control logic required and shown in the conceptual pump control schematic. All components necessary for standard operation of pumps shall be mounted on the exterior door of the panel so that all components normally actuated by Operating Personnel are accessible without opening panel door.

The Pump Control panel shall incorporate the monitoring relay(s)/base unit (mini-cas relays or other pump manufacturer equivalent) for each pump seal and temperature monitoring. The panel manufacturer shall install these inside the panel and incorporate all control wiring, signals, alarms, etc. for a complete monitoring system. The relays should be provided by the pump manufacturer. Monitoring relays shall be provided and installed for 3 pumps. Coordinate with the Contractor and pump supplier.

Each pump will be furnished with motor thermostats. A high temperature condition shall shut down the pump, issue an alarm to the SCADA System, and require a manual reset. Coordinate with the Contractor and pump supplier.

The Pump Control Panel shall have a primary pump controller and a backup pump controller that controls the pumps. Both controllers shall have a UPS battery backup system that will keep the controllers and cellular modem operational for 8 hours after power loss. The primary pump controller shall be model SEL 2411P as manufactured by Sweitzer for operating 3 pumps. The SEL 2411P pump controller control panel shall include a local interface (LCD screen) to provide local access to all the functions, operations, and configuration. The display shall provide status of most aspects of the pump station, control of pumps, resetting of faults, and configuration of parameters. The parameters displayed on the main screen shall include level in user definable units (percent, feet, meters, or custom units), setpoints for alarms and pump start/stop, pump running/stopped, pump available/unavailable, faults, and user-configurable options to display.

The SEL 2411P controller shall have the following capabilities to handle the following inputs/outputs, and controls at a minimum.

- 4-20 mA input from a pressure level transducer located within the wet well
- Inputs from selector switches and buttons mounted on the panel
- Inputs from pump VFD's
- Pumps - in Auto, in Hand, Pump Running, Starter Fault, Thermal Overload, Seal/Temp Failure
- Local E-stop
- Outputs for Pumps - Call to Run
- Fault Output
- The I/O shall be expandable. All inputs/outputs shall be available for telemetry transmission.

The above I/O requirements are minimum. Panel manufacturer shall review all plans and specifications and provide additional I/O as necessary for a fully functional system.

The SEL 2411P controller shall control the **triplex** pump station (2 pumps originally installed), with an intuitive user-interface have the following control capabilities at a minimum.

- The Pump Controller shall provide functionality for pump control of 3 pumps
- Setpoint adjustment for pump activation/deactivation and level alarms.
- Level monitoring from 4-20mA signal from pressure transducer.
- Alternation schemes include fixed and lead/lag alternation.

Local manual control shall be provided by H-O-A switches. The H-O-A switches shall be fail-safe and operate in the OFF and HAND positions if the pump controller needs to be powered down or fails. Alarms shall indicate that a H-O-A switch has been left in the HAND or OFF position. The pump controller shall be able to alarm when a pump is called to run, but fails to run, or if the pump is turned off by the pump controller but continues to run.

The pump controller shall be provided with all communication ports, discrete input/output modules, analog in/out modules, etc. as necessary for control features. Each pump controller shall have spare slots capable of accepting analog input cards or analog output cards, or combination discrete input and output card (ex: 4DI/4DO card). The pump controller shall be capable of utilizing the I/O cards in the spare slots for expansion if necessary. The primary pump controller shall be capable of controlling 3 pumps in a lead-lag-backup control scheme using a pressure transducer, alternating pumps, alarms, signals, controls, programming, etc. The primary pump controller shall send a signal to the SCADA if it fails. The backup pump controller shall use the floats as control if the primary pump controller fails.

If for some reason the primary pump controller is not properly controlling the pumps, or the level transducer has malfunctioned and the water level in the wet well rises to a high-water level float, the backup controller shall take over control of the pumps. When this happens, A "Backup Controller Active" alarm should issue. Once in this mode, the Owner will have to reset the system in order for it to go back to transducer mode.

The Pump Control Panel shall have all components for communications with the SCADA panel. This includes but is not limited to, communication cables, ethernet switches, etc. for proper communication of all pump status, float levels, transducer levels, and all other pump station information. Panel/Supplier shall coordinate with the SCADA supplier to verify all information required to be received at the WWTP and into the SCADA system. Connections and ports shall be determined by the panel manufacturer/integrator and included as required. The system shall support a variety of media and communications networks as required by integrator. Communication cables shall be supplied between the pump controller, backup controller, relays, alarms, and SCADA panel as a minimum. See Contract Drawings and specifications herein for all requirements.

The Pump Control panel shall have an alarm light for indicating alarm conditions as requested by the Owner/Engineer. A red alarm light shall be installed on the top of the control panel and shall flash under alarm conditions. These alarm outputs shall be activated upon detection of an alarm condition from the pump controller or the backup control logic. The alarm light shall have the ability to be reset. These outputs shall be configured for local automatic alarming or configured through the display unit for general purpose outputs used by telemetry. Coordinate with Owner/Engineer during construction.

The panel manufacturer shall provide a minimum of 4 spare relays and 2 spare timers to the Owner once the project is complete. The relays and timers shall match relays and timers used throughout the panel. The panel manufacturer shall also provide 3 (three) spare fuses of any and all sizes installed in the panel to the Owner.

Payment for the panel shall not be made in full until the panel is fully installed, properly operating, and approved by the Engineer/Owner.

3.0 CONTROL/PROGRAMMING

Panel manufacturer/supplier shall reference the single line diagram, conceptual pump control panel schematic, and all SCADA system requirements included in the Contract Drawings. The pump control panels shall integrate a pump controller and backup controller with relay logic to run and control VFD's and 3 submersible pumps (2 current and 1 future). The panel manufacturer shall review all plans and specifications and provide additional I/O as necessary for a fully functional system.

This section describes the overall conceptual control provided by the panels. Provide other features as needed for proper operation and functionality. Provide miscellaneous changes and additions as requested during construction and start-up.

The pump power panel and the pump control panel shall work together to control all 3 submersible pumps in a lead-lag-backup standard pump station control scheme. The control panels shall control the operation of two (2) submersible sewage pumps, in a pump-down mode, in accordance with the level of water in the wet well as monitored by a pressure level transducer and backup float switches. The control panel shall integrate a primary pump controller, backup controller (with floats), and transducer for pump controls. All logic and programming for controller shall be provided to the Owner. The controller and panel manufacturer shall also save and store all logic and programming and make available if needed by the Owner in the future.

There will be three (2 current and 1 future) identical pumps controlled out of these panels. Pump controls shall be achieved by a Hand-Off-Auto (H-O-A) switches. With the H-O-A switch in the "Hand" position, the pumps will start and run. When the H-O-A switch is in the "Auto" position, the pumps are controlled by the pump controller or by a SCADA override command from the SCADA system.

The primary pump controller shall be capable of controlling all 3 pumps based on an analog signal from a pressure level transducer. When the level of the wet well rises to a certain level, the controller shall call for the lead pump to run. The controller shall increase the speed of the VFDs as the sewage level increases. The controller shall vary the speed of the VFDs to closely maintain a desired/selectable level. If the level continues to rise, the controller shall call for the lag pump to run. The controller shall be capable of operating pumps with variable frequency drives. If the controller indicated does not have the capability to control the speed of VFD's with level control, panel manufacturer shall provide alternate pump controller that has this functionality at no additional cost to the Owner.

The standard programming of the controller shall be capable of operating all pumps in an alternating arrangement. The pumps operated with VFDs shall be started and ran at a user defined speed for a defined timeframe to flush pump and lines. After timeframe, the speed of the pump shall be either increased or decreased according to the rising or lowering level of the wet well as measured by the pressure level transducer. The pump shall continue to operate until a "pump off" set point for each pump is reached.

If for some reason the primary pump controller is not properly controlling the pumps, or the level transducer has malfunctioned and the water level in the wet well rises to a high-water level float, the backup controller shall take over control of the pumps. When this happens, A "Backup Controller Active" alarm should issue. Once in this mode, the Owner will have to reset the system in order for it to go back to transducer mode.

The control panels shall have the following interface, lights, selector switches, etc. located on the interior door behind the deadfront door of the control panels:

Pump Power Panel

- Power On
- VFD HMI's

Pump Control Panel

- Pump Controller LED Display

- Pump ETM's
- Selector Switches - H-O-A for 3 Pumps
- Indicator Lights - Backup Control Active
  Pump Running
  Power Ok

- Push Buttons - E-stop
  Alarm Reset
  "Push to test" button shall be provided to test all lights

The panel manufacturer shall include all equipment, ethernet switches, connections, etc. to communicate with the SCADA Panel onsite. The panel supplier shall see all drawings and requirements for inputs/outputs to the SCADA system. At a minimum, the panel supplier shall provide the following signals/alarms to the SCADA system:

- Pump Running for each pump
- H-O-A in Hand for each pump
- H-O-A in Auto for each pump
- Seal/Temp Alarm for each pump
- Motor Overload for each pump
- Pump Failed to Run for each pump
- Back-Up Mode Active
- High Level Float
- Power Ok
- Wet Well Level
- Pump "ON" SCADA Override (from SCADA panel)

The panel manufacturer shall fully coordinate all equipment to ensure finished product is as designed and is installed and operating properly. The panel manufacturer shall provide a terminal block or other means of communication with panels, pumps, modem, etc. and shall fully coordinate with the Owner's SCADA system regarding communications.

The panel manufacturer shall provide a minimum of 2 spare relays and 1 spare timers to the Owner once the project is complete. The relays and timers shall match relays and timers used throughout the panel. Three spares of any and all fuses (if any) in the panel shall be provided.

The panel manufacturer and the pump controller manufacturer shall fully coordinate to ensure finished product is as designed and is installed and operating properly. As a group, the panel and controller manufacturers shall coordinate with the SCADA supplier regarding proper integration of all communications.

4.0 PRESSURE TRANSDUCER

The panel manufacturer shall provide a submersible pressure level transducer and all necessary accessories and appurtenances. The transducer shall be field mounted by the Contractor in the sewage pump station wet well as shown on the drawings. The Contractor

and/or panel manufacturer shall provide all weights, cables, etc. required for mounting transducer. Contractor shall properly coordinate. Final location and mounting details shall be shown on submittal drawings for equipment. Provide transducer suitable for the installed site conditions including, but not limited to, material compatibility, site altitude, process and ambient temperature, and humidity conditions. The transducer shall communicate with pump controller to control all pumps. Wet well level, alarm settings, and alarm conditions shall be displayed on the control panel screen. The Pressure Transducer shall be selected and supplied by the Panel Manufacturer and shall be Devar Inc. Submersible Pressure Transducer Series 2500 or approved equal. Provide as a complete system with cabling, brackets, etc. as required for a fully functional system. The panel manufacturer shall verify correct installation of transducer and shall calibrate instrument in the field as required at startup. Each instrument shall be tested before commissioning and the Owner/Engineer shall witness the response in the pump control panel.

5.0 FLOAT SWITCHES

The panel manufacturer shall provide all float switches for the pump controls, bypass pump controls, and SCADA signals. See the Contractor Drawings for float switches required. The Contractor and/or panel manufacturer shall provide all weights, cables, etc. required for mounting float switches. Contractor shall properly coordinate. The floats shall be constructed leak proof, shock proof, and impact resistant for harsh sewer environments for use with intrinsically safe relays as manufactured by Conery Inc., or equal.

6.0 TESTING

The panel manufacturer shall fully test all required controls, functionality, etc. of each of the pump power and pump control panels prior to delivery. The Owner shall have the option to attend a witness test for the control panel at the panel manufacturers shop. The panel manufacturer shall fully test and demonstrate all functionality of each panel during the test.

Once the pump control panels are installed, the panel manufacturer shall fully integrate the control panel into the system and ensure proper operation under all operational scenarios. Proper interaction with the equipment and SCADA system shall be fully tested and demonstrated. The panel manufacturer shall fully test and inspect the control panel, pump controller, relay logic, and completed installation and make all adjustments necessary to place the system in trouble-free operation.

Once the system has been thoroughly tested, the panel manufacturer representative that inspected and tested the installation shall instruct the operating personnel in the proper care and operation of the equipment. Coordinate with the Owner/Engineer.

7.0 GUARANTEE

At a minimum, all equipment shall be guaranteed against defects in material and workmanship for a period of one year from date of Owner's final inspection and acceptance to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner.