The PDF digital Contract Documents for this project consist of the Drawings and Specifications and are being released by the Engineer solely as a convenience to the Bidders. Actual hard copies of Contract Documents bearing a stamp and signature of a professional engineer shall be used for the purpose of providing a bid proposal for this project.

Users of these PDF digital Contract Documents assume all risks associated with any information contained within this digital set without any liability to the Owner and/or Engineer. It is the user's responsibility to verify the information contained within the PDF digital set of Contract Documents matches the information shown on the stamped hard copy Contract Documents. In all discrepancies or differences between the PDF digital set and the hard copy set, the hard copy set of Contract Documents shall prevail.

COOSA VALLEY WATER SUPPLY DISTRICT
SPECIFICATIONS - CONTRACTUAL DOCUMENTS
HIGH SERVICE PUMP ADDITION
(PUMP #3)

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

FEBRUARY 2025

COOSA VALLEY WATER SUPPLY DISTRICT
SPECIFICATIONS - CONTRACTUAL DOCUMENTS
HIGH SERVICE PUMP ADDITION
(PUMP #3)

TABLE OF CONTENTS

GENERAL

BID DOCUMENTS

CONTRACT DOCUMENTS

SPECIAL PROVISIONS

SPECIAL PROVISIONS (CONTINUED)

GENERAL SPECIFICATIONS

STANDARD SPECIFICATIONS EQUIPMENT AND MISCELLANEOUS

(Additional Items Specified on Contract Drawings)

STANDARD SPECIFICATIONS – ELECTRICAL

STANDARD SPECIFICATIONS – ELECTRICAL (CONTINUED)

*NOTE: The "All Equipment" Specification applies to ALL EQUIPMENT including but not limited to, Electrical, SCADA, and Control Equipment provided on this project.

GENERAL

ADVERTISEMENT FOR BIDS

Sealed proposals for the construction of **High Service Pump Addition (Pump #3)** will be received by Coosa Valley Water Supply District (Owner) at the Water Treatment Plant at 6262 AL-144, Ragland, AL 35131 until **10:00 a.m.,** the prevailing time, on **March 4, 2025,** or by mailing to 6262 AL-144, Ragland, AL 35131 at which time and place they will be publicly opened and read. The bid is comprised of the following principal items and approximate quantities:

New High Service Vertical Turbine Pump Assembly in Vacant Slot
Associated Discharge Piping and Valving
New VFD Pump Drive in New MCC Section
Associated Electrical Work

Plans and Specifications may be inspected at the Coosa Valley Water Supply District Water Treatment Plant 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 **$50.00**. Cost of plans and specifications are non-refundable.

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.

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 not be a Pre-Bid Conference for this Project.

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

By: Jimmy Bailey

Title: Chairman

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

BID DOCUMENTS

GENERAL INFORMATION FOR BIDDERS

BIDS will be received by the Coosa Valley Water Supply District (herein called the "OWNER"), at the Water Treatment Plant at 6262 AL-144, Ragland, AL 35131 until **10:00 a.m.**, the prevailing time, on **March 4, 2025,** and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to the Coosa Valley Water Supply District. Each sealed envelope containing a BID must be plainly marked on the outside as BID for **High Service Pump Addition (Pump #3)** 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 6262 AL-144, Ragland, AL 35131.

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 Pre-Bid conference for prospective BIDDERS will not be held. 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 **Coosa Valley Water Supply District** 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

High Service Pump Addition (Pump #3).

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.

COOSA VALLEY WATER SUPPLY DISTRICT
SPECIFICATIONS - CONTRACTUAL DOCUMENTS
HIGH SERVICE PUMP ADDITION
(PUMP #3)

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 _____

COOSA VALLEY WATER SUPPLY DISTRICT
SPECIFICATIONS - CONTRACTUAL DOCUMENTS
HIGH SERVICE PUMP ADDITION
(PUMP #3)

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.	Vertical Turbine Pump Assembly	**Base:**	Trillium- Floway USA; Goulds; Flowserve
a.	Substitute _____	**b.**	Deduct $_____
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 _____

By _____

Date _____

COOSA VALLEY WATER SUPPLY DISTRICT
SPECIFICATIONS - CONTRACTUAL DOCUMENTS
HIGH SERVICE PUMP ADDITION
(PUMP #3)

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 _____

Date _____

COOSA VALLEY WATER SUPPLY DISTRICT
SPECIFICATIONS - CONTRACTUAL DOCUMENTS
HIGH SERVICE PUMP ADDITION
(PUMP #3)

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.**

ITEM 1 – HIGH SERVICE PUMP INSTALLATION (PUMP #3)

The Contract Lump Sum Price shall be payment in full for all labor, materials, equipment, and incidentals required to furnish, install, and make fully operational the new high service pump assembly (Pump #3) and provide the required evaluation report and any necessary adjustments for the existing surge relief/anticipator valve assembly. This shall include but not be limited to: the pump assembly; the concrete pump pedestal; anchorage; pipe supports; painting; all associated valving and piping as shown in the Plans; coordination with plant personnel and operations; pump testing; and all other work required by or reasonably

inferred from the Plans and Specifications for a complete and operable pump installation. This item shall include any work that is not covered by another pay item.

ITEM 2 - ELECTRICAL

The Contract Lump Sum Price shall be payment in full for all labor, materials, equipment, appurtenances, and incidentals required to furnish, install, and make fully operational all electrical work required by or reasonably inferred from the Plans and Specifications for a complete and operable electrical installation.

ITEM 3 – ALLOWANCE FOR START-UP AND USE OF THE NEW HIGH SERVICE PUMP ASSEMBLY AND FINAL CLEAN-UP/RESTORATION

The Contract Lump Sum Allowance shall be paid for the furnishing the Owner a completed project with an operable and completed pump installation which has successfully passed all tests and demonstrations as specified, been approved by all authorities for use by the Owner as intended and is put in service. This item shall include all clean-up, final grading, grassing, fertilization, finish mowing, and all other activities required for full restoration of all disturbed areas. Temporary grassing for BMP or other purposes shall be included in Bid Item 1. Any Contractor costs above this allowance to complete the work shall be included in Bid Item 1. Partial payment will not be allowed for this item.

ALTERNATE DEDUCTS/ADDERS

ITEM 2A – DEDUCT/ADDER FOR PROVIDING SEPARATELY ENCLOSED NEMA 3R VFD PACKAGE (IN LIEU OF BASE BID MCC-MOUNTED VFD PACKAGE) FOR PUMP #3

The Contract Lump Sum Price shall represent a lump sum deduct (or adder) to the Lump Sum Bid Price for Bid Item 2 – Electrical. The lump sum price bid shall represent only the difference in costs between the alternate and the base bid. The Contractor shall clearly indicate whether his lump sum bid price for the alternate represents a deduct or an adder. The lump sum deduct (or adder) shall be in accordance with all requirements of the Electrical Drawings and Specifications and shall generally include, but not be limited to, the following primary items:

a. Providing a separately enclosed NEMA 3R VFD package (in lieu of a MCC-mounted VFD package) for Pump #3 including all associated electrical appurtenances that would differ from that which would be provided for the base bid MCC-mounted VFD package. Additional VFD manufacturers and enclosed drive suppliers/integrators (beyond those specified in the base bid arrangement) are allowed in this separately enclosed arrangement. See Specification for Variable Frequency Drives for the approved manufacturers/suppliers/integrators.

b. Feed power to the separately enclosed VFD via a feeder tap from the existing MCC-A main horizontal bus (in lieu of extending the horizontal bus) per the Electrical Drawings.

The Owner desires to have Pump #3 and its VFD installed and fully operational as soon as possible. The Bidding Contractor shall carefully consider the material/equipment lead times and differential costs (adder or deduct) for providing this alternate bid versus the base bid. The Basis of Award for this project considers costs, time, and contractor qualifications. See the Special Provisions for the "Basis of Award" and "Starting and Completion Time and Liquidating Damages".

BID

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

To the **Coosa Valley Water Supply District** (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the construction of **High Service Pump Addition (Pump #3)** 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	1	Lump Sum	High Service Pump Installation (Pump #3)	$_____	$_____
2	1	Lump Sum	Electrical	$_____	$_____
3	1	Lump Sum	Allowance for Start-up and Use of New High Service Pump (Pump #3) and Final Cleanup/Restoration	$ 10,000.00	$ 10,000.00

TOTAL OF BASE BID $ _____

ALTERNATE DEDUCTS/ADDERS TO BASE BID

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

2A	1	Lump Sum	Deduct/Adder for Providing Separately Enclosed NEMA 3R VFD Package (In Lieu of Base Bid MCC-Mounted VFD Package) for Pump #3	$_____	$_____

The alternate bid number above represents an: **ADDER—**or-- **DEDUCT** (circle one)

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 the Contractor issues the Purchase Order for that Item (lead time).

Vertical Turbine Pump Assembly _____ calendar days

Electrical Equipment _____ calendar days

Piping and 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

CONTRACT DOCUMENTS

NOTICE OF AWARD

To: _____

_____

_____

_____

PROJECT Description: **High Service Pump Addition (Pump #3)**

_____

The OWNER has considered the BID submitted by you on (Bid Date) 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____.

Coosa Valley Water Supply District

_____

By _____

Name Jimmy Bailey

Title Chairman

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged

By _____

this the _____day of _____, 20 _____.

By _____

Title _____

NOTICE TO PROCEED

To: _____ Date: _____

_____ Project: _____

_____ **High Service Pump Addition**

_____ **(Pump #3)**

_____ _____

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_____.

Coosa Valley Water Supply District

_____

By _____

Name Jimmy Bailey

Title Chairman

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO 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

Coosa Valley Water Supply District
(Name of Owner)

6262 AL-144, Ragland, Alabama 35131
(Address of Owner)

hereinafter called OWNER, in the penal sum of

_____ Dollars,

($ _____) 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:

High Service Pump Addition (Pump #3)

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

Coosa Valley Water Supply District
(Name of Owner)

6262 AL-144, Ragland, AL 35131
(Address of Owner)

hereinafter called OWNER, in the penal sum of

Dollars,

($) 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:

High Service Pump Addition (Pump #3)

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)

_____
(Principal) Secretary

By_____(s)

(SEAL)

_____
(Witness as to Principal)

_____
(Address)

_____
(Address)

_____
Surety

ATTEST:

_____
(Surety) Secretary

(SEAL)

_____
Witness as to Surety

By _____
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 Coosa Valley Water Supply District, hereinafter called "OWNER" and <CONTRACTOR> 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 _____ **High Service Pump Addition (Pump #3)**

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:

Coosa Valley Water Supply District

By _____

Name Jimmy Bailey

Title Chairman

(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 determined as follows:

The Owner desires to have Pump #3 installed and fully operational as soon as possible by an expected date of August 6, 2025, or before. Per the Special Provision for the Basis of Award, the Owner will consider costs, material/equipment lead times, and qualifications of the Contractor when awarding the project. The Completion Time will be determined as follows:

Longest single Material Lead Time stated by the Contractor on BD-15 + 60 calendar days = Completion Time (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 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. Award of the contract will be made on the basis of the lowest base bid with the Owner reserving the right to consider material availability for the project (see Section 4.0). Lowest bid shall be defined as the sum of the totals listed in the Bid Schedule under **Items of Work Base Bid** minus/plus requested and accepted **Alternate Deducts/Adders to Base Bid**. The Owner shall reserve the right to include or exclude any listed Alternate Deducts/Adders to Base Bid in calculating the low bid. The Owner will select the Alternate Deducts/Adders to Base Bid to be accepted based upon budget constraints, the deduct/adder amount offered and the general benefit to the plant. These deductive/additive alternates will be established by the Owner in the Bid Schedule and Basis of Payment sections of the Bid Documents. Any other suggested and/or proposed alternates by the Contractor/Bidder will not be considered in calculation of the low bid price.

In submitting the base and alternate prices in the Bid Schedule, the Contractor shall certify that these prices are based upon providing the base materials and equipment he has indicated in the **List of Material Suppliers and Equipment Manufacturers**. Substitute material suppliers and equipment manufacturers whether listed or provided by the Contractor shall have no basis in determining the low bid.

Once the Owner has determined the lowest responsible responsive bidder as set forth herein, and the Contract is awarded, the Owner will consider separately whether or not to accept any deductive substitutes listed or provided in the **List of Material Suppliers and Equipment Manufacturers** if the Owner determines it is in its best interest.

Bidder must possess all licenses and permits required by applicable law, rule, or regulation for the performance of the work prior to bidding.

2.0 AWARD OF CONTRACT

In order to be considered for the Award, the Bidder shall immediately present to the Owner, when required/notified by the Owner, 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 the work within the time specified.
C. He has within his organization, at the time, the construction management and experienced supervisory personnel available for assignment to the project. Also see Special Provisions for “Contractor Personnel”.
D. A list of references for successfully completed projects of similar size, magnitude, and cost.

E. A list of projects completed for the Owner. If it is determined that the bidding Contractor or his employees have performed or completed previous work for the Owner in an unsatisfactory or unprofessional manner, then the Contractor's bid will be rejected.

3.0 REDUCTION OF QUANTITIES

In the event the lowest bid (determined by the Owner as described in Section 1.0 above) 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 such as case, the Owner may require that a change order be executed simultaneously with the execution of the Contract. In the event a reduction in quantities is made, the time allowed for completion of the work shall be reduced proportionately. Regardless, the Owner may also reduce quantities as described in the Basis of Payment.

4.0 CONSIDERATION OF MATERIAL LEAD TIMES

Where indicated in the Bid Documents, the Contractor shall provide the specific number of calendar days required to deliver each specified material order to the jobsite, after the Contractor issues the Purchase Order for that Item (Lead Time). Time is of the essence, and the Owner may consider the lead times provided by each bidder in determining the award of the project. Material lead times may be utilized to award the project to another bidder, other than the lowest bidder(s), if it is determined to be in the best interest of the Owner.

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

_____ 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.

016586

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.

SPECIAL PROVISIONS
FOR
CONTRACTOR'S PERSONNEL

SECTION IX

Contractor shall submit, when required by the Owner, the resumes of the project manager and project superintendent who will be assigned to this job. Resumes should include recent references from jobs where the manager and superintendent performed in a similar capacity up to two resumes may be submitted for each position. The Owner reserves the right to condition the Award and Execution of the project on selected personnel being assigned to this project for the duration of the project.

Contractor shall also submit when required by the Owner, the resumes and qualifications of the electrical subcontractor. Electrical subcontractor personnel shall be experienced in the construction of water/wastewater facilities. Submission should include job references and resumes of project manager and superintendent who will be assigned to this project.

The Owner reserves the right to reject a subcontractor at the Owner's sole discretion and to condition the Award and Execution of the project on selected personnel being assigned to the project for the duration of the project.

SPECIAL PROVISIONS
FOR
PERFORMING WORK IN EXISTING FACILITIES

SECTION X

1.0 SAFETY

This project involves work in an existing water or wastewater (or "sewer") facility. Where the word "facility" is used in this specification, it shall be understood to refer to all lift stations, pumping stations, wet wells, pipes, vaults, valve pits, manholes, stormwater handling components, structures, basins, tanks, and treatment plants (both water and wastewater), etc. "Facility" shall include any and all components of a water or wastewater system. As such, there are many unavoidable risks associated with many aspects of the work. It is the responsibility solely of the Contractor to always identify all risks and to take all appropriate precautions. This section contains some very basic introductory information to remind the Contractor of some - but by no means all - of the many potential safety matters that must be understood, considered, and properly addressed by the Contractor. It is the duty of only the Contractor to recognize and identify all the dangers – including the many dangers not listed - that he may encounter in this project and to take all the actions necessary for proper safety.

Pumping Stations, Lift Stations, Water and Wastewater Treatment Plants, and all other facilities contain many dangers and many safety hazards. These include, **but are by no means limited to**, such dangers as confined spaces, deadly atmospheres with dangerously low oxygen levels, toxic and explosive gases, etc., potentially hazardous (poisonous) gases and chemicals stored and used onsite, sewage and sludge with pathogens (infectious disease hazards), non-potable water systems, electrical hazards, falling hazards, drowning hazards, unanticipated equipment starting, and trench dangers, among many others. Note that power in a panel, an enclosure, or at equipment, etc., may originate from multiple, different and independent sources. Therefore, turning off the main power supply for a panel likely will NOT kill all power in the panel. The Contractor shall have a thorough understanding of all the dangers and hazards associated, or possibly associated, with this type of work. This shall also include all additional potential dangers not listed herein. It shall be the responsibility solely of the Contractor to fully educate himself and all his personnel, subcontractors, and suppliers, etc., regarding all the potential hazards and dangers. The Contractor shall fully understand all the possible hazards and dangers and shall continuously follow all appropriate safety procedures at all times. The Contractor shall insure that all his personnel and all subcontractor personnel, suppliers, etc., follow all appropriate safety precautions at all times. Continuously and fully comply with all OSHA regulations and requirements, etc. and always follow good, effective safety practices.

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 all 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. 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.

In addition to panel, equipment, or similar type hazards, many additional electrical hazards can exist due to buried wiring and conduits, overhead wiring, exposed wiring, wiring concealed in walls, floors, or ceilings, etc. Overhead wiring and other wiring or conduits are often not shown on drawings and it is the responsibility solely of the Contractor to always take appropriate safety precautions and to carefully locate all wiring.

The Contractor shall understand that most hazardous atmospheres in water and wastewater systems or plants or other facilities, etc., cannot be detected by smell as most have no odor. The Contractor shall also note that the atmosphere in confined spaces and other areas is always subject to change – sometimes dramatically and quickly – due to a wide variety of causes. Atmospheres that were not dangerous when previously entered may suddenly become deadly for many different reasons.

The Contractor shall be alert for buried and exposed natural gas, LP gas, or propane gas lines, etc., and other facilities that may be potential hazards.

The Contractor shall be aware that all components of existing facilities are subject to deterioration and failures due to corrosion, aging, overuse, lack of maintenance, or many other reasons. The Contractor shall never assume that existing components of facilities will operate as originally intended when they were first installed. Ladders, handrails, access doors, grating, manhole steps, valves, flow control gates, electrical items, ventilation fans, exhaust fans, and many other components, etc., are always subject to failure. Existing alarm devices of all types should not be relied upon by the Contractor. The Contractor shall always provide his own equipment to allow safe working in existing facilities.

The Contractor shall be aware that this is an operating facility and that facility personnel must make their rounds through all areas and buildings in Plants or Lift Stations or other Facilities at any time during the day or night. Operators or maintenance personnel may have to access Facilities (including for emergency outages) at anytime, day or night. As such, the Contractor must carefully plan his activities and always provide adequate safety barriers and other measures as desirable, etc., to continuously protect Pumping Station, Lift Station, plant, and all other facilities personnel and visitors, as well as his own personnel.

The Contractor shall provide temporary facilities for safety, including but by no means limited to, guardrails, barriers, fencing, covers over openings, lighting, and signs, etc., as desirable for the protection of the facility visitors and personnel who must operate and maintain the facility throughout the course of construction. Additionally, the Contractor shall provide temporary walkways, steps, or pedestrian bridges or similar temporary facilities where access to existing structures or buildings, etc., are interrupted, or made inconvenient, or made potentially unsafe, etc., by the activities of the Contractor. The Contractor shall perform his work and maintain clean and clear passages in a manner to eliminate tripping hazards during construction to the greatest extent possible. The Contractor shall promptly remove all his equipment, materials, and supplies, etc., not immediately needed from areas where the

Owner's operation and maintenance personnel must periodically walk, inspect, check, observe, or maintain equipment, etc.

Pumping Stations, Lift Stations, Plants, and all other facilities have many hazards from which the general public must be protected. The Contractor shall always perform and coordinate all his work to maintain the facility security. This shall include, but not be limited to, continuously maintaining secure fencing around the entire site (or sites if there is more than one site) at all times. Temporary fencing that properly maintains facility security shall be provided at all times whenever the existing fence is removed or whenever the existing fence does not provide adequate security. The Contractor shall be responsible for locking and controlling access through gates and for taking other measures as applicable to maintain a secure site at all times, whether or not work is ongoing.

Safety is the responsibility solely of the Contractor. Neither the Owner nor the Engineer have any duty to review the safety practices of the Contractor.

Wet wells and valve pits, etc. are confined spaces. As with other wastewater and water treatment components and tanks, they should always be assumed to contain deadly atmospheres. The contents of such atmospheres at lift stations and in treatment plants can vary and can suddenly and unexpectedly become deadly due to a wide variety of reasons. Effective gas monitoring and effective ventilation, as well as other safety procedures, shall always be carefully utilized by the Contractor at all times. The Contractor shall always carefully and fully comply with all OSHA requirements.

Whenever the Contractor turns off power to existing equipment or new equipment, he shall always carefully verify that the correct breaker and disconnect switch has been correctly locked out. He shall always be alert for confusing or incorrect labels for breakers and equipment, etc. The Contractor shall be aware that electrical drawings and diagrams, etc., for existing wiring and equipment, etc., are often incorrect. Electrical drawings are often outdated due to changes that have been previously made both during construction and after the original facility was initially constructed. It shall be the responsibility of the Contractor to identify the actual circuits and wiring, etc., that must be turned off and/or disconnected, etc., so that the work can proceed safely.

The Contractor shall always utilize only project personnel who are completely knowledgeable about and fully understand all the risks and potential safety hazards to which they will or may be exposed. The Contractor shall not use personnel – and shall not allow any subcontractor, etc., to use personnel – who will not carefully follow appropriate safety precautions at all times.

The sole purpose of this section is to remind the Contractor of his duty to properly address the many dangers throughout the existing facilities. It is not the intent of the specifications, nor is it possible for the specifications, to list all the possible dangers that will be encountered or all the actions the Contractor is required to take to ensure that his work is always performed in a safe manner.

2.0 RESTRICTIONS ON INTERRUPTIONS

The improvements in this project will be constructed in an operating pumping station, lift station, and/or treatment plant or facility that must remain in operation throughout construction. Where the word "facility" is used throughout this specification, it shall be understood to refer to any component of a water or wastewater system. The Contractor shall carefully plan and conduct his work in a manner that minimizes the interruption of normal

facility operations. The following restrictions on the interruption of normal facility operations and other sequencing notes are made for the Contractor's benefit and to advise the Contractor of certain sequencing requirements for this project. All appropriate sequencing details, requirements, and limitations, etc., on interruptions of normal operations have not been listed. It is the responsibility of the Contractor to plan all work and conduct it in a manner such that the pumping station(s), lift station(s), plant, or other facilities can be maintained in operation, to prevent bypassing or permit violations, and to avoid damage to existing equipment and facilities.

The Contractor shall maintain access for the Owner to all existing facilities throughout construction. The Owner must have access to all facilities for operation and maintenance. Where it is necessary to cut roads, the Contractor shall schedule this with the Owner and Engineer and shall backfill the cuts as quickly as possible to allow the Owner access. If the Contractor interrupts a utility (e.g. power, phone, internet, water, natural gas, sewer, etc.) or a treatment process or pipeline, he shall restore service as quickly as possible.

Prior to beginning the work, the Contractor shall develop a detailed schedule for all work clearly indicating where interruptions to normal operation are required. However, the failure to include such work in the schedule or the duration of the work, nor any changes in the schedule, etc., shall not constitute a justification for an increase in construction time or an increase in cost.

The plans and specifications may contain some partial construction sequencing notes. These notes are provided for the Contractor's benefit to help him understand at bidding time that construction sequencing will be an important part of the project that must be considered during bidding and construction. These notes are not a detailed or complete sequence but rather a very general guideline. These notes shall be considered by the Contractor in preparing his detailed construction sequence and project schedule. It is the duty solely of the Contractor to understand water and wastewater facility operations and to fully consider all restrictions associated with this type of work in the interruptions of existing facilities. The Contractor shall bid and plan his work accordingly.

Tie-ins and interruptions of existing facilities (i.e. pumping stations, lift station(s), and/or plant(s), etc.) can be done only at certain times when (1) the flowrate into the facility is sufficiently low, (2) rainfall is not forecast to occur until well after the tie-in work has been fully completed, (3) the operator workload allows them, and (4) facility limitations, etc., allow them. For water plants and water systems, additional factors may include extent of dry weather and water customer demand, etc. Tie-ins or other interruptions of normal facility operations shall not be performed when the SCADA System is not capable of properly receiving and issuing all alarms. Carefully coordinate all such work with the Owner and make requests for interruptions through the Engineer in a timely manner. Carefully plan work to ensure it can be fully completed within the allowable period of interruption to be established by the Owner. The allowable schedule for performing the work addressed by this special provision and other interruptions shall depend on existing and anticipated facility flows, as well as other limitations. The work shall not be performed at a time that is not suitable to the Owner.

If bypass pumping is required or needed to perform the work, it shall be designed by and provided by the Contractor. The bypass pump(s) must be capable of handling the highest peak flow that may be expected or was experienced in the past. In addition to the bypass pump (or pumps) required to handle the highest peak flow, a stand-by bypass pump shall be provided. The standby pump capacity shall be at least equal to or greater than the

largest duty bypass pump. The stand-by pump shall be piped and controlled so that it will start functioning automatically and immediately if one of the duty pumps fails or if a high level is reached. The standby pump control system shall be independent of the duty pumps so that a failure of the duty pump controls will not prevent operation of the standby pump. The Contractor shall have a qualified person carefully monitor the bypass pumping continuously (24-hours per day, including weekends and holidays) whenever it is in operation. All bypass pumps shall be in high quality acoustic enclosures that will prevent complaints from neighbors. All bypass pumps (including the standby pump) shall be new, or in like-new condition, and shall be highly dependable. All bypass pumps shall be fully tested before delivery to the jobsite. Once installed, all pumps, their controls, and the bypass piping shall be fully and completely tested to ensure proper functionality before taking any existing components out of service. Install floats or other controls such that entanglement (which could prevent proper functionality), etc., is prevented. The entire bypass pumping system must be highly reliable. The Contractor shall be solely responsible for any failure of his bypass pumping system. No additional payment will be made for bypass pumping unless additional payment is clearly established by the Basis of Payment and specifically approved by the Owner prior to the pumping.

Where a facility utilizes UV disinfection, chlorination, and/or dechlorination, such treatment must be provided continuously. The Contactor shall not take UV, chlorination, or dechlorination facilities offline until all new disinfection facilities have been fully tested, are in reliable operation, are capable of fully complying with all permits regulatory requirements, and the SCADA system is sufficiently complete that it will send a remote alarm in the event of a problem or failure.

Some tie-ins and interruptions at water and wastewater facilities are best performed during and may be restricted to early morning hours (e.g. from 12 a.m. to 5 a.m.) during dry weather. Where appropriate to facilitate tie-ins, the Contractor shall perform as much work as possible in preparation for making the actual tie-in. This shall include work such as: thorough coordination with the Owner and Engineer; having all required materials on-site and ready; preassembly of fittings, piping, etc. to the greatest extent possible; verifying satisfactory operation and dependability of all equipment to be used for completing the tie-in; having back-up equipment and materials on-site and ready for immediate operation in case original equipment malfunctions or fails or if additional material is needed; etc.

The Contractor shall carefully plan all interruptions and ensure that all material and equipment are onsite prior to initiating an interruption. The Contractor shall have backup (spare) equipment onsite and completely ready to be immediately used to ensure the work can proceed expeditiously if the primary equipment fails. For each requested interruption in normal operations, the Contractor shall provide the Owner and Engineer a detailed, step-by-step, written description of (1) how he plans to make the tie-in or other work activity, (2) the equipment, materials, and personnel that he will have on hand, and (3) his schedule for fully completing all the work required. This description shall be submitted for Owner consideration a minimum of seven days before requested interruption.

Note that when structures and pipelines, etc., are isolated for the purposes of making tie-ins, etc., the Contractor shall expect that existing valves and gates will be difficult to operate and will leak. It shall be the Contractor's responsibility to handle these leakages. The Contractor is responsible for handling any sludge, sewage, grit, and material, etc, remaining in the piping or force mains, tanks, or other structures after they are drained to the extent possible.

Once an interruption is initiated, the Contractor shall work expeditiously to complete the work as soon as possible and return the facility to normal service. The Contractor shall not divert resources away from completing the work until the work has been completed and the facility returned to normal operation. Generally, an interruption shall not extend beyond normal business hours of the same day it was initiated. If it is necessary for the interruption to extend beyond the end of the day, the Contractor shall work continuously if requested by the Owner to return the facility to normal operations. Interruptions shall not be initiated on Fridays. Interruptions shall not extend into a weekend or holiday.

The Contractor shall email to the Engineer and Owner a list with Contractor cell phone numbers or other emergency numbers to allow the Contractor's personnel to be contacted should an emergency develop during an interruption or after an interruption has been completed. This phone list shall also include the Contractor's electrical subcontractor, systems integrator, SCADA personnel, and any other appropriate personnel who may be able to provide assistance in an emergency. Additionally, a copy of this list shall be posted in the facility's main office.

The Contractor shall be responsible for any and all damages and costs due to his activities including but by no means limited to flooding, overflows, bypassing, and fines, etc.

3.0 ELECTRICAL, CONTROL, AND SCADA CONSIDERATIONS

This is an operating facility. Where the work requires the modification, abandonment, or removal of existing electrical facilities, the existing facilities must remain in operation until such time as the Contract states that they may be removed. Unless stated otherwise, existing facilities must remain in normal operation until the new replacement facilities have been completed, started up, proven to be ready for reliable operation, and approved for permanent service. Any and all work involving the existing electrical system, control system, or SCADA system, etc., must be carefully coordinated by the Contractor with the Owner through the Engineer. Existing electrical, control, or SCADA circuits may be de-energized or removed from service only with the approval of the Owner. Where shutdowns may be allowed, the allowable duration of such shutdowns may be extremely brief. The timing for performing such work, as well as the allowable duration of the interruption, will be limited by factors such as recent rainfall, predicted rainfall, plant operations, plant limitations, or other situations. The Contractor shall develop a detailed step-by-step written plan of his proposed activities during any requested interruption. The written plan shall be furnished to the Engineer for review. Whenever the Contractor is working on a circuit that must be de-energized, he shall insure that all possible power sources are locked out with his own padlocks. Note that power in a panel, an enclosure, or at equipment, etc., may originate from multiple, different, and independent sources. The Contractor shall also tag all lockout locations with appropriate warning information. The Contractor shall also give written notice to the Owner (with a copy to the Engineer) regarding the work and the need to keep the power locked off until it is safe to re-energize.

When modifications to the existing SCADA system are required, the Contractor shall carefully plan all work and shall work promptly to ensure the SCADA system can be completed, fully tested, and returned to normal service as soon as practical. This work shall be coordinated in advance with the Owner. A detailed work plan and schedule shall be furnished to the Owner for his review of this work. The plan and schedule shall be modified if, in the Owner's opinion, such modifications are needed to provide the level of protection the

Owner deems appropriate for facility operations. All possible preparatory work shall be performed prior to any necessary interruptions such that all interruptions can be reduced to the shortest possible duration. This shall include, but by no means be limited to, such tasks as pre-assembly of components, programming, testing, etc.

If a SCADA system (or Telemetry System or remote alarm system) is interrupted or modified during the project, it shall be returned to service the same day so that the Owner's personnel can receive alarms at all times including after normal work hours. The capability to receive alarms is especially important during construction projects and during startup as those are periods when there is a greater potential for a failure or other problem to occur. The Contractor shall take special care not to interrupt alarms and to verify that all alarms, including new alarms, are properly functional during construction. Carefully and promptly verify by field testing the continued performance of any alarm that has been modified or may have been unintentionally modified or disabled by the Contractor's activities.

The General Electrical Notes and/or other notes in the drawings or specifications may contain further restrictions and information. However, neither the plan notes nor the specifications describe all the issues the Contractor will face in performing the electrical, control, instrumentation, and SCADA work.

4.0 SEQUENCING

As is typical when performing work in an existing facility that must remain in operation and in full compliance with its permit, some work in this project must be performed in a specific sequence to allow this.

Many connections and tie-ins to existing facilities or piping cannot be initiated until certain other work has been completed. These restrictions are not necessarily called out on the drawings or in this Special Provisions. In some cases, the connections and tie-ins cannot be performed until associated tanks or other facilities have been drained or modified. The Owner's approval must be obtained before such work can be performed. The Contractor shall be responsible for draining the tanks and associated piping, but only after receiving the Owner's clearly stated approval and the Owner's conditions associated with the approval.

This Special Provision and other sections of the plans or specifications contain only some examples of scheduling and sequencing considerations that will affect the project. These are listed for the convenience of the Contractor. There are many other considerations not listed but inherent when working in an existing wastewater or water facility. It is the responsibility of the Contractor to develop his own detailed schedule considering all the restrictions involved in performing the work.

The plans or other specifications may have some abbreviated sequencing notes regarding certain work items that must be performed in a particular sequence. These notes may give only general sequencing considerations that shall be considered the minimum. The Contractor shall determine the full scope of the sequencing considerations for these items and present a step-by-step plan to the Engineer for comment.

In addition to the work where abbreviated sequencing notes are contained in the plans, there are other work items where sequencing is required but no sequencing considerations are stated. The Contractor shall be responsible for determining those work items and shall determine the full scope of the sequencing considerations and present a step-by-step plan to the Engineer for comment. It is the responsibility solely of the Contractor to determine and comply with all necessary sequencing considerations. The Contractor shall have and

utilize project personnel with sufficient experience on similar projects in other pump stations, plants, and facilities and that have a high level of understanding of the type of work items where sequencing and/or plant interruption minimization are necessary. Note that the electrical work will also have to be carefully coordinated with the other work to fully comply with sequencing requirements.

5.0 OVERALL PROJECT SCHEDULE

The Contractor shall develop a schedule for his work that allows it to proceed in an orderly and logical manner. The schedule shall consider all requirements contained in the Contract as well as other restrictions inherent in performing the work in a facility that must remain in operation.

The Contractor shall carefully excavate to determine the location, depth, materials, orientation, and nature of existing piping, conduit, and other buried facilities in a timely manner to allow him to plan his work and order the appropriate materials. The Contractor shall perform this exploratory work early in the project before proceeding with other work, before making piping submittals, and before ordering materials that may be affected. This exploratory excavation shall be done wherever called for on the drawings, at all underground tie-ins, at all potential conflicts with new facilities, and wherever else desirable to avoid problems. The Contractor shall record the actual location and elevation of the piping and shall promptly provide field sketches to the Engineer showing this information. Field measurements are required where appropriate and should be completed in a timely manner. No extra time shall be given for changes necessitated by actual pipe locations, conflicts, type pipe, and fittings, etc.

To facilitate scheduling and final testing, piping, equipment, and structures shall be tested to the extent practical prior to formal testing.

6.0 EXPLORATORY EXCAVATION AND CONFLICTS

As is typical when performing work in an existing facility, there will inevitably be conflicts between the existing facilities (including but by no means limited to structures, piping, electrical components, underground conflicts, and above ground conflicts, etc.) and the proposed work. The Contractor shall carefully investigate, plan, and schedule his work to minimize the potential for all possible impacts of conflicts. These plans do not show all the details necessary to avoid or address such conflicts. It shall be the responsibility solely of the Contractor to perform timely investigations of and explorations into all proposed work to learn of all conflicts and properly address them in a timely manner and in a method that is acceptable to the Owner.

7.0 MISCELLANEOUS

The existing conduit and electrical line locations and depths are not known and generally are not shown. In some cases, the assumed routing of wiring, conduits, or duct banks entering or leaving the pull boxes may be shown. The Contractor shall conduct his work carefully and coordinate with the facility staff. However, the staff does not know the exact location or depth of these lines. The Contractor shall carefully coordinate his excavation

activity in the vicinity of suspected or possible electrical facilities with the facility superintendent.

Much information is based on drawings prepared for the previous construction of the facilities. Much of this information has not been and/or cannot be verified.

This project requires work in and connections to an existing, operating facility. As such, the Contractor should anticipate the problems associated with such work, including but not limited to, coordination of all work with the Owner (through the engineer) including making tie-ins, electrical tie-ins and modifications, and all other interruptions during suitable periods, thoroughly planning work activities to minimize interruptions of normal operations, maintaining plant safety at all times for the plant operations and maintenance staff, and leaking gates and valves, etc. Some activities may be best performed during the early morning hours of dry weather. The Owner shall have the authority to make the final decision as to whether or not tie-ins and interruptions can be allowed at the time requested by the Contractor.

The Contractor shall be fully responsible for all fines and costs, etc., due to bypassing or inadequate treatment, or permit violations, etc., that are due to the Contractor's operations.

The above considerations do not include all the issues, sequencing, limitations, conflicts, or restrictions, etc., that the Contractor will face in performing the work and making modification and tie-ins (mechanical and electrical, etc.) required by the Contract. The Contractor shall expect and plan for such issues as they are inherent in making modifications in existing water and wastewater facilities. There shall be no extra time or payment for any such issues encountered in the performance of the work.

The Contractor shall remain fully and solely responsible for all safety associated with all interruptions, sequencing, conflicts, and all other work.

The Contractor should anticipate that wet wells, tanks, structures, basins, channels, and piping, etc., will contain debris, grit, and sludge, etc. It shall be the Contractor’s responsibility to remove and properly dispose of such material to the extent necessary to properly perform the work required by the project. The material shall not be disposed of at a facility of the Owner. Where required by the Contract or necessary to perform, all such material shall be removed and the location cleaned from which it was removed. Comply with all environmental regulations in the disposal of all removed materials.

Coordinate and cooperate with other Contractors, subcontractors, manufacturers, suppliers, and vendors, etc., who may be working on the same project or at the same location(s).

All equipment and processes shall be tested to the maximum extent practical prior to placing them into service. It is the responsibility of the Contractor to test all facilities in compliance with the Contract.

All equipment shall be operated trouble-free a minimum of 7 -10 consecutive days prior to being placed into service unless indicated otherwise. Where allowed, pump disinfected plant effluent water or clean stream water to test units. Clean any remaining debris, etc. Unless explicitly stated otherwise, the Contractor shall purchase any potable water used for testing and cleaning, etc. The Contractor shall be solely responsible for providing all pump(s), piping, fuel, and labor, etc. necessary for such testing. To facilitate scheduling and final testing, piping, equipment, and structures shall be tested to the extent practical prior to formal testing.

No demolition shall be performed until the replacement process and all associated piping and controls and alarms, etc., that are necessary for proper operation, etc.,

have passed testing, been started up, and been approved to be placed into service. The Contractor must request in writing the Owner's approval to demolish structures on a case-by-case basis. Approval of the Owner must be obtained on a case-by-case basis before demolition can be performed. The Contractor shall carefully plan demolition. The Contractor shall take all proper safety precautions when demolishing any item particularly any that contains, or any that may have previously contained, any potentially explosive or flammable or hazardous materials, etc.

Where demolition will include, or potentially may include any wiring or any electrical items, the Contractor shall first verify that all possible sources of power have been definitely identified, locked off, and tagged out. The Contractor shall be aware that drawings of existing facilities may not show, or may not accurately show, all electrical wiring, components, circuits, or power sources, etc. Circuits may be mislabeled or may have been changed from available drawings.

New facilities must operate trouble-free in the intended mode of normal operation for a minimum of seven consecutive days unless indicated otherwise before they may be placed into service. New facilities must be approved by the Owner to be placed into operation before they may be placed into service. See other requirements elsewhere.

If the Owner determines it is in his best interest, he may allow new facilities to be placed in operation due to extenuating circumstances. However, if this occurs, it shall not be an indication of any of the following: (1) that the facilities are complete, (2) the facilities have met the requirements of the "Start-up and Use of …" payment item, (3) the facilities have been accepted, or (4) the facilities meet all Contract requirements. It shall not be an indication that the warranty for the facilities has started. The Owner shall not be obligated to make full payment on such facilities but may withhold a sufficient amount to fully pay all costs (including any remediation costs to correct non-complying work) associated with bringing the project into full compliance with the Contract.

Due to the need to schedule the work such that some new facilities will be in operation while others are still under construction, it will be necessary for the Contractor to clearly communicate to the Owner and Engineer regarding his plans and the status of equipment that he has installed. These communications shall be clearly stated in writing which will help the personnel (including evening shift and weekend shift as applicable) at the Facility to receive the instructions. The Contractor shall lock out with his own padlocks any equipment that he does not intend for the Owner to operate. The Contractor shall take other means as appropriate to prevent accidental damage to equipment due to the sequencing associated with the project.

Due to the work being performed in an existing Facility that must be staffed, operated, and maintained, the Contractor shall take appropriate actions to prevent all operating and maintenance personnel (including, but not limited to, all shifts other than the normal day shift, as applicable) from being injured due to the Contractor's activities. It shall be the duty solely of the Contractor to determine these actions and to provide any and all temporary barriers, walks, lighting, closures at openings, warning signs, and whatever other measures may be desirable to protect the operators.

The Plans and Specifications do not list all scheduling or sequencing considerations. These shall be developed by the Contractor as he plans his work with the understanding of the necessity to keep certain lines, processes, equipment, and tanks on line until new processes are tested and ready to be placed into operation.

Some interruptions of Facility operation or tie-ins, etc., may require bypass pumping and the associated temporary piping. The Contractor shall bid and plan his work accordingly. It may also be necessary to pump flow or tank contents from one tank to another to allow certain work to be performed. Multiple such transfers may be needed. The plans and specifications do not necessarily call out all the various bypass operations that will be needed to properly perform the work. The Contractor shall provide bypass pumping wherever needed to properly perform his work.

All costs associated with performing all the work in this existing plant while maintaining existing plant operations shall be included in the price bid. There shall be no extra payment or extra time due to the necessary sequencing and procedures necessary to properly perform the work while allowing the existing plant to remain in operation. There shall be no extra payment or extra time due to the Contractor's failure to properly plan all required work activities and material acquisition.

See the plans and specifications for other information that will affect scheduling and sequencing. See the "All Equipment" specification for additional information regarding start-up and training. The "All Equipment" specification applies to all equipment provided on the project.

While some restrictions regarding scheduling and sequencing are listed, and some requirements for exploratory excavation, etc., are contained in this Special Provision, this by no means relieves the Contractor of his responsibility for the means and methods of construction or for safety.

The above considerations do not include all the issues, sequencing, limitations, or restrictions, etc., that the Contractor will face in performing the work and making tie-ins (mechanical and electrical, etc.) required by the Contract. The Contractor shall expect and plan for such issues as they are often inherent in making modifications in existing water and wastewater facilities. There shall be no extra time or payment for such issues encountered in the performance of the work.

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.

STANDARD SPECIFICATIONS EQUIPMENT & MISCELLANEOUS

SPECIFICATION
FOR
ALL EQUIPMENT

SECTION 1-1

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 ensure 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
VERTICAL TURBINE PUMP

SECTION 1-2

PART 1 - GENERAL

1. SCOPE

1.1 This section covers the furnishing of a vertical turbine pumping unit for a potable water application as required and to the expectations of the ENGINEER regarding the manufacture of the equipment. The vertical turbine pump will be operated using a variable frequency drive (VFD).

1.2 The Vertical Turbine Pump specified in this section shall be furnished by and be the product of one manufacturer. All components of the pumping unit must be supplied by and warranted by the pump OEM (original equipment manufacturer) including bowls, impellers, column, shafting, discharge head, couplings, seals, suction barrel (if applicable) and motors. A letter from the pump OEM must be provided as part of the submittal confirming that they accept responsibility for the warranty of the entire pumping unit. Equipment furnished under this section shall be fabricated and assembled in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by ENGINEER.

1.3 Except as modified or supplemented herein, all vertical turbine pumps shall conform to the most recent edition of ANSI/AWWA E103 and Hydraulic Institute Standards.

2. SUBMITTALS

2.1 Submittals shall be in accordance with the Project's General Specifications. Complete fabrication and assembly drawings together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Project's General Specifications. The pump manufacturer shall also show the number of service trips and days per service trip included for the project in the submittal (also see section "Field Quality Control" under Part 3 - Execution). The data and specifications for each pumping unit shall include, but not be limited to, the following:

- Name of manufacturer
- Type and model

- Design rotative speed
- Motor Horsepower and complete motor nameplate data, as defined by NEMA
- Number of stages
- Type of bowl bearings.
- Type of line shaft bearings
- Size of shafting
- Size of pump column
- Size of discharge outlet
- OD of pump bowls
- Details and dimensions of suction bell basket strainer
- Weights of each component of the pump assembly
- Data on shop painting (shop painting shall be compatible with the Project's Painting Specifications
- Materials of Construction of all components
- Detailed dimensions of all components of the pump assembly
- Max overall dimensions
- Total weight of the entire pump assembly
- Complete performance curves showing capacity versus head, NPSH required, overall efficiency, and BHP plotted scales consistent with performance requirements. These same type performance curves with the same information shall also be provided for reduced speeds (i.e., 55 HZ, 50 HZ, 45 HZ, 40 HZ, 35 Hz, 30 HZ). Also, provide minimum submergence required at guaranteed point and recommended range of operation on the pump curves.
- Max downthrust and upthrust (if applicable). Upthrust is to be minimized.
- Due to the pump operating on a VFD, perform and submit Reed Critical Frequency calculations showing that the design of the head has been engineered to push any critical 20 percent above or below the specified operating range.

- Electrical power and control wiring diagrams showing connection locations and types.
- Special shipping, handling, protection, and storage instructions
- Manufacturer's printed installation instructions

2.2 Adequate operation and maintenance information shall be supplied. Operation and maintenance manuals shall be submitted in accordance with the submittals sections and be in accordance with the Project's General Specifications. The operation and maintenance manuals shall be in addition to any instruction or parts lists packed with or attached to the equipment when delivered. Operation and maintenance manuals shall include the following as a minimum:

- Equipment function, normal operating characteristics, and limiting conditions.
- Assembly, installation, alignment, adjustment, and checking instructions.
- Operating instructions for startup, routine, and normal operation, regulation and control, shutdown, and emergency conditions.
- Lubrication and maintenance instructions.
- Guide to troubleshooting.
- Parts lists, recommended spare parts, and predicted life of parts subject to wear.
- Outline, cross-section, and assembly drawings; engineering data; and wiring diagrams.
- Test data and performance curves, where applicable.

3. QUALITY ASSURANCE

3.1. The pump manufacturer shall be certified to the ISO 9001 standard for design and manufacture of vertical turbine pumps.

3.2. All fabricated components of the pump must be fabricated by the pump OEM in a facility located in the USA. Outsourcing to 3rd party fabricators not owned by the pump OEM is strictly prohibited. All pressure containing fabrications shall be welded only by welders who are qualified to ASME code section 9. Welder certification shall be provided as part of the submittal package.

4. WARRANTY

4.1 The manufacturer shall warrant their pumps to be free of defects in material and workmanship for a period of two (2) years after the product is first put into operation.

5. DELIVERY, STORAGE, AND HANDLING

5.1 The pumps shall be adequately supported during transit, off-loading, handling, and storage to ensure the pumping unit is not subjected to undue stresses.

5.2 Spare parts shall be furnished as specified. Spare parts shall be suitably packaged with labels indicating the contents of each package. Spare parts shall be delivered to OWNER as directed.

5.3 Final documentation shall be delivered on flash drive, readable using Acrobat, MS Office, and Solidworks (or AutoCad).

5.4 The Contractor shall protect the equipment from all construction traffic and activities and shall prevent damage to the equipment.

5.5 The Contractor shall store the equipment in a protected location either at the project site or a secure location approved by the Engineer.

5.6 The Contractor shall store and maintain the equipment in accordance with the manufacturer's instructions and recommendations including providing all lubrication, periodic shaft rotation, temporary power for motor winding anti-condensation heaters, etc.

5.7 If the equipment is stored off site, the Contractor shall allow the Engineer access to the equipment to observe the condition and to check for conformance with the Contract Documents.

PART 2 - PRODUCTS

6. MANFACTURERS

6.1 Trillium Pumps/Floway USA, Goulds, or Flowserve

7. PERFORMANCE AND DESIGN REQUIREMENTS

7.1 Pumping units shall be designed for the performance and design requirements as required, at maximum speed unless otherwise noted.

7.2 The pump curve shall be continuously rising and shall be free from dips & valleys from the design point to the shutoff head. The shutoff head shall be at least 115% of the head that occurs at the design point.

7.3 For design and rating purposes, the water to be pumped shall be assumed to have a temperature of 70°F.

7.4 Pump performance shall be stable and free from damaging cavitation, vibration, and noise within the operating head range. The performance of each pump with an enclosed impeller shall be based on a radial running clearance between the bowl wearing ring and the impeller of not less than 6 mils, or 0.5 mil per inch of wearing ring diameter, whichever is greater.

7.5 The pumping application required for this project demands equipment that will operate reliably for many years. Un-scheduled downtime is unacceptable to the client, and it is the objective of this specification to deliver the highest quality equipment that is fit for the purpose.

7.6 The complete pumping unit shall conform to the vibration requirements set forth in the latest edition of Hydraulic Institute Standards. The completed installation of pump and driver shall be smooth-running and vibration free.

8. SERVICE CONDITIONS

Service	High Service Potable Water
Quantity	1
Design Flow (GPM)	2100
Design TDH (FT)	420 ft
Max NPSHR at design point	22’
Minimum Bowl Efficiency at Design Flow/TDH	82%
Minimum number of stages	6
Maximum Speed at Design (RPM)	1770
Minimum Shutoff TDH (FT)	715.5 ft
Maximum Flow (GPM)	2800
TDH at Maximum Flow (FT)	220 ft
Motor HP	300
Minimum Column Diameter (inches)	10”
Discharge Diameter (inches)	10”
Minimum Line Shaft Diameter (inches)	1.69”

9. PUMP CONSTRUCTION

9.1 NSF61 CERTIFICATION

9.1.1 The complete pump assembly shall be certified to NSF/ANSI standard 61. This certification shall cover all wetted components of the pump, including but not limited to the bowl assembly, column assembly, discharge head assembly & suction barrel. Manufacturers without NSF61 certification will not be considered. Written documentation demonstrating full compliance to NSF61 shall be provided as part of the submittal package. The pump discharge head shall be fitted with a separate nameplate displaying the NSF61 logo. No exceptions.

9.2 BOWL ASSEMBLY

9.2.1 The pump bowls shall be constructed of the material as listed under the subsection "Materials of Construction". The bowl interior and all water passages on shall be durably enameled to reduce friction losses. The waterways and diffusion vanes shall be smooth and free from nodules, bumps & dips and shall be cast of high quality free of blow holes, sand holes and other detrimental defects. The bowls shall be accurately machined and fitted with a suction bell with integral cast ribs supporting the suction bearing. The bearings shall be sleeve type of the material listed in the subsection "Materials of Construction" and are to be lubricated by the product being pumped. The bearings are to be located above and below each impeller. The suction bearing shall be permanently packed with food grade grease and shall have a length not less than 2 times the shaft diameter. The bowls shall be flanged with machined rabbet fit connections. Bowl bolting material shall be as listed in the subsection "Materials of Construction."

9.2.2 The suction bell shall be fitted with the manufacturer's basket strainer for preventing foreign objects from entering the pump and for preventing vortices. The strainer shall be secured to the suction bell by bolting. Strainer and bolting material shall be as listed in the subsection "Materials of Construction".

9.2.3 The bowls shall have AS568 sized styrene butadiene rubber (SBR) "O" rings fitted to custom machined grooves. There shall be zero leakage between flanged joints.

9.2.4 Fit all bowls & impellers with renewable wear rings. The wear rings shall be constructed of material as outlined in the subsection "Materials of Construction." The bowl & impeller wear ring faced shall have a

minimum Brinnell hardness difference of 50BHN. Wear ring clearances shall not exceed 0.002 – inch clearance per inch of diameter.

9.2.5 The impellers shall be cast in one piece of the enclosed type and constructed of the material listed in the subsection "Materials of Construction". The impellers shall be statically and dynamically balanced. The impeller shall be securely fastened to the shaft with taper split bushings (collets) of the material listed in the subsection "Materials of Construction." The impeller shafting shall conform to the material listed in the subsection "Materials of Construction." Impellers shall be adjusted vertically by external means and shall have sufficient axial clearance for reliable service in accordance with the specified operating conditions.

9.3 COLUMN ASSEMBLY

9.3.1 The outer column pipe shall be of ASTM A53 Gr. B steel pipe in interchangeable sections not over 5' in length. The top and bottom sections of column pipe for product lubricated pumps shall not exceed 5'. The ends of each section shall be faced parallel and machined with 8 straight threads per inch permitting the ends to butt and insuring alignment when connected by standard mill steel couplings. The weight of the column pipe shall be no less than that stated in ANSI/AWWA Specification E103, Section 5.1 "Standard Specifications for Discharge Column Pipe". The column size shall be such that friction loss will not exceed 5' per 100', based on the design capacity of the pump or as listed under the subsection "service conditions".

9.3.2 The column line shaft shall be turned and ground and manufactured of the material listed in the subsection "Materials of Construction". They shall be furnished in interchangeable sections not over 10 feet in length. The butting faces shall be machined square to the axis of the shaft with maximum permissible misalignment of the thread axis with the shaft axis 0.002" in 6". The size of the shaft shall be no less than that determined by ANSI/AWWA-E101 Specifications, Section 5.5 and shall be such that elongation due to hydraulic thrust will not exceed the axial clearance of the impellers in the pump bowls. Maximum run out shall not exceed 0.005" in 10 feet. The line shaft shall be of adequate size for transmitting the full HP rating of the motor that is installed. The line shaft bearings shall be sleeve type provided of the material listed in the subsection "Materials of Construction." Line shaft bearing spacing shall be such that shaft first critical frequency shall be safely above or below the operating frequency.

9.3.3 The top shaft section shall be designed to facilitate the removal of the motor and shall be of adequate size for transmitting the full HP rating of the motor that is installed. Undersized shafting shall be basis for rejection of the pump.

9.3.4 Threaded shaft couplings are to be supplied for shafts less than 2-3/4" diameter and shall be sized per ANSI/AWWA E101 section A-4.1.4. They shall utilize left-hand threads to tighten during operation.

9.3.5 Bearing retainers shall be of the drop-in type, held in place by compression of the butted ends of the column pipe. The bearing retainers are to be on the material listed in the subsection "Materials of Construction."

9.4 DISCHARGE HEAD

9.4.1 The discharge head shall be fabricated of carbon steel materials using ASTM A181 flanges, ASTM A53 Grade B body pipe and ASTM A36 steel plate. All wetted pressure retaining parts shall be designed for a maximum working pressure equal to the pump shut off head. The discharge flange shall have a 300# or 150# (as required by the shut-off head conditions) ANSI raised face with bolt holes straddling the vertical centerline. The discharge nozzle shall provide smooth flow transition from the head cavity and shall incorporate vertical vane for minimizing turbulence. A ¼" NPT pressure gauge connection shall be supplied on the top centerline of the discharge outlet. The top of the discharge head shall be machined to accept a standard NEMA P base, driver and have a diameter equal to the driver base diameter (BD). The discharge head shall have provisions for the mounting and securing of a vertical hollowshaft motor. The motor mounting flange shall be machined for a perfect fit and angular misalignment shall not be allowed. The headshaft shall be coupled to the top lineshaft beneath the motor to facilitate ease of assembly and maintenance. All couplings and other moving or rotating parts shall be covered on all sides by an OSHA approved coupling guard. Coupling guards shall be fabricated from 16 USS gage or thicker galvanized or aluminum-clad steel or from 1/2 inch mesh expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. The pump shall be furnished with a stainless-steel nameplate securely mounted to the discharge head. At a minimum, it shall contain information providing (design flow, design TDH, HP, RPM, bowl model number, number of stages, manufacturer serial number, pump type & impeller setting dimension).

9.4.2 A threaded coupling constructed of the same material as the top line shaft shall be provided to couple the motor shaft to the pump shaft. Impeller adjustment shall be provided by means of a bronze adjusting nut located on top of the motor and constructed of ASTM B16 alloy C36000. After adjustment, the nut shall be positively locked in position to the motor clutch.

9.4.3 The high-pressure packing box shall be rated for 400PSI discharge pressure and shall be fitted with a high-pressure bypass line (integral to the pump assembly). A minimum of six (6) rings of metallic babbitt foil lubricated with special oil and graphite and two (2) lantern rings (all components to be NSF 61 approved). Throttle bearing shall be of bismuth tin bronze (UNS C89835). The packing gland shall be of stainless-steel ASTM A743 GR CF –8M with stainless steel studs and with brass or stainless steel adjusting nuts. Sealing between the stuffing box and the discharge head shall be accomplished by means of an "O" ring. Packing box is to be secured in place with a minimum of eight cap screws. The packing box shall utilize a split type packing gland to allow ease of packing removal & installation.

9.4.4 The pump shall be mounted and supported by a separate steel base plate (sole plate). The soleplate shall be 30" square (minimum) x 1.25" thick (minimum) and shall be drilled to match the base flange drilling of the discharge head. Abutting surfaces between the soleplate and the discharge head shall be machined to a perfectly flat surface providing 100% surface contact with the discharge head base. The center opening diameter shall be of sufficient size to permit installation and removal of the complete pump assembly. The soleplate shall be permanently anchored into a concrete pump pad, grouted, and leveled within 0.003 inches per foot by the installing contractor. Anchor bolts shall be 316 stainless steel and shall be selected and provided by the pump manufacturer. The concrete pad/pedestal shall be doweled into the concrete floor slab by the installing contractor. See concrete pad/pedestal detail and other requirements in the Contract Drawings.

9.4.5 Lifting lugs shall be integrally cast on the discharge head and shall be capable of supporting the entire weight of the pump. A 1-inch NPT drain connection, ½ inch NPT pre-lube connection (with removeable cap/plug), and a ¼ inch NPT gauge connection shall be provided. The drain connection shall drain back to the sump.

9.5 FACTORY TESTING

9.5.1 The discharge head shall be non-witness factory pressure tested in accordance with the Hydraulic Institute Standards to 150% of maximum shut off pressure or to 200 psi or whichever is greater. Test pressure shall be maintained for a minimum five-minute duration.

9.5.2 The pump shall be performance tested prior to shipment to confirm the pump performance. Test shall include, but not be limited to, checking the unit at its rated speed, capacity, head, efficiency, and bake horsepower at such conditions of head and capacity so as to properly establish the actual performance curve. Certified copies of the test reports shall be submitted for review prior to shipment. The Standards of the Hydraulic Institute (test standard ANSI/HI 14.6 Acceptance Grade 1U) shall govern the procedures and calculations for the prescribed testing.

9.6 FACTORY COATING

9.6.1 The bowl assembly OD, column ID & OD, discharge head ID & OD shall be factory painted with a NSF 61 approved two-part epoxy coating, such as Carboguard 891 or equal by Tnemec and shall be compatible with the Tnemec coatings included in the Project's Painting Specification. The coating shall be applied in two coats of 4-6 mils DFT, with a final dry film thickness no less than 10-12 mils. Prior to coating, all surfaces shall receive a commercial blast meeting SSPC-SP10 and shall be primed.

Final field coating shall be per the Project's Painting Specification and in accordance with the pump manufacturer's recommendations for a long-lasting, durable, coating system.

9.7 ELECTRIC MOTOR

9.7.1 Motor Characteristics

HP	300
Shaft Type	Hollow Shaft
RPM	1770
Voltage	460V, 3 ph
Enclosure	TEFC
Efficiency Rating	NEMA "High" standard for Premium Eff.
Non-Reverse Ratchet	Yes
Service Factor	1.15

Inverter Duty Rated	Yes
VFD Operated	Yes
Oversized Motor Tap Box	Yes
Motor Insulation	Class H with Class B temperature rise

9.7.2 Motor shall have thrust bearing(s) capable of carrying the dead weight of all rotating parts of the pump plus the hydraulic thrust (up-thrust and down-thrust) incurred during operation.

9.7.3 The motor shall be furnished with a protective cap. All bearings shall be oil or grease lubricated, with proper provisions made to guard against the escape of the lubricant

9.7.4 Bi-metallic thermostats shall be provided in the windings of each phase to afford protection of the motor against excessive operating temperature. Thermostats shall be normally closed, suitable for operation on 120 VAC, with leads from the same routed to an accessory conduit box for connection separate from the power wiring.

9.7.5 Motor shall be provided with 120 VAC anti-condensation heaters to prevent corrosion.

9.7.6 Motors for use with VFDs shall be provided with shaft grounding rings and insulated bearings.

9.8 SPECIAL TOOLS AND ACCESSORIES

9.8.1 Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments and accessories, required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

9.9 SPARE PARTS

9.9.1 Provide one complete set of bearings, gaskets, o-rings, packing, and lubricants (NSF 61 approved).

9.10 MATERIALS OF CONSTRUCTION

Component	Material
Pump Bowls	Cast Iron (ASTM A48 c130 - Enamel Lined)
Impellers	316 Stainless Steel - (ASTM A743-89 Gr. CF-8M)
Bowl Assembly Shaft	416 SS - (ASTM A582-88a Type 416)

Bowl Bearings	Marine (bronze backed rubber)
Collets	316 SS - (ASTM A276-90a Type 316)
Bowl Bolting	304 SS – (ASTM F593 Gr CW1)
Bowl Wear Rings	Bronze - (ASTM B148-89a Alloy 954)
Impeller Wear Rings	Bronze - (ASTM B505-91 Alloy 952)
Strainer/Vortex Suppressor	316 Stainless Steel, bolting = 304 S.S.
Column Pipe	ASTM A53 Gr. B steel pipe
Column Pipe Thickness	Standard (not less than schedule 30)
Column Bolting	304SS Bolts (ASTM F593-Gr.CW1), Nuts (ASTM F594-Gr.CW1)
Line Shaft	416 SS – (ASTM A582-88a)
Line Shaft Couplings	416 SS – (ASTM A582-88a)
Line Shaft Sleeves	304 Stainless Steel (ASTM A269)
Line Shaft Bearings	Styrene Butadiene Rubber (SBR)
Bearing Retainers	Ductile Iron – (ASTM A536-84 Gr 60-40-18)
Discharge Head	Fabricated Steel - (A36-Gr 70 plt, A105 flg, A53-Gr B pipe)
Sole Plate	Fabricated Steel (A36-Gr 70 plt)
Name Plate	Aluminum
Anchor Bolts	N/A

PART 3 - EXECUTION

10. FIELD QUALITY CONTROL

10.1 The pump manufacturer shall provide all direction and instruction as necessary to the installing Contractor to ensure the pump assembly is installed plumb and square and is in full accordance with the pump manufacturer's instructions and recommendations. Special instructions shall be provided as required for proper adjustment and lubrication of the packing box.

10.2 An experienced, competent, authorized representative of the manufacturer shall visit the site of the Work and Inspect, check, adjust if necessary, and approve the equipment installation including specific details such as proper operation of the

anti-condensation heaters in the motor, proper lubrication, proper adjustment of the packing box and its lubrication, etc. The representative shall be present when the equipment is placed in operation and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Engineer.

10.3 Field/functional testing shall be performed by the Contractor with the assistance of the manufacturer's representative and in close coordination with the Owner's plant personnel to ensure proper mechanical operation at the jobsite and no interference with plant operations. All testing data to be used for evaluation shall be provided in advance by the pump manufacturer based on factory testing.

10.4 The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; and has been operated under full load conditions and that it operated satisfactorily.

STANDARD SPECIFICATION
FOR
CONCRETE

SECTION 1-3

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 effects 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
PAINTING

SECTION 1-4

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 the 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.
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

Item	*Prime Coat*	*Finish Coat(s)*
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)
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

ELECTRICAL

JRA PROJECT NO. 224213
Coosa Valley Water Supply District
Proposed High Service Pump No. 3
Saint Clair County, Alabama
CLIENT JOB NO. -
BASED ON CLIENT TEMPLATE: "Municipal Consultants.docx"
PRINTED ON: February 19, 2025

ELECTRICAL SPECIFICATION INDEX:

2/13/2025

SECTION 26 05 00 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General Conditions:
   1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this section.

B. General Requirements:
   1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.
   2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as “Code”), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.
   3. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
   4. The Owner shall be provided access to all software to include copies of software for all systems provided under this division of the specifications. Software shall be password protected where applicable.
   5. Only qualified electrical sub-contractors will be allowed to submit proposals for this project. In order to be considered qualified, contractor shall have completed a minimum of five (5) projects of similar type/scope and equal or greater magnitude and complexity within the last ten (10) years. Sub-contractors without qualifications will be rejected. If desired, potential electrical sub-contractors may submit qualification evidence for review and pre-bid approval a minimum of ten (10) days prior to bid. Previous projects used to meet this experience requirement must have included similar (or greater) scopes of work for each of the following areas:
      a. Power Systems.
      b. Control Systems.
      c. Instrumentation Systems.
   6. Electrical contracting firm shall be licensed as an electrical contractor in the state where work will be performed

1.2 GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)

A. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.

B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the

project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the Engineer. Contractor shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the owner in the presence of the prime consultant prior to start of any electrical demolition.

C. Furnish and install complete power distribution system as shown on drawings and/or specified herein.

D. Furnish and install complete variable frequency drives and associated devices for motors as shown on drawings and/or specified herein.

E. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.

F. Install and connect electrical equipment mentioned in Division 26/27/28 Specifications or noted in drawings, whether furnished by electrical contractor or by others.
   1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.
   2. Where shown or specified, Contractor shall receive, unpack, check and assume custody of equipment furnished by Others. Contractor shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until Owner acceptance of project.

G. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.

H. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.

I. Furnish and install complete controls, instrumentation & auxiliary systems as shown on drawings and/or specified herein.

J. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.

K. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.

L. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.

M. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

PART 2 - PRODUCTS

2.1 APPROVED MATERIALS AND DEVICES

A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of Engineer before installation. All like items and associated equipment/systems shall be of one manufacturer.

B. To ensure proper coordination, it is intended that all electrical equipment and materials specified in Division 26/27/28 of these specifications and shown on the electrical drawings be furnished and installed by the electrical sub-contractor. It will not be permissible for any of these items to be furnished directly by the general contractor without the electrical contractor's coordination.

2.2 SUBMITTALS

A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the contractor intends to meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.

B. Submit to Engineer ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.

C. Submit to Engineer promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of Contract. Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:
   1. SECTION 26 24 19: MOTOR CONTROL CENTERS
   2. SECTION 26 29 23: VARIABLE FREQUENCY DRIVES
   3. SECTION 26 50 00: LIGHTING MATERIALS AND METHODS
   4. ALL ELECTRICAL AND TELECOMMUNICATION EQUIPMENT LAYOUTS - Submittals shall include ¼" = 1'-0" CAD drawings (hand drawn sketches will not be accepted) of each electrical room, IT room, electrical equipment stand, generator area, or any other similar area with electrical equipment. Drawings shall indicate all panelboards, transformers, switchboards, generators, equipment racks, control panels, HVAC equipment, etc. that are located in each electrical/IT area. Layouts shall show that each piece of electrical equipment has the clearances, working space and dedicated equipment space required by applicable codes. No conduits to equipment within these areas shall be installed until submittals have been provided and returned without exception by the design team.
   5. ALL CONTROL ITEMS & SYSTEMS

D. The contractor shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to Engineer. The failure of the contractor to properly review and correct shop drawings prior to

submittal will result in rejection of shop drawings by the engineer. Review by the Engineer will be for general conformance with contract documents. The contractor shall be fully responsible for correctness of all submitted dimensions, details, quantities and locations.

E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by Engineer without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if directed.

F. Any required resubmittal will be reviewed by the Engineer for conformance with previously issued comments only. The contractor shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.

G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the Engineer. All material proposed for substitution is subject to the approval of the Engineer and his authority for approval is final. No material proposed for substitution will be considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.

H. Samples of material shall be furnished where required by drawings or Division 26/27/28 Specification, or as requested by the Engineer on items proposed as substitutes.

I. Submit to Engineer a certificate of final inspection from local inspection department.

PART 3 - EXECUTION

3.1 SITE VISIT

A. The Contractor shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves Contractor of his responsibility under Contract.

3.2 CLEARANCE WITH UTILITIES

A. It shall be the responsibility of this Contractor, prior to bid, to reaffirm with the utility companies involved, that the locations, arrangement (and with power company voltage, phase, and metering required) and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the Contract price shall include any additional cost necessary to meet those requirements without extra cost to Owner after a contract is entered into.

B. On many projects the utility company may levy charges due to locations, size or type service involved. The Contractor shall be responsible for these charges (including permanent meter deposit), unless such charges are not available prior to bid and

Contractor so documents as described below. The meter deposit will be refunded to the contractor at time of Owner's acceptance.

C. Should above cost not be available, prior to bid, Contractor must submit a letter signed by a responsible utility company person so stating with his bid and in turn must be submitted by Prime Contractor with his bid to Owner. The cost will then be deleted from the Contract and become responsibility of the Owner.

D. Arrange with utility companies for such services as shown or herein specified and installation of meter where shown. Furnish with shop drawings a signed document from utility companies describing the location and type of services to be furnished and any requirements they may have. This document shall be signed for each utility company by a person responsible for granting such service.

3.3 WORKMANSHIP

A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.

B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.

C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.

D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.

E. Keep site clean of accumulation of cartons, trash and debris.

3.4 SAFETY

A. The contractor is solely responsible for all job safety. Engineer assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably ensure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

3.5 CONTRACT DOCUMENTS

A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.

B. Contract documents consist only of the hardcopy documents issued by the Prime Engineer. Electronic documents issued directly by the electrical engineer to the contractor and/or its sub-contractors/vendors are issued for convenience only (electronic documents are not formal contract documents).

C. If the contractor and/or one of its suppliers require a one-time transfer of electronic files of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:
   1. Sign a waiver prepared by the electrical engineer prior to the transmittal of these files.
   2. Agree to pay the electrical engineer a fee of $50.00 per drawing, up to a maximum of $400 per transfer, payable upon receipt of the files.
   3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.

D. Take finish dimensions at job in preference to scaled dimensions.

E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Engineer.

3.6 UNDERGROUND UTILITY/EQUIPMENT COORDINATION

A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify Engineer immediately if any conflict is found.

3.7 EQUIPMENT STORAGE

A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. Contractor shall be responsible for replacing or repairing improperly-stored equipment as directed by Engineer.

3.8 EXCAVATION, CUTTING AND PATCHING

A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After Engineer's observation, complete all excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of Engineer before cutting into any structural members.

B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

3.9 PENETRATIONS

A. All penetrations in water tight barriers shall be made so that barrier rating is not compromised. Furnish roof flashing for all equipment installed under Division 26/27/28 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet metal section. Supply these flashings for installation under roofing and sheet metal section.

B. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly to maintain the fire/smoke rating of the associated membrane.

C. Where penetrations are required through structural elements, verify penetration locations and sizes with structural engineer. In no case shall the structural integrity be compromised without written approval from structural engineer.

3.10 INSTALLATION OF EQUIPMENT - GENERAL

A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.

B. Items shall be securely anchored and/or fastened. Provide proper support for all equipment, devices, conduits, boxes, panels, etc. as required by code and for a workmanlike installation. Provide guy wiring for wood poles where required to prevent leaning. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.

C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted stainless steel disconnect switches shall be mounted to stainless steel unistrut frames.

D. All electrical equipment, furnished by Contractor or by others shall be covered and protected during construction.

E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.

F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

3.11 MOTORS, STARTERS AND CONTROLS

A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.

B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.

C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit by the electrician.

3.12 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.

B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by contractor into larger, single homerun conduits unless specific permission is granted by the Engineer.

3.13 LUG/TERMINAL RATINGS

A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the contractor.

B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

3.14 EQUIPMENT FAULT CURRENT RATINGS

A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

3.15 OUTLET LOCATION

A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the Contractor's responsibility to coordinate with other trades to ensure correct installation.

3.16 IDENTIFICATION

A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.

B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.

C. See Specification Section 26 05 53 for additional requirements.

3.17 GROUNDING

A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

3.18 PAINTING

A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact color paint as original finish.

3.19 ACCEPTANCE TESTING

A. Upon completion of work, the entire electrical system installed within this project shall be tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the Engineer. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.

B. The electrical sub-contractor shall include in bid price start-up assistance and training from a certified representative of the manufacturer for the following systems:
   1. SECTION 26 29 23: VARIABLE FREQUENCY DRIVES

3.20 OPERATION AND MAINTENANCE DATA

A. One set of marked “AS BUILT” drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to owner. These items shall be bound in hard back book. Contractor shall explain and demonstrate all systems to Owner’s representative.

3.21 GUARANTY-WARRANTY

A. Furnish a written Guarantee-Warranty, countersigned and guaranteed by General Contractor, stating:
   1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.
   2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION 26 05 00

SECTION 26 05 19 – POWER CONDUCTORS AND CABLES 51V-600V

PART 1 - GENERAL

1.1 DESCRIPTION

A. Power Wires and Cables

B. Low Voltage Wires and Cables

PART 2 - PRODUCTS

2.1 POWER WIRES AND CABLES - 600 VOLT

A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.

B. General Application (see below for exceptions):
   1. At or Below Grade (including within slab-on-grade):
      a. #8 or larger conductors:
         1) XHHW or RHH/RHW/USE stranded (in conduit).
      b. #10 or smaller conductors for circuits terminating at motors:
         1) THHN/THWN or XHHW stranded (in conduit).
      c. #10 or smaller conductors (excluding circuits terminating at motors):
         1) THHN/THWN or XHHW solid (in conduit).
   2. Above Grade:
      a. #8 or larger conductors:
         1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
      b. #10 or smaller conductors for circuits terminating at motors:
         1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
      c. #10 or smaller conductors (excluding circuits terminating at motors):
         1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).
   3. Power Wire and cable shall be as manufactured by Southwire, Rome, Encore Wire, American Insulated Wire, Okonite, Phelps-Dodge, Amercable, Aetna or approved equal.

C. VFD Cabling
   1. Wiring/Cabling installed between each VFD (Variable Frequency Drive) and the associated motor shall be multi-conductor shielded VFD power cable with the following characteristics:
      a. Multi-conductor cable with three (3) power conductors and three (3) ground conductors
      b. Soft annealed flexible stranded copper conductors.
      c. 1kV cross-linked polyolefin insulation (to resist the potential reflected voltages experienced in 600VAC VFD applications).
      d. Metallic shielded providing 100% shield coverage
      e. Oil, abrasion, chemical & sunlight resistant thermosetting compound outer jacket.

f. Flexible TC-ER rated, UL listed for use in cable trays.
g. Equal to AmerCable #37-108VFD cable.

D. Class 1 Control Cabling (120VAC Control Circuits, Etc.)
1. Unless specified otherwise, Class 1 control cabling shall:
a. Be rated for exposed cable tray installation.
b. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
c. Be UL-rated for the proposed application.
d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
e. Utilize copper conductors.
f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.
i. Be rated for 600V.
j. Be industrial grade.
k. Have stranded conductors.
l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.

E. Fixture Wiring
1. Conductor Types:
a. Type TFFN or XFF.
2. Minimum Sizes:
a. For fixtures up to 300 watts: #16.
b. For fixtures over 300 watts up to 1500 watts: #14.
c. For fixtures over 1500 watts: as required.
d. Conductors to concrete pour fixtures: #12.
3. Fixture wire shall extend only from fixture to first junction, and not over 6 feet, except for concrete pour units.

2.2 WIRE CONNECTIONS:

A. All connector types:
1. Shall be properly rated for the proposed application by UL and per the manufacturer.

B. At Motor Connections (within motor terminal boxes):

1. On Unshielded Wire:
    a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.
    b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or Ilsco.
2. On Shielded Power Wire:
    a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.
3. Cabling within motor terminal boxes shall be trained such as to prevent any splice/termination/connection kits from contacting inside edge(s) of the motor terminal boxes (to prevent chaffing of the insulation/splice/wiring which could lead to faults). Contractor shall carefully coordinate all required motor terminal box sizes to ensure proper capacity for all required conductors/splices.

C. Other Dry locations:
1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.
2. On Wire #10 and smaller: shall be made with one of the following:
    a. Ideal Wing Nuts or equal by 3M .
    b. Ideal Push-In Wire Connectors (for #12 and smaller only).

D. Other Wet/Damp locations:
1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by Ilsco, Burndy or T&B.
2. On Wire #10 and smaller: shall be made with one of the following:
    a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. All wires and cables shall be installed in conduit unless specifically noted otherwise.

B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.

C. No splices shall be pulled into conduit.

D. No conductor shall be pulled until conduit is cleaned of all foreign matter.

E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.

F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.

G. Network cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

H. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See above for general termination hardware requirements.

3.2 POWER WIRE AND CABLE INSTALLATION:

A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.

B. Multi-wire lighting branches shall be used as indicated.

C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).

D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).

E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.

F. In installing overhead main power services, a minimum of 5’-0” of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

3.3 WIRE CONNECTIONS

A. See Part 2 above for material types.

B. Aluminum Wire Connections:
   1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).

C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.

D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.

E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.

F. Under no condition shall the specified conductors be connected to terminals rated less than 75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

3.4 SHIELDED CABLE INSTALLATION

A. Shielded VFD (power) cables:
   1. The braided shields and internal grounding conductors of shielded VFD (power) cables shall be grounded at BOTH ends (at VFD and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.
   2. Contractor shall coordinate the necessary size of conduit with the outer diameter of the proposed cable type to verify that the raceway loading does not exceed NEC requirements prior to rough-in of the conduit system.

B. Shielded instrumentation (low voltage) cables:
   1. The outer foil of shielded instrumentation cables shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.

3.5 LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE INSTALLATION:

A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
   1. Cabling shall be plenum-rated, multi-conductor.
   2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
   3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.
   4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings

shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

3.6 CIRCUITS AND BRANCH CIRCUITS

A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

3.7 LABELING AND COLOR CODING OF WIRE AND CABLE

A. Refer to Specification Section 26 05 53 for all labeling requirements.

B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI-LEG)	ORANGE
C	BLUE	BLUE	YELLOW
NEUTRAL	WHITE	WHITE	GRAY
GROUND	GREEN	GREEN	GREEN

C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER
NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

D. Control Conductors: Shall be color coded by use of colored “tracers”. No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

3.8 TESTING

A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.)

shall be tested at the load side of the feeder breaker with a 1000-volt DC Megger Tester prior to energization or final termination. Any feeder conductor with an insulation resistance less than the recommended minimums in the latest version of NETA Acceptance Testing Specification ("ATS") standard shall be replaced by the contractor at the contractor's expense. All final test results shall be clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING

PART 1 - GENERAL

1.1 GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:
   1. Service Equipment.
   2. Transformers.
   3. Non-current carrying conductive surfaces of equipment.
   4. Metal Buildings.
   5. Structures.
   6. Other Equipment.

1.2 GENERAL REQUIREMENTS

A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to ensure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.

B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall ensure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.

B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be “jumpered” by an appropriate bonding conductor.

C. Supplemental grounding system conductors shall be bare, softdrawn, stranded, single conductor copper wire, and generally sized as follows (unless shown otherwise on plans):
   1. Switchgear, motor control centers, and power transformer #4/0 minimum or as shown on plans.
   2. Power panels, #2/0.
   3. Control panels and consoles, #4.
   4. Process Motors, #1/0.
   5. Building Columns, #4/0.
   6. Light Poles, #2.
   7. Telephone Backboard & Cabinet ground busses, #2.

2.2 GROUNDING ELECTRODES

A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, Contractor shall provide sectional rods, connectors, drive heads, etc.

2.3 CONNECTIONS

A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.

B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).

C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.

D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.

E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

2.4 MANUFACTURERS

A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.

B. Lugs shall be as manufactured by Square “D”, Burndy, or T and B.

C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.

D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.

E. Split post grounding shall be as manufactured by Burndy or T and B.

PART 3 - EXECUTION

3.1 MAIN SERVICE GROUND

A. The main service grounding electrode system shall consist of the following items bonded together by the grounding electrode conductor:
   1. The main underground cold water pipe (metal).
   2. The metal frame of the building.
   3. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a

minimum of ten (10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.

B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

3.2 TRANSFORMER GROUNDS

A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-30.

3.3 EXPOSED NON-CURRENT-CARRYING METAL PARTS

A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all power conduits and properly terminated at each end.

B. Ground conductors shall be routed as straight as possible. Where possible, ground conductors shall be routed such as to avoid bends exceeding 90 degrees or with a radius of less than 8”.

C. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground. Connections from the supplemental grounding system (when specified) shall be made directly to the motor frame. Additionally, utilization equipment connected to the motor (pump, fan, mixer, etc.) shall be bonded to the motor with flexible braid-type bonding strap to ensure equalization of ground potentials.

D. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible “jumpers” shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections or rigid conduit

connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel, such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.

E. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub need not be otherwise bonded.

F. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the contractor as directed by equipment suppliers.

G. Both ends of ground busses in motor control centers, switchboards, etc., shall be separately connected to the main ground buss to form two separate paths to ground.

H. Fences and Grills: Fences and metal grills around equipment carrying voltage above 500 volts between phases shall be bonded together and to ground. Fences and grill work shall be grounded at every post, column, or support, and on each side of every gate.

3.4 ACCEPTANCE DOCUMENTATION AND TESTING

A. Contractor shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by Engineer.

B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.

C. Contractor shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 (“Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System”). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the Engineer prior to the final observation, and shall be included in final O&M documentation.

END OF SECTION 26 05 26

SECTION 26 05 33 – RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:
   1. Conduits
   2. Conduit Fittings
   3. Couplings & Connectors
   4. Bushings
   5. Raceway Hardware, Conduit Clamps & Supports
   6. Watertight Entrance Seal Devices

PART 2 - PRODUCTS

2.1 CONDUITS

A. PVC-Coated Rigid Steel:
   1. The PVC coated rigid metal conduit must be UL Listed. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
   2. The PVC-coated rigid metal conduit shall be ETL PVC-001 listed.
   3. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
   4. Form 8 Condulets®, 3/4" through 2" diameters, shall have a tongue-in-groove “V-Seal" gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
   5. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
   6. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
   7. Form 8 Condulets® shall be supplied with plastic encapsulated stainless steel cover screws.
   8. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.
   9. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30deg.F (-1deg.C).
   10. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.
   11. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.

12. Independent certified test results shall be available to confirm coating adhesion per ETL PVC-001 standards under the following conditions:
    a. Conduit immersed in boiling water with a minimum mean time to adhesion failure of 200 hours. ASTM D870)
    b. Conduit and condulet exposure to 150deg F (65deg C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D11513.
    c. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).
    d. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
    e. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1.
    f. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.
13. Water tight flex connectors used in areas where PVC coated metal conduit is utilized shall be PVC coated also.
14. Shall be as manufactured by Perma-Cote, Plastibond, Korkap, Ocal or Okote.

B. Rigid Galvanized Steel and I.M.C.:
    1. Shall be galvanized outside and inside by hot dipping.
    2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

C. Rigid Aluminum:
    1. Shall be manufactured of 6063 Alloy, T-1 temper.
    2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

D. Schedule 40 and 80 PVC:
    1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.
    2. The conduit manufacturer shall have had a minimum of 5 years experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.

E. HDPE Innerduct
    1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.
    2. Shall be corrugated unless noted otherwise.
    3. Shall be manufactured by Carlon, Ipex or equal.

F. Liquidtight Flexible Metallic Conduit:
    1. Shall be galvanized steel-core sealtite, code approved for grounding.
    2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.
    3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

2.2 FITTINGS, COUPLINGS & CONNECTORS

A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Raco, Efcor, or Appleton or equal.

B. All fittings, conduit bodies, couplings and connectors (**including, but not limited to, condulettes, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.**) used in areas where PVC-Coated Rigid conduit is used shall also be PVC-coated.

C. All fittings, conduit bodies, couplings and connectors (**including, but not limited to, condulettes, conduit couplings, connectors, hubs, nipples, unions, expansion fittings, explosion proof seal-offs, threaded hole closures, and seal-tight connectors, etc.**) installed in other wet, exterior or process areas where PVC-coated conduit systems are not required, shall be aluminum or stainless steel type. Standard steel fittings will not be acceptable.

D. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.

E. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.

F. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.

G. Liquidtight Flexible Metallic Conduit connectors shall be liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit. Fittings shall be as manufactured by Efcor, Raco, Midwest or equal.

H. All LB unilets sizes 1 ¼" or larger shall have rollers.

I. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

2.3 BUSHINGS

A. All non-grounding rigid bushings 1-1/4" and larger shall be the insulating type (O-Z/Gedney type "BB" or equal by T&B, Midwest Electric or Penn Union).

B. All non-grounding rigid bushings 1" and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit bushings shall be O-Z/Gedney type "B" or equal by T&B, Midwest Electric or Penn Union.

C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type "BLG" or equal by T&B, Midwest Electric or Penn Union.

2.4 HARDWARE, CONDUIT CLAMPS AND SUPPORTS

A. All hardware such as expansion shields, machine screws, toggle bolts, "U" or "J" bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).

B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.

C. Supports in exterior, process, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.

D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated steel unless specifically noted otherwise.

E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

2.5 WATERTIGHT ENTRANCE SEAL DEVICES

A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).

B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Minimum Diameter: 3/4-inch.

B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:
   1. Exterior, Exposed: Rigid Aluminum unless otherwise noted.
   2. Exterior, Used for Instrumentation Circuits: See Below.
   3. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-encasement or direct earth burial. See "transition" items below for additional requirements. Conduits shall be left exposed until after Engineer's observation.

4. Raceways used for Instrumentation Circuits:
    a. Typical Dry or Wet Locations: Rigid Aluminum .
    b. Underground or Locations Embedded inside Poured Concrete: PVC-Coated Rigid Steel.
    c. Extremely Corrosive Locations (Chlorine Storage Rooms, Fluoride Storage Rooms and other similar areas): PVC-Coated Rigid Steel.
5. Terminations at motors, transformers and other equipment which has moving or vibrating parts:
    a. Liquidtight Flexible Metallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.
6. Terminations at instruments:
    a. Liquidtight Flexible Metallic Conduit (shall generally not exceed 12 inches in length) with watertight fittings.
7. Transition from underground or concrete-encased to exposed:
    a. Convert PVC to PVC-Coated Rigid Steel utilizing PVC-Coated Rigid Steel 90 degree bends (and vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6” above floor level, and shall be installed at uniform heights.

3.2 RACEWAY INSTALLATION

A. General:
1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.
2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.
3. Where any run of rigid aluminum conduit (including bends) exceeds 50’ in length, an approved conduit expansion fitting shall be installed (beginning at center of run) at intervals not to exceed 50’ on center.
4. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.
5. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.
6. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.
7. All PVC joints shall be made as follows:
    a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.
    b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.
    c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.
8. All metallic conduit installed below grade or within concrete shall be coated with two (2) spiral-wrapped layers of 3M Scotchrap 50 PVC tape or two coats of asphaltum paint prior to installation.
9. Install ground wire sized per N.E.C. Table 250.122 in all conduits.

10. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.
11. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings.
12. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.) or urethane paint (for PVC-Coated Rigid Steel) as recommended by conduit manufacturer .
13. Installation of PVC coated conduit systems shall be performed in strict accordance with the manufacturer's installation instructions. Damage to PVC coated conduit coating shall be touched up with patching compound as directed by manufacturer. To assure correct installation, the installer shall be certified by the manufacturer to install coated conduit.

B. Routing/Locating:
1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.
2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.
3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.
4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.
5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3" from the covering of the pipe crossed.
6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.
7. No conduit for instrumentation shall be run closer than 12 inches to parallel power conduits.
8. A minimum of 12" of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).
9. Where any portion of raceway is installed in a wet environment (such as below grade) and located at a higher elevation than the raceway termination point in a dry environment, install watertight compound inside raceway at termination around cabling to prevent transfer of water through conduit system. Watertight compound shall be rated for the potential water head pressure, based on the assumption that ground water level would be at grade level.

C. Bends:

1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.
2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
3. All bends in raceways containing multi-conductor power cables (such as shielded VFD cables) shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
4. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance
5. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:
1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be subject to Engineer's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.
2. Rigid Aluminum Conduits shall be supported at intervals not to exceed 5' on center.
3. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.
4. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.
5. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.
6. Raceways installed on top of flat roofing shall be supported a minimum of 3 ½" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

E. Terminations:
1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight (Meyers) hubs.
2. In wet, exterior or process areas, conduits shall NOT enter tops of enclosures. All conduits shall enter enclosures from bottom, left or right sides of the enclosure (utilizing rain-tight Meyers hubs as indicated above).
3. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.
4. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.
5. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.
6. Contractor shall be responsible for coordinating required conduit sizes with equipment hubs/conduit entry provisions (such as at motor tap boxes) prior to

installation of conduit systems. Contractor shall field adjust final conduit sizes at terminations where so required (only as allowed by code) from those indicated on plans to coordinate with equipment hubs/conduit entry provisions.

7. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.
8. Conduit ends shall be carefully plugged during construction.
9. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

F. Penetrations:
   1. All penetrations shall be at right angles unless shown otherwise.
   2. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the structural engineer.
   3. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.
   4. All raceways entering structures, or where water is otherwise capable of entering equipment/devices through the raceway system, shall be sealed (at the first box or outlet) with foam duct sealant to prevent the entrance of gases or liquids from one area to another or into equipment/devices.
      a. Where the elevation of the raceway penetration (into the structure) is no more than 15’ below the other (higher) end of the same raceway, Polywater FST sealant (rated to hold back up to 22’ of continuous water head pressure), or pre-approved equal, shall be used.
      b. Where the elevation of the raceway penetration (into the structure) is between 15’ and 75’ below the other (higher) end of the same raceway, Polywater PHRD Custom Mechanical Seals (rated to hold back up to 36psi or 83’ of continuous water head pressure), or pre-approved equal, shall be used.
      c. Where the elevation of the raceway penetration (into the structure) is more than 75’ below the other (higher) end of the same raceway, the contractor shall propose a custom solution designed to hold back or to drain the possible water within the associated raceway. Submittals shall be provided to the engineer for review/approval, including a summary of the anticipated elevations/PSIs, details of the proposed installation, cut-sheets of devices/materials, etc.
   5. Additionally, where necessary to ensure that water does not enter equipment/devices through the raceway system (where raceways extend to equipment/devices from wet areas), junction boxes with drain assemblies in bottom shall be located at low point of raceway system near equipment/devices (to drain water out of raceway system before it enters equipment/devices). Contractors shall provide drains in raceway systems where so necessary to prevent water entry into equipment/devices. In special applications (such as to instruments, etc.,), where cabling rated for exposed application is provided, contractor may propose short air

gaps (approximately 6” or less) between the end of the conduit system and the equipment/device cable entry (to be made with cable gland connectors) to prevent water in conduit system from entering equipment/devices in lieu of drained junction boxes.

6. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:
    a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.
    b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.
7. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).

G. Exterior Electrical Ductbanks:
1. Where exterior electrical concrete-encased ductbanks are indicated on drawings, conduit runs between buildings or structures shall be grouped in concrete-encased ductbanks as follows:
    a. A minimum of 3” of concrete shall encase each side of all ductbanks.
    b. A minimum of 1 ½” of separation shall be provided between each conduit within ductbanks. PVC spacers shall be installed at the necessary intervals prior to placement of concrete to maintain the required spacing and to prevent bending or displacement of the conduits.
    c. Top of concrete shall be a minimum of 30” below grade. A continuous magnetic marking tape shall be buried directly above each ductbank, 12” below grade.
    d. Exact routing of ductbanks shall be field verified and shall be modified as necessary to avoid obstruction or conflicts.
    e. Underground electrical raceways shall be installed to meet the minimum cover requirements listed in NEC Table 300.5. Refer to drawings for more stringent requirements.

END OF SECTION 26 05 33

SECTION 26 05 34 – OUTLET BOXES, JUNCTION BOXES, WIREWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Outlet and Junction Boxes

B. Pull Boxes

C. Wireways

PART 2 - PRODUCTS

2.1 OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")

A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Raco, Appleton, Bowers or equal.

B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.

C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.

2.2 JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")

A. Oil-Tight JIC: Shall be Hoffman Type CH box or approved equal.

B. Galvanized Cast Iron or Cast Aluminum: Shall be O-Z/Gedney or approved equal.

C. Stainless Steel: Shall be as manufactured by O-Z/Gedney, Hoffman or approved equal. Boxes shall have continuous hinges, seamless foam-in-place gaskets and screw-down clamps.

D. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal. Boxes shall have hinged covers and screw-down clamps.

E. Wireways: Shall be standard manufacturer's item as manufactured by Hoffman, Square "D", Burns, B & C or equal. Wireways shall have hinged covers and screw-down clamps.

F. Pre-cast Polymer Concrete Below-Grade Hand Holes & Pull Boxes:
   1. Enclosures, boxes and cover are required to be UL Listed and conform to all test provisions of ANSI/SCTE 77 "Specifications For Underground Enclosure Integrity" for Tier 15 applications (15,000lb design load and 22,500lb test load) unless noted otherwise.
   2. All covers shall have a minimum coefficient of friction of 0.05 in accordance with ASTM C1028 and the corresponding Tier level shall be embossed on the top surface.

3. Cover shall be bolt-down include factory-labeling to read “Electric”, “Communications” or other as directed.
4. Hardware shall be stainless steel.
5. Shall be Quazite PG/LG Style or approved equal.

G. Above-Grade Padmounted Low Profile Pull Boxes:
1. Construction:
   a. 12Ga. stainless steel base with 12Ga aluminum top with brushed finish, and structural bracing as required.
   b. Continuous base frame with open bottom and eight (8) ½” x 1” slots for securing box to concrete pad below and a center support member.
   c. Two (2) full-size swing-open lids with full-length, stainless steel continuous hinges, lifting handles, key-locking provisions and provisions for latching lids in open position (with stainless steel chain or approved equal).
   d. Guides on lid and base frame as required to ensure proper closing of box and to provide increased security.
   e. Aluminum or stainless steel barrier between power & instrumentation areas within box if box is used for both power and instrumentation wiring.
   f. Other stainless steel hardware as required.
2. Minimum Dimensions:
   a. Power: 40 inches square x 18 inches high.
   b. Instrumentation: 24 inches square x 18 inches high.
3. Manufacturer:
   a. Electrical Enclosure Mfg. (Pell City, AL).
   b. Ebox (Pelham, AL).
   c. Approved Equal.

PART 3 - EXECUTION

3.1 APPLICATION

A. General
1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by contractor per NEC requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16”)
   a. Sheet metal boxes shall be used on concealed work in ceiling or walls.
2. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed. Cast boxes shall be Cast Aluminum wherever installed in same locations as Rigid Aluminum conduit
3. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
4. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.
5. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.

6. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger required due to number of wires.
7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.

C. Junction & Pull Boxes (larger than 4-11/16")
1. For all below grade exterior use and elsewhere as shown:
   a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).
   b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).
2. All boxes installed exposed in exterior or wet areas shall be stainless steel (NEMA 4X).
3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).
4. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
5. Padmounted Pull Boxes shall be installed as shown on Plans or as required by project conditions. Transclosure-style Padmounted boxes shall be installed wherever required by the quantities and sizes of conductors. Contractor shall submit all Padmounted Pull Box types prior to ordering for engineer's review and comment.
6. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
7. All others shall be oil tight JIC box not less than 16 gauge.

3.2 INSTALLATION

A. General
1. All boxes and wireways shall be securely anchored.
2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.
3. All boxes and wireways shall be readily accessible. Contractor shall be responsible for furnishing and installing access panels per architect's specifications. Locations shall be as directed by the architect as required to make boxes, wireways, electrical connections, etc. accessible where above gypsum board ceilings or in other similar locations.
4. All metallic boxes and wireways shall be properly grounded.
5. Refer to Specification Section 26 05 53 for identification requirements.

B. Outlet Boxes & Junction Boxes (through 4-11/16")
1. Boxes shall be provided with approved 3/8" fixture studs were required.
2. Recessed boxes for wiring devices, surface fixtures, or connections, shall be set so that the edge of cover comes flush with finished surface.
3. There shall be no more knockouts opened in any sheet metal box than actually used.
4. Any unused opening in cast boxes shall be plugged.
5. Back to back boxes to be staggered at least 3 inches.
6. Under no circumstances shall through-the-wall boxes be used.

C. Junction & Pull Boxes (larger than 4-11/16")
   1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.
   2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.
   3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.
   4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.

D. Wireways and/or wall-mounted equipment
   1. Mount each wireway to channels of the same metal type as the wireway.
   2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION 26 05 34

SECTION 26 05 53 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Wire and cable identification.

B. Pullbox & Junction Box Identification

C. Electrical distribution & utilization equipment identification.

D. Instrument and control device identification.

E. Raceway identification.

PART 2 - PRODUCTS

2.1 WIRE AND CABLE IDENTIFICATION

A. Intermediate Locations:
   1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.

B. Circuit/Cable Termination Locations:
   1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

2.2 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.

2.3 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

A. Instruments and control device labels shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment or the adjacent, visible mounting surface with silicone adhesive or stainless steel wire ties.

2.4 RACEWAY IDENTIFICATION

A. Raceway labels shall be white thermal transfer marker plates permanently affixed to the associated raceway with stainless steel wire ties, with two wire ties (one on either end of marker plate to provide a flush installation) where possible. Labels shall be Panduit #M300X series or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Engineer for review and comment prior to installation.

B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.

C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).

D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

3.2 WIRE AND CABLE IDENTIFICATION

A. General:
   1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.

B. Intermediate Locations:
   1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:
      a. Wireways
      b. Pullboxes/Junction boxes larger than 4-11/16”
      c. Pullboxes/Junction boxes through 4-11/16” where wires and cables are not easily identifiable via the color coding and box labeling
      d. Vaults & Manholes
      e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).
      f. Other similar intermediate locations.
   2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:
      a. From where the circuit originates (including panel designation and circuit number):
         1) Ex: “FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)”
      b. To where the circuit extends (using the common name of the equipment):
         1) Ex: “TO: RTU-6 (ON ROOF)”
      c. The purpose of the circuit:
         1) Ex: “POWER”
      d. The set number (If parallel power feeds are used).

1) Ex: “SET NO. 3 OF 4”

C. Circuit/Cable Termination Locations:
   1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.

D. Refer to Specification Section 26 05 19 for all color-coding requirements of wires and cables.

3.3 PULLBOX & JUNCTION BOX IDENTIFICATION

A. Concealed pullboxes/junction boxes:
   1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: “RP-1A Cir. 1, 2 & 3”). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.

B. Exposed pullboxes/junction boxes:
   1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled “Power”, “Telecommunications”, “Fire Alarm” or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.

C. Where pullboxes/junction boxes are named on contract documents (Ex:”PULLBOX #3”), an engraved nameplate shall be installed on the front surface of the box to identify the name.

3.4 ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

A. General:
   1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.

B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:
   1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:

a. Ex: First Line: “NAME: RP-A”, Second Line: “120/208V-3Ø-4W”, Third Line: “FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)”

2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.

C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.)::

1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):
   a. Ex: First Line: “RTU-6”, Second Line: “FED FROM: PP-A CIR. 5”
2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: “WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH”.
3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: “WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER”.

3.5 INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

A. New Instruments and control devices (whether furnished by contractor or not) shall be labeled with black-on-white engraved nameplates permanently affixed to the equipment or to the adjacent, readily-visible mounting surface with silicone adhesive or stainless steel wire ties.

1. Instruments and process control devices (float switches, etc.) shall be labeled with instrument name and, where available, instrument ID number.
2. Pushbutton stations shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all pushbutton stations.
3. Thermostats and other similar HVAC control devices installed in process areas shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all thermostats and other similar HVAC control devices.

3.6 RACEWAY IDENTIFICATION

A. Each exposed raceway shall be labeled at the point where it becomes concealed, such as where it enters a concrete floor slab, a concrete wall, the ground, etc.

B. Each raceway entering in-grade or on-grade pullboxes/junction boxes, where the conduits are only visible inside the box, shall be labeled within the box at the point where the raceway becomes concealed.

C. Raceway nameplates shall identify:
   1. The location of the other end of the raceway ("TO MCC-1" or similar). If the other end of the raceway is at an intermediate, named pullbox ("INSTRUMENTATION PULLBOX #4" or similar), that pullbox name shall be labeled rather than the endpoint of the circuitry.

3.7 OTHER IDENTIFICATION

A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION 26 05 53

SECTION 26 24 19 – MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes requirements for motor control centers (MCC's) and all required control devices as shown on the drawing and specified to be part of the MCC equipment. The MCC shall be 277/480 V, 3-Phase, 4-Wire, 60 Hz unless otherwise indicated.

1.2 SUBMITTALS

A. Submittals shall be furnished in accordance with Specification Section 26 05 00.

B. Submittals shall show separate views of the elevation, profile and conduit openings. The elevation shall show the section identification and the unit identification. The drawings shall give dimensions of size and location of the following:
   1. Vertical section height, width and depth
   2. Mounting channels
   3. Conduit openings top and bottom
   4. Wireway openings in sides
   5. Horizontal buss
   6. Ground buss

C. The submittals shall contain a summary of the design specification containing but not limited to the following:
   1. NEMA type enclosure and class of wiring
   2. Rated buss voltage
   3. Current ratings for horizontal buss, vertical busses and ground buss
   4. Buss material and plating

D. Buss bracing and sheet circuit rating

E. The submittals shall contain a listing of all modifications, options and special equipment.

F. The submittals shall contain a listing of each unit containing but not limited to the following:
   1. Unit Location
   2. Nameplate
   3. Major contents of unit (fuse starter, CB switch, M.C.P., etc.) complete with NEMA size and heater rating or current rating.
   4. Size of load served (H.P. KVA, KW, etc.).

G. Provide the following for each starter/controls unit:
   1. A job-specific, custom wiring diagram
      a. The wiring diagram shall clearly show all control components (whether the components are mounted internal or external to the MCC enclosure).
      b. All wires and terminal blocks shall be clearly labeled.
      c. Diagram shall be in accordance with NEMA/ICS standards.
   2. Size, type and rating of all system components.

3. Unit frontal elevation and dimension drawings.
4. Internal component layout diagrams.
5. Manufacturer's product data sheets for all components.

H. Submittals shall be complete and electrical contractor shall review and approve all accessories required for control wiring prior to submittal

1.3 REGULATORY REQUIREMENTS

A. The MCC shall conform to Underwriters Laboratory (UL) 845, current revision, CSA, EEMAC, NEMA ICS-2, the latest version of the National Electrical Code, and the Canadian Electrical Code. The MCC shall be manufactured in an ISO 9001 certified facility.

1.4 WARRANTY

A. An eighteen-month warranty shall be provided on materials and workmanship from date of owner acceptance/substantial completion after completion of startup.

PART 2 - PRODUCT

2.1 MANUFACTURERS

A. Additions to existing MCCs shall be the same as the original manufacturer (Square 'D').

2.2 MATERIALS

A. Steel material shall comply with UL 845 and CSA requirements.

B. Each MCC shall consist of one or more vertical sections of heavy gauge steel bolted together to form a rigid, free-standing assembly. A removable 7 gauge structural steel lifting angle shall be mounted full width of the MCC shipping block at the top. 10 gauge bottom channel sills shall be mounted underneath front and rear of the vertical sections extending the full width of the shipping block. Vertical sections made of welded side-frame assembly formed from a minimum of 12 gauge steel. Internal reinforcement structural parts shall be of 12 and 14 gauge steel to provide a strong, rigid assembly. The entire assembly shall be constructed and packaged to withstand normal stresses included in transit and during installation.

C. Each entire MCC assembly (including all sub-components) shall be rated to withstand (and provide proper breaker functionality within) the existing MCC fault current ratings.

2.3 MCC FINISH

A. All steel parts shall be provided with UL and CSA listed acrylic/alkyd baked enamel paint finish, except plated parts used for ground connections. All painted parts shall undergo a multi-stage treatment process, followed by the finishing paint coat.

B. Pre-treatment shall include:
1. Hot alkaline cleaner to remove grease and oil.

2. Iron phosphate treatment to improve adhesion and corrosion resistance.

C. The paint shall be applied using an electro-deposition process to ensure a uniform paint coat with high adhesion.

D. The standard paint finish shall be tested to UL 50 per ASTM B117 (5% ASTM Salt Spray) with no greater than 0.125 in (3 mm) loss of paint from a scribed line.

E. Paint color shall be #49 medium light gray per ANSI standard Z55.1-967 (60-70 gloss) on all surfaces unless specified otherwise. Paint color of additions to existing MCCs shall match that of the existing MCC. Control station plates and escutcheon plates shall be a contrasting gray.

2.4 STRUCTURES

A. Structures shall be totally enclosed, dead-front, free-standing assemblies. Structures shall be capable of being bolted together to form a single assembly.

B. The overall height of the MCC shall not exceed 90 in (2286 mm) (not including base channel or lifting angle). Lifting angles, of 3 in (76 mm) in height, shall be removable. The total width of one section shall be 20 in (508 mm); (widths of 25 in (630 mm), 30 in (760 mm), and 35 in (890 mm) can be used for larger devices). The total depth of each section shall be 20 in (508 mm) unless shown otherwise.

C. MCC structures shall be NEMA/EEMAC type 1 enclosed in an outer NEMA 3R enclosure, exptended to match existing enclosure type/provisions.

D. Each section shall include a top plate (single piece or two-piece). NEMA/EEMAC type 12 shall also include a bottom plate. Top and bottom plates shall be removable for ease in cutting conduit entry openings.

E. All MCC components, terminations, wiring, etc. shall be fully accessible from the front of the MCC unless noted otherwise.

2.5 WIREWAYS

A. Structures shall contain a minimum 12 in (305 mm) high horizontal wireway at the top of each section and a minimum 6 in (152 mm) high horizontal wireway at the bottom of each section. These wireways shall run the full length of MCC to allow room for power and control cable to connect between units in different sections.

B. A full-depth vertical wireway shall be provided in each MCC section that accepts modular plug-in units. The vertical wireway shall connect with both the top and bottom horizontal wireway. The vertical wireway shall be 4 in (102 mm) wide minimum with a separate hinged door. There should be a minimum of 80 in^2 (516 cm^2) of cabling space available for 20-inch-deep sections. Access to the wireways shall not require opening control unit doors. Structures that house a single, full section control unit are not required to have vertical wireways. Those control units shall open directly into the MCC horizontal wireways.

C. All wireway doors shall be hinged and shall be held shut by captive hardware.

2.6 BARRIERS

A. All power bussing and splice connections shall be isolated from the unit compartments and the wireways. The horizontal bus shall be mounted onto a glass filled polyester support assembly that braces the bus against the forces generated during a short circuit. The horizontal bus shall be isolated from the top horizontal wireway by a two-piece rigid non-conductive barrier. The barrier design shall allow qualified personnel to slide the barriers both left and right, to allow access to the bus and connections for maintenance without having to remove the barrier. Barrier sliding shall occur via an upper and lower track system.

B. The vertical bus shall be housed in a molded glass-filled polyester support that provides bus insulation and braces the bus against the forces generated during a short circuit. These supports shall have openings every 3 in (75 mm) for unit stab-on connections. Each opening shall be provided with a manual shutter to close off the stab opening. These shutters shall be attached to the structure so that when they are removed (to allow a stab connection) they are retained in the structure and are readily accessible for use should a plug-in unit be removed from the MCC.

C. Barriers shall be provided in the vertical structure and unit designs to prevent the contact of any energized bus or terminal by a fishtape inserted through the conduit or wireway areas.

2.7 BUSSING

A. All bussing and connectors shall be tin-plated copper.

B. The main horizontal bus shall be rated as indicated on plans and shall extend the full length of the MCC. Bus ratings shall be based on 65° C maximum temperature rise in a 40° C ambient. Provisions shall be provided for splicing additional sections onto either end of the MCC.

C. The horizontal bus splice bars shall be pre-assembled into a captive bus stack. This bus stack is installed into the end of the MCC power bus to allow the installation of additional sections. The main bus splice shall utilize four bolts, two on each side of the bus split, for each phase. Additional bolts shall not be required when splicing higher amperage bus. The splice bolts shall secure to self clenching nuts installed in the bus assembly. It shall be possible to maintain any bus connection with a single tool.

D. A neutral bus and/or neutral lugs (with amperage rating equal to that of the main horizontal bus) shall be provided for all 4-wire motor control centers.

E. Each section that accepts plug-in units shall be provided with a vertical bus for distributing power from the main bus to the individual plug-in starter units. This bus shall be of copper and plating as the main bus, and shall be rated 300 A or 600 A continuous based on UL standards (and the associated loads connected to the bus). The vertical bus shall be connected directly to the horizontal bus stack without the use of risers or other

intervening connectors. It shall be possible to maintain the vertical to horizontal bus connection with a single tool. "Nut and bolt" bus connections to the power bus shall not be permitted. When a back-to-back unit arrangement is utilized, separate vertical bus shall be provided for both the front and rear units.

F. A tin-plated copper ground bus shall be provided that runs the entire length of the MCC. The ground bus shall be rated for 25% (minimum) of the main horizontal bus amperage. Compression lugs shall be provided in the MCC for a ground cable, sized to accommodate the grounding connections shown on plans. The ground bus shall be provided with six (6) holes for each vertical section to accept customer-supplied ground lugs for any loads requiring a ground conductor.

G. Each vertical section shall have a tin-plated copper vertical ground bus that is connected to the horizontal ground bus. This vertical ground bus shall be installed so that the plug-in units engage the ground bus prior to engagement of the power stabs and shall disengage only after the power stabs are disconnected upon removal of the plug-in unit.

H. The system shall be rated for an available short circuit capacity as indicated on plans. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. Interrupting ratings shall be full ratings. Series ratings will not be allowed unless specifically shown otherwise on drawings.

2.8 TYPICAL UNIT CONSTRUCTION

A. Units with circuit breaker disconnects through 400 A frame, and fusible switch disconnects through 400 A, shall connect to the vertical bus through a spring reinforced stab-on connector. Units with larger disconnects shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus.

B. All circuit breakers rated (or able to be adjusted to) 1200A or higher shall be electronic trip and shall be provided with arc energy-reducing maintenance switching (with local status indicator) to reduce arc flash energy per NEC 240.87 requirements.

C. All circuit breakers shall have adjustable magnetic trip settings. Provide a field adjustable breaker to allow for one breaker for each NEMA size starter. The adjustment range shall include current range to encompass the entire range of each size starter. There shall also be adjustments to select either standard or high inrush magnetic settings, from 6 times to 13 times motor full load current. If a standard, non adjustable, magnetic only trip breaker is furnished for a combination starter unit, the manufacturer shall include in the bid cost to furnish and install replacement breakers at jobsite if equipment changes dictate.

D. All conducting parts on the line side of the unit disconnect shall be shrouded by a suitable insulating material to prevent accidental contact with those parts.

E. Unit mounting shelves shall include hanger brackets to support the unit weight during installation and removal. All plug-on units shall use a twin-handle camming lever located

at the top of the bucket to rack in and out the plug-on unit. The cam lever shall work in conjunction with the hanger brackets to ensure positive stab alignment.

F. A lever handle operator shall be provided on each disconnect. With the unit stabs engaged onto the vertical phase bus and the unit door closed, the handle mechanism shall allow complete ON/OFF control of the unit. All circuit breaker operators shall include a separate TRIPPED position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door. Clear indication of disconnect status shall be provided, by adhering to the following operator handle positions:
   1. Handle "On" position shall be up or to the left and within 45 degrees of being parallel to the face of the equipment.
   2. Handle "Off" position shall be down or to the right and within 45 degrees of being parallel to the face of the equipment.
   3. The minimum separation between the "On" and "Off" positions shall be 90 degrees.
   4. On Circuit Breaker disconnects, the handle "Tripped" position shall be perpendicular to the face of the equipment +/- 30 degrees. Minimum separation between "On" and "Tripped" shall be 30 degrees. Minimum separation between "Tripped" and "Off" shall be 45 degrees.

G. A mechanical interlock shall prevent the operator from opening the unit door when the disconnect is in the ON position. Another mechanical interlock shall prevent the operator from placing the disconnect in the ON position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.

H. A non-defeatable interlock shall be provided to prevent installing or removing a plug-in unit unless the disconnect is in the OFF position.

I. The plug-in unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.

J. Provisions shall be provided for locking all disconnects in the OFF position with up to three padlocks.

K. Handle mechanisms shall be located on the left side to encourage operators to stand to the left of the unit being switched.

L. Unit construction shall combine with the vertical wireway isolation barrier to provide a fully compartmentalized design.

M. All unit doors shall be hinged and shall be held shut by captive hardware.

N. Interiors of all units shall be painted white.

2.9 COMPONENTS FOR TYPICAL UNITS

A. Main Lugs
   1. Main and sub-feed lugs shall be provided with AL/CU compression lugs suitable for the quantities and sizes of conductors required.

B. Circuit Breakers
   1. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated (or can be adjusted to is 1200A or higher, breakers shall be electronic trip and shall be provided with arc energy-reducing maintenance switching (with local status indicator) to reduce arc flash energy per NEC 240.87 requirements.
   2. Circuit breakers shall be quick-make and quick-break, whether actuated automatically or manually. Circuit breakers shall have inverse time tripping characteristics with automatic release which shall trip free of the handle. Circuit breaker handles shall be three distinct positions—"OFF", "ON", and "TRIPPED". When a circuit breaker opens on overload or short circuit, the operating handle shall automatically assume the "TRIPPED" position.

C. Combination Starters
   1. All combination starters shall utilize a unit. Magnetic starters shall be furnished in all combination starter units unless specifically shown otherwise. All starters shall utilize full NEMA/EEMAC rated contactors (size 1 minimum).
   2. Starters shall be provided with a three-pole, external (door mounted) manual reset, solid state overload relay . Solid state overload relay shall have switch-selectable trip class and shall provide protection from:
      a. Overload.
      b. Phase Unbalance.
      c. Phase Loss.
      d. Ground Fault (Class II detection).
   3. Unless specifically shown otherwise, each combination starter shall be furnished with a control circuit transformer including two primary protection fuses and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads (including motor space heaters and other similar loads where specified). The transformer rating shall be fully visible from the front when the unit door is opened. Unless otherwise indicated, control voltage shall be 120V AC. Control power shall be provided by individual unit control power transformers.
   4. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.
   5. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.
   6. NEMA/EEMAC Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.
   7. Each starter shall be equipped with a minimum of the following control devices:
      a. Door-mounted reset button.
      b. Two (2) field-reversible (N.O./N.C.) auxiliary contacts
      c. For reversing and two-speed starters: Four (4) field-reversible (N.O./N.C.) auxiliary contacts
      d. Additional control devices as indicated on plans.

D. Terminal Blocks
   1. Wiring within all units shall be type B, with unit-mounted control terminal blocks for each field wire.
   2. Terminal blocks shall be the pull-apart type 600 volt and rated at 25 amps. All current carrying parts shall be tin plated. Terminals shall be accessible from inside the unit when the unit door is opened. Terminal blocks shall be DIN rail mounted with the stationary portion of the block secured to the unit bottom plate. The stationary portion shall be used for factory connections, and shall remain attached to the unit when removed. The terminals used for field connections shall face forward so they can be wired without removing the unit or any of its components.

E. Nameplates
   1. Each unit shall be properly labeled with an engraved phenolic nameplate with a white background and black letters.
   2. Each pilot device shall be properly labeled with a legend plate or an engraved phenolic nameplate.

F. Wiring
   1. All wiring shall be identified on each end with hot stamped or shrink tube type permanent wire markers to correspond with numbering shown on wiring diagrams.

G. Wiring Diagram
   1. A job-specific, custom wiring diagram for each unit shall be provided to the contractor prior to installation for making the appropriate electrical connections. The wiring diagram shall clearly show all control components connected to each unit (whether the components are mounted internal or external to the soft start enclosure). All wires and terminal blocks shall be clearly labeled. A laminated copy of the final wiring diagram for each unit shall be installed inside the door of the associated unit.

H. Control Components:
   1. All pushbuttons, pilot lights, selector switches and other control devices shall be separate, standard size (full 30mm) and shape, heavy duty oil-tight units.
   2. All pilot lights to be cluster LED type & push to test.
   3. Relays:
      a. Control relays shall have the following characteristics, unless noted otherwise:
         1) General purpose, plug-in type.
         2) Minimum mechanical life of 10 million operations.
         3) Coil voltage as indicated or required by application.
         4) Single-break contacts rated 12 amperes, resistive at 240 volts.
         5) Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each individual relay shall have 3PDT contacts. Where required, multiple control relays shall be provided (to provide the required quantities of contacts) for each “relay” function shown on plans/diagrams.
         6) Furnished with RC transient suppressor to suppress coil-generated transients to 200% of peak voltage.
         7) LED on/off indicator light and manual operator.

8) Industry standard wiring and pin terminal arrangements.
9) Equal to Square D 8501KP series with matching plug-in socket.

b. Interposing/isolation relays used to isolate input/output field wiring from PLC inputs/outputs shall be terminal-block style. Terminal-block style relays shall have the following characteristics, unless noted otherwise:
1) Minimum mechanical life of 10 million operations.
2) Single-break contacts rated 6 amperes, resistive at 120 volts.
3) One (1) N.O. contact per relay.
4) Furnished with integral transient protection.
5) LED on/off indicator light.
6) DIN-rail mounted.
7) Equal to Square D type Zelio RSL.

c. Timer relays shall be electronic, adjustable plug-in devices meeting the following characteristics, unless noted otherwise:
1) General purpose, plug-in type.
2) Minimum mechanical life of 10 million operations.
3) Single-break contacts rated 10 amperes, resistive at 240 volts.
4) Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each relay shall have DPDT contacts (2 N.O. & 2N.C.). Where required, multiple timer or control relays shall be provided (to provide the required quantities of contacts) for each "relay" function shown on plans/diagrams.
5) Rotary-thumbwheel adjustments for time value, timing range and function.
6) Time value adjustments from .05 seconds to 999 hours
7) Selectable Timing Functions, including the following:
a) On Delay
b) Interval
c) Off Delay
d) One Shot
e) Repeat Cycle-Off
f) Repeat Cycle-On
g) On/Off Delay
h) One Shot Falling Edge
i) Watchdog
j) Trigger On Delay
8) Accuracy shall be $\pm$ 2% and repeatability shall be $\pm$ 0.1%.
9) Furnished with integral transient protection.
10) LED indicator light(s) for "timing" and "on/off status"
11) Held in place with hold-down spring
12) Equal to Square D type JCK with matching plug-in socket.

2.10 VARIABLE FREQUENCY DRIVES

A. Refer to Section 26 29 23.

2.11 QUALITY CONTROL

A. The entire MCC shall go through a quality inspection before shipment. This inspection shall include:
   1. Physical Inspection of:
      a. Structure.
      b. Electrical conductors, including:
         1) bussing.
         2) general wiring.
         3) units.
   2. Electrical Tests
      a. General electrical tests include:
         1) power circuit phasing.
         2) control circuit wiring.
         3) instrument transformers.
         4) meters.
         5) ground fault system.
         6) device electrical operation.
      b. AC dielectric tests shall be performed on the power circuit.
   3. Markings/Labels, include:
      a. instructional type.
      b. Underwriters Laboratory (UL)/Canadian Standards Association (CSA).
      c. inspector's stamps.
   4. The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the MCC meets operating specifications.

B. The motor control center design shall be in accordance with the latest applicable standards of NEMA and Underwriters Laboratories.

2.12 SPECIAL REQUIREMENTS

A. Where the schedules and diagrams show deviations from these Specifications, the schedules and diagrams shall take precedence, but only for the particular feature.

PART 3 - EXECUTION

3.1 PACKING/SHIPPING

A. The MCC shall be separated into shipping blocks no more than three vertical sections each. Shipping blocks shall be shipped on their sides to permit easier handling at the jobsite. Each shipping block shall include a removable lifting angle, which shall allow an easy means of attaching an overhead crane or other suitable lifting equipment.

3.2 STORAGE

A. If the MCC cannot be placed into service reasonably soon after its receipt, store it in a clean, dry and ventilated building free from temperature extremes. Acceptable storage temperatures shall be determined by the manufacturer. Anti-condensation space heaters shall be provided during equipment storage as directed by the manufacturer.

3.3 LOCATION

A. Where located outdoors space heaters shall be provided within the motor control center.

B. Motor control centers shall be located in an area with a minimum of 4 ft (1219 mm) of free space in front of front-of-board construction. This free space shall give adequate room to remove and install units. A minimum of 0.5 in (13 mm) space should be provided between the back of front-of-board MCCs and a wall, 6 in (152 mm) required for damp locations.

C. The MCCs shall be assembled in the factory on a smooth level surface so that all sections are properly aligned. A similar smooth and level surface shall be provided for installation. An uneven foundation will cause misalignment of shipping blocks, units, and doors. The surface under a MCC shall be of a non-combustible material unless bottom plates are installed in each vertical section.

3.4 INSTALLATION

A. Motor control centers shall be installed on concrete housekeeping pads (height above grade to match existing) unless specifically shown otherwise. Pad shall extend a minimum of four inches to all sides and shall have beveled edges.

B. Orientation of motor control centers shall be as shown on the Engineer's drawings. Space requirements are critical on this project and therefore special care shall be taken to ensure that equipment will fit in the designated space. To ensure proper coordination, the MCC manufacturer shall submit with shop drawings a 1/2"=1'-0" scale floor plan of each electrical room showing all columns, doors, walls and proposed equipment. Manufacturer shall not bid equipment that will not fit in available space.

C. All motor control center dimensions and clearances shall be carefully checked and coordinated with the proper trades to ensure proper mounting space and support prior to roughing in equipment.

D. Motor control centers shall be grounded in two places as specified on drawings.

E. Verify all accessories as shown on drawings. Perform all necessary additions and modifications to make the motor control center to the Engineer's drawings.

F. A job-specific, custom wiring diagram for each unit shall be provided to the contractor prior to installation for making the appropriate electrical connections. The wiring diagram shall clearly show all control components connected to each unit (whether the components are mounted internal or external to the soft start enclosure). All wires and terminal blocks shall be clearly labeled. A laminated copy of the final wiring diagram for each unit shall be installed inside the door of the associated unit.

G. Operations and Maintenance Manuals and a listing of the nearest and most convenient source of replacement parts and service shall be provided to the owner for all MCC components, control wiring, etc.

H. Operations and Maintenance Manuals shall include hardcopy printouts of all device settings and programming.

I. For safety, reliability, and continuity of warranty, any modifications, alterations, etc. required to conform to the requirements of this specification shall be performed by the MCC manufacturer only. Distributor modifications, third party packaging, etc. of a manufacturer's standard product are specifically disallowed.

J. Services shall include a minimum of eight (8) hours of field/classroom training for owner's personnel on routine operation and maintenance of the specified units.

3.5 SPARE PARTS

A. The following spare parts shall be provided at no extra cost to the Owner:
   1. One of each type and size of control fuse.

END OF SECTION 26 24 19

SECTION 26 27 26 – WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Wiring Devices

B. Plates

C. Finishes

PART 2 - PRODUCTS

2.1 WIRING DEVICES AND PLATES

A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.

B. Receptacles shall have blade configuration and shall be heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.

C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.

D. Each wiring device shall have a plate (see “Finishes” section below for specific requirements).

2.2 FINISHES

A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.

B. Coverplates, trim rings, etc. for recessed, floor-mounted electrical items (floor outlets, underfloor duct junctions, etc.) shall match finish of building hardware (302/304 stainless steel, brass, etc.) in area installed.

C. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.

D. Coverplates for receptacles in wet locations shall be metallic, in-use type, rated for wet locations per NEC requirements unless noted otherwise.

E. See “Electrical Identification” specification section for coverplate labeling requirements.

PART 3 - EXECUTION

3.1 GENERAL MOUNTING

A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation. For example, Contractor shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.

B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.

C. Devices and associated plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.

D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.

E. Unless otherwise shown or required by local handicap codes, outlet boxes shall be the following distances above the finished floor unless otherwise noted.
   1. Receptacles and telephone outlets in offices and other finished areas: 1’-6” to the center of the box.
   2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4’-0” to the center of the box.
   3. Receptacles over counters: As Noted
   4. Switches, general: 4’-0” to the top of the box.
   5. Push-button, etc., general: 4’-0” to the top of the box.
   6. Other device types: verify with engineer prior to rough-in.

END OF SECTION 26 27 26

SECTION 26 29 23 – VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section provides specification requirements for adjustable frequency drives, variable speed drives or herein identified as VFD's.

B. The manufacturer shall furnish, field test, adjust and certify all installed VFD's for satisfactory operation.

C. Any exceptions or deviations to this specification shall be indicated in writing and submitted to the engineer for approval a minimum of ten (10) days prior to bid.

1.2 REFERENCES

A. ANSI®/NFPA® 70 - National Electrical Code® (NEC®)

B. CSA® C22.2 No. 14-M91 - Industrial Control Equipment

C. IEC 61000 - Electromagnetic Compatibility

D. NEMA 250 Enclosures for Electrical Equipment

E. NEMA ICS7 - Industrial Control and Systems Adjustable Speed Drives

F. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection Installation and Operation of Adjustable Speed Drives

G. UL® 50 – Enclosures for Electrical Equipment

H. UL 98 – Disconnect Switches

I. UL 507 – Electric Fans

J. UL 508 – Industrial Control Equipment

K. UL 508C – Power Conversion Equipment

L. UL 991 – Safety Tests for Safety Related Controls employing Solid State Devices

M. OSHA® 1910.95 – VFD Controller Acoustical Noise

1.3 QUALITY ASSURANCE

A. The manufacturer of the VFD shall be a certified ISO 9001 facility.

B. The VFD and all associated optional equipment shall be UL Listed according to UL508C Power Conversion Equipment. A UL label shall be attached inside each enclosure as verification.

C. The VFD shall be designed constructed and tested in accordance with UL, CSA, NEMA and NEC standards.

D. Quality Assurance documentation shall be furnished to verify successful completion upon written request of the engineer.

1.4 SUBMITTALS

A. Submittals shall be furnished in accordance with Specification Section 26 05 00.

B. Provide the following for each VFD:
   1. A job-specific, custom wiring diagram
      a. The wiring diagram shall clearly show all control components connected to the starter (whether the components are mounted internal or external to the VFD enclosure).
      b. All wires and terminal blocks shall be clearly labeled.
      c. Diagram shall be in accordance with NEMA/ICS standards.
   2. Size, type and rating of all system components.
   3. Enclosure frontal elevation and dimension drawings.
   4. Internal component layout diagrams.
   5. Available conduit entry and exit locations.
   6. Manufacturer's product data sheets for all components.

C. Standard catalog sheets showing voltage, horsepower, maximum current ratings and recommended replacement parts with part numbers shall be furnished for each different horsepower rated VFD shall be provided.

D. The following calculations shall be submitted:
   1. Thermal calculations showing amount of panel air conditioning required for each panel, per ambient requirements listed below and operating temperature limitations of all equipment/devices within each control panel. Heating for these panels shall be provided by the panel supplier (and powered from the 120V CPT within the panel). Air conditioning for these panel(s) will be provided by others (as shown on plans) as required by the thermal calculations provided by this panel supplier. Stirring fans shall be provided WITHIN the enclosure as required to eliminate hot spots at components. Equipment/devices within panel shall be spaced as required to allow for proper airflow/cooling around individual components, and as required to allow ductwork to enter the rear of the enclosure as indicated on plans (to match existing adjacent drives). If necessary, enclosure(s) shall be oversized to accommodate these requirements:
      a. Thermal calculations used for sizing cooling/ventilation systems for each control panel located in exterior or non-conditioned spaces shall assume:
         1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
         2) Full solar contact where applicable (not applicable where enclosures are fully protected from solar contact using solar shields separated from panel enclosure with standoffs or similar).
         3) No wind.

4) Heat loss from interior equipment (electronics, etc.) per equipment supplier's information.

b. Thermal calculations used for sizing heating systems for each control panel shall assume:
   1) Ambient exterior air temperature ranges of -5 degrees F to 105 degrees F.
   2) No heat loss by interior components of control panel.
   3) No solar gain on exterior of control panel.
   4) Doubling of heating wattage required to account for wind where control panels are located outdoors.
   5) Minimum temperature difference (due to heating) of 10 degrees F to prevent condensation, regardless of equipment temperature limitations.

2. Load calculations showing the sizing of all power supplies provided (with spare capacity as specified). Power supplies shall each have ratings/capacities at least 20% larger than required by load calculations unless noted otherwise.

1.5 WARRANTY

A. An 18-month parts warranty shall be provided on materials and workmanship from the date of owner acceptance/substantial completion after completion of startup.

PART 2 - PRODUCT

2.1 SUPPLIER & MANUFACTURERS

A. Enclosed Drive/Integration
   1. MCC-mounted VFD: The enclosure and integration of the engineered drive package shall be furnished by the original MCC supplier (Square D). See Specification Section 26 24 19 ("Motor Control Centers") for additional MCC requirements.
   2. Separately-enclosed VFD: The enclosure and integration of the engineered drive package shall be furnished by:
      a. Electric Machine Controls (EMC) – Birmingham, Alabama
      b. Revere Controls – Birmingham, Alabama
      c. Square D
      d. Eaton/Cutler Hammer
      e. ABB

B. The Variable Frequency Drive (VFD) itself (within the MCC or a separately-enclosed package) shall be manufactured by:
   1. Square 'D', Eaton/Cutler Hammer, or ABB.
   2. Or pre-approved equal meeting the detailed requirements of this specification. Note that all "named" Manufacturers are obligated to meet the detailed requirements of this specification. Any proposed exceptions shall be clearly stated at bid time, citing the reason for noncompliance, and the cost for providing a conforming product. Failure to provide a detailed list of proposed exceptions may cause a bid to be deemed non-responsive. The Engineer will be the sole determiner of the acceptability of a proposed exception.

C. Alternate control techniques other than pulse width modulated (PWM) are not acceptable.

2.2 GENERAL DESCRIPTION

A. The VFD shall convert the input AC mains power to an adjustable frequency and voltage as defined below and indicated on the drawings or motor control schedules.
   1. The VFD manufacturer shall supply a Low Harmonic Active-Front-End drive design equal to Square D Altivar ATV680, with the following characteristics:
      a. The VFD shall be a 3-level Active Front End (AFE) AC drive that is designed to comply with standard IEEE 519-2014 when installed in a system that is already in compliance with the standard. A 3-level design shall be used to provide a low harmonic current load to the power system and to avoid introducing additional common mode noise to the motor. Passive harmonic filters shall be acceptable for motors less then 150hp in size provided the TDD is shown to be less than limits established by IEE 519-2014. The 2-level type design shall not be acceptable due to the additional common mode noise output from the VFD to the motor. Input THDi of less than 5% at 80% load.
      b. "Stop and Go" function to de-energize active front end while not in use to reduce energy consumption and to provide isolation in standby mode
      c. Embedded power measurement and energy dashboard
      d. Performance Drift Monitoring
      e. The power section shall be insensitive to phase rotation of the AC line.

B. The output power section shall convert fixed DC voltage to adjustable frequency AC voltage. This section shall use insulated gate bipolar transistors (IGBT) or intelligent power modules (IPM) as required by the current rating of the motor.

2.3 CONSTRUCTION

A. MCC Construction:
   1. Refer to Specification Section 26 24 19 (Motor Control Centers) for additional requirements (for enclosure, component types, etc.).

B. Separately-enclosed:
   1. Enclosures shall be fabricated using a minimum of 12 steel. Continuously weld all exterior seams and grind smooth. Reinforce sheet steel with steel angles where necessary support equipment and ensure rigidity and preclude resonant vibrations.
   2. Use pan-type construction for doors.
   3. Door widths shall not exceed 36-inches.
   4. Mount doors with full length, heavy duty piano hinge with hinge pins.
   5. Provide gasket completely around each door opening.
   6. Mount and secure all internal components to removable back plate assembly.
   7. Provide provisions for padlocking all doors and provide clamps on three (3) sides of each door.
   8. Enclosures (and associated backpanels and other similar accessories) shall be manufactured by Hoffman Engineering Co., or Saginaw Control & Engineering.

C. The enclosure shall include an outer NEMA 3R door and an inner deadfront door. Door-mounted pilot devices, HMIs, etc. shall be mounted on the INNER deadfront door.

D. The VFD shall be provided complete with a main circuit breaker disconnect means for Type 1 short circuit overcurrent protection as follows:
   1. Short circuit withstand rating shall be equal to or greater than the AIC rating listed on the plans for the distribution equipment (motor control center, panelboard, switchboard, etc.) that feeds the VFD.
   2. Where the VFD installed within a motor control center, refer to Motor Control Centers Specification Section 26 24 19.
   3. Sized by manufacturer per NEC requirements for corresponding motor load.

E. All enclosures (with any required accessories or auxiliary items) shall fit within the space shown on the Plans. Any costs associated with furnishing equipment which exceeds the available space shall be borne by the Contractor.

F. A mechanical interlock shall prevent an operator from opening the VFD door when the disconnect is in the on position. Another mechanical interlock shall prevent an operator from placing the disconnect in the on position while the VFD door is open. It shall be possible for authorized personnel to defeat these interlocks.

G. Provisions shall be provided for locking all disconnects in the off position with up to three padlocks.

H. Provisions shall be made for accepting a padlock to lock the enclosure door.

I. A seismic qualification label shall be provided for all wall and floor mount units to comply with the latest IBC and NFPA 5000 guidelines.

2.4 CONTROL PANEL ACCESSORIES:

A. Space heaters shall be provided for condensation and temperature control. Thermostats AND hygrostats (or combination hygrotherm controllers) shall be provided to control heating requirements (based on temperature and relative humidity within enclosure) without need of manual operation. Setpoints shall be as per recommendations of the equipment suppliers. See above for thermal calculation requirements. Space heaters and associated control devices shall be as manufactured by Hoffman Engineering Co., Rittal, Stego or approved equal.

B. Provide component layout/design that accommodates cut-outs in the rear of the enclosure for owner-furnished air conditioning supply & return ductwork as indicated on plans and to match the existing adjacent VFD enclosures/equipment.

C. Provide interior mounting panels and shelves constructed of minimum 12 gauge steel with white enamel finish. Provide metal print pocket with white enamel finish on inside of door.

D. Provide interior LED light kit, mounted at top of interior of panel, and switched to turn “ON” when door is opened for the following control panels:
   1. Control panels with outer dimensions greater than 20” wide or 30” high.
   2. Control panels containing PLCs or other similar programmable devices.

E. VFDs shall include an inner-deadfront door mounted digital keypad for adjusting the starter parameters and viewing process values and viewing the motor and starter statuses without opening the enclosure deadfront door.

2.5 CONTROL COMPONENTS

A. General:
   1. All pushbuttons, pilot lights, selector switches and other control devices shall be separate, standard size (full 30mm) and shape, heavy duty oil-tight units.
      a. Devices in extremely corrosive areas (chlorine rooms, fluoride rooms, etc.) shall be of non-metallic construction.
      b. Devices in other areas shall be of chrome-plated construction.
   2. All components and devices so that connection can be easily made and so there is ample room for servicing each item.
   3. Door-mounted indicators, recorders, totalizers and controllers shall be located between 48” and 72” above finished floor level.
   4. Door-mounted indicator lights, selector switches and pushbuttons shall be located between 36” and 80” above finished floor level.
   5. All devices and components shall be adequately supported to prevent movement. Mounting strips shall be used to mount relays, timers and other devices suitable for this type of mounting.

B. Pilot Lights:
   1. All pilot lights to be cluster LED type & push to test.

C. Pushbuttons:
   1. All STOP operators within control stations located at equipment shall be provided with lockout provisions and a minimum of two (2) sets of contact blocks.
   2. Emergency shutoff pushbutton devices shall be as follows unless noted otherwise:
      a. 2 ¼” diameter, mushroom-style, maintained contact push buttons
      b. With a minimum of one (1) normally open dry contact and three normally closed dry contacts.
      c. Connections made such that pushing “in” the button will shutoff the associated equipment.
      d. Provided with a red engraved nameplate with ½” lettering to read “Emergency Shutoff”.

D. Relays:
   1. Control relays shall have the following characteristics, unless noted otherwise:
      a. General purpose, plug-in type.
      b. Minimum mechanical life of 10 million operations.
      c. Coil voltage as indicated or required by application.
      d. Single-break contacts rated 12 amperes, resistive at 240 volts.
      e. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each individual relay shall have 3PDT contacts. Where required, multiple control relays shall be provided (to provide the required quantities of contacts) for each “relay” function shown on plans/diagrams.

f. Furnished with RC transient suppressor to suppress coil-generated transients to 200% of peak voltage.
g. LED on/off indicator light and manual operator.
h. Industry standard wiring and pin terminal arrangements.
i. Equal to Square D 8501KP series with matching plug-in socket.

2. Interposing/isolation relays used to isolate discrete output field wiring (and where required for voltage translation for other discrete signals) to/from PLC inputs/outputs shall be terminal-block style. Terminal-block style relays shall have the following characteristics, unless noted otherwise:
   a. Minimum mechanical life of 10 million operations.
   b. Single-break contacts rated 6 amperes, resistive at 120 volts.
   c. One (1) N.O. contact per relay.
   d. Furnished with integral transient protection.
   e. LED on/off indicator light.
   f. DIN-rail mounted.
   g. Equal to Square D type Zelio RSL.
3. Timer relays shall be electronic, adjustable plug-in devices meeting the following characteristics, unless noted otherwise:
   a. General purpose, plug-in type.
   b. Minimum mechanical life of 10 million operations.
   c. Single-break contacts rated 10 amperes, resistive at 240 volts.
   d. Contacts as shown on wiring diagrams plus a minimum of one (1) spare N.O. contact and one (1) spare N.C. contact. At a minimum, each relay shall have DPDT contacts (2 N.O. & 2N.C.). Where required, multiple timer or control relays shall be provided (to provide the required quantities of contacts) for each "relay" function shown on plans/diagrams.
   e. Rotary-thumbwheel adjustments for time value, timing range and function.
   f. Time value adjustments from .05 seconds to 999 hours
   g. Selectable Timing Functions, including the following:
      1) On Delay
      2) Interval
      3) Off Delay
      4) One Shot
      5) Repeat Cycle-Off
      6) Repeat Cycle-On
      7) On/Off Delay
      8) One Shot Falling Edge
      9) Watchdog
      10) Trigger On Delay
   h. Accuracy shall be $\pm$ 2% and repeatability shall be $\pm$ 0.1%.
   i. Furnished with integral transient protection.
   j. LED indicator light(s) for "timing" and "on/off status"
   k. Held in place with hold-down spring
   l. Equal to Square D type JCK with matching plug-in socket.

2.6 MOTOR DATA

A. Each VFD shall be sized to operate the AC motors defined to match load schedules and other specification documents as follows:
   1. Motor Horsepower and voltage rating(s) – See electrical drawings and schedules.
   2. Minimum full load amperage rating of VFD – See electrical drawings and schedules.
   3. Motor full load amperes, RPM and service factor ratings - See individual motor specification documents.

B. The VFD manufacturer shall be responsible for verifying each exact motor amperage, horsepower, voltage, RPM and service factor with motor equipment supplier prior to submitting shop drawings.

2.7 APPLICATION DATA

A. The VFD shall be sized to operate either a Variable Torque or Constant Torque load (unless specifically stated otherwise on drawings). The exact load type shall be as determined by the motor supplier and shall be coordinated by the VFD supplier prior to submitting shop drawings.

B. The speed range shall be from a minimum speed of 0.1Hertz to a maximum speed of 60 Hertz.

2.8 ENVIRONMENTAL RATINGS

A. The VFD shall meet IEC 60664-1 and NEMA ICS-1 Annex A standards.

B. The VFD itself shall be designed to operate without derating in an ambient temperature from 0 to + 40 degrees C (+32 to 104 degrees F). Where temperatures exceed these limitations, the VFD manufacturer shall properly derate the unit as required and shall clearly submit this derating calculation with the submittal package. See Specification Section 26 24 19 (Motor Control Centers) or Specification Section 26 29 00 (Manufactured Control Panels) as applicable for additional requirements (for thermal controls required within VFD outer enclosures).

C. The storage temperature range shall be -25 to +65 degrees C (-13 to +149 degrees F).

D. The maximum relative humidity shall be 95 percent at 40 degrees C non-condensing or dripping water conforming to IEC 60068-2-3.

E. The VFD shall be rated to operate at altitudes less than or equal to 3,300 feet (1000 meters) without derating. For altitudes above 3,300 feet, de-rating factors shall apply by the manufacturer.

F. The VFD shall conform to IEC 600721-3-3-3M3 amplitude for Operational Vibration Specifications.

2.9 ELECTRICAL RATINGS

A. The VFD shall be designed to operate from the rated input voltage plus or minus 10 percent.

B. The VFD shall operate from an input voltage frequency range of 57 to 63 Hertz.

C. The displacement power factor shall not be less than 0.95 lagging under any speed or load condition.

D. The efficiency of the VFD at 100 percent speed and load shall not be less than 96 percent.

E. The VFD unit amperage shall be the greater of the following:
   1. 110% of the NEC amperage rating associated with the horsepower rating shown on the plans (for constant torque loads).
   2. 100% of the unit amperage rating shown on the plans (for constant torque loads).

F. The rated VFD overcurrent capacity shall be 150 percent of the constant torque rating (or 110 percent of the variable torque rating where applicable) for one minute.

G. The VFD shall have a coordinated short circuit rating equal to or in excess of the minimum value listed on the piece of distribution equipment that feeds the VFD. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. This rating shall be listed on the nameplate.

H. The output carrier frequency of the VFD shall be randomly modulated depending on Drive rating for low noise operation. No VFD with an operable carrier frequency above 10 kHz shall be allowed.

I. The output frequency shall be from 0.1 to 200 Hertz.

J. The VFD shall be able to develop rated motor torque at 0.5 Hertz (60 Hertz base) in a sensorless flux vector (SVC) mode using a standard induction motor without an encoder feedback signal.

2.10 PROTECTION

A. Upon power-up shall automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, dynamic brake failure, DC to DC power supply, control power and the pre-charge circuit.

B. Protection against short circuits, between output phases and ground; and the logic and analog outputs.

C. Minimum AC undervoltage power loss ride-through of 200 milliseconds. The VFD shall have the user-defined option of frequency fold-back to allow motor torque production to continue to increase the duration of the powerloss ride-through.

D. Selectable ride through function that shall allow the logic to maintain control for a minimum of one second without faulting.

E. For a fault condition other than a ground fault, short circuit or internal fault, an auto restart function shall provide programmable restart attempts. The programmable time delay before restart attempts shall be unlimited.

F. Deceleration mode programmable for normal and fault conditions. The stop modes shall include free-wheel stop, fast stop and DC injection braking.

G. Upon loss of the analog process follower reference signal, shall fault and/or operate at a user-defined speed set between software programmed low-speed and high-speed settings.

H. Solid state I^2t protection that is UL Listed and meets UL 508C as a Class 10 overload protection and meets IEC 60947. The minimum adjustment range shall be from 20 to 150 percent of the nominal output current rating of the VFD.

I. Thermal switch with a user selectable pre-alarm that shall provide a minimum of 60 seconds delay before overtemperature fault.

J. Use bonded fin heatsink construction for maximum heat transfer.

K. Fold-back function that shall automatically anticipate a controller overload condition and fold back the frequency to avoid a fault condition.

L. The output frequency shall be software enabled to fold back when the motor is overloaded.

M. There shall be three skip frequency ranges with hysteresis adjustment that can each be programmed independently, back to back or overlapping.

2.11 ADJUSTMENTS AND CONFIGURATIONS

A. The VFD shall self-configure to the main operating supply voltage and frequency. No operator adjustments shall be required.

B. Upon power-up, automatically send a signal to the connected motor. The stator resistance data shall be measured at rated current. The VFD shall automatically optimize the operating characteristics according to the stored data.

C. The VFD shall be factory pre-set to operate most common applications.

D. A choice of four types of acceleration and deceleration ramps shall be available in the VFD software; linear, S curve, U curve and custom.

E. The acceleration and deceleration ramp times shall be adjustable from 0.01 to 3,200 seconds.

F. The volts per frequency ratios shall be user selectable to meet variable torque loads, normal and high-torque machine applications.

G. The exact acceleration ramp time/type, current limitation, overload protection type and motor current shall be set in the field by the startup technician prior to equipment startup as recommended/approved by the motor supplier.

H. The memory shall retain and record run status and fault type of the past eight faults.

I. Slip compensation shall be adjustable from 0 to 150%.

J. The software shall have an "Energy Saving" function that shall reduce the voltage to the motor when selected for variable torque loads. A constant volts/Hertz ratio shall be maintained during acceleration. The output voltage shall then automatically adjust to meet the torque requirement of the load.

K. The VFD shall offer programmable DC injection braking that shall brake the AC motor by injecting DC current and creating a stationary magnetic pole in the stator. The level of current shall be adjustable between 10 and 110 percent of rated current and available from 0.1 to 30 seconds continuously. For continuous operation after 30 seconds, the current shall be automatically reduced to 50 percent of the nameplate current of the motor.

L. Sequencing logic shall coordinate the engage and release thresholds and time delays for the sequencing of the VFD output, mechanical actuation and DC injection braking in order to accomplish smooth starting and stopping of a mechanical process.

M. The VFD shall offer a programmable "Deragging" feature (to allow the drive to cycle the motor forward and reverse for a few cycles to clear a pump of rags). This feature shall only be used where requested by the civil engineer or owner in the construction phase, or where required by the application. All programming shall be provided by the factory-trained startup personnel, to engineer's and owner's satisfaction.

2.12 GRAPHIC TERMINAL DISPLAY INTERFACE

A. The graphic display terminal shall provide 8 lines of 240 by 160 pixels in plain English to control, adjust and configure the VFD. All electrical values, bar charts, configuration parameters, I/O assignments, application and activity function access, faults, local control, adjustment storage, self-test and diagnostics. There shall be a standard selection of six additional languages built-in to the operating software as standard.

B. The VFD model number, torque type, software revision number, horsepower, output current, motor frequency and motor voltage shall all be listed on the drive identification display as viewed on the graphic display terminal.

C. As a minimum the selectable outputs shall consist of speed reference, output frequency, output current, motor torque, output power, output voltage, line voltage, DC voltage, motor thermal state, drive thermal state, elapsed time, motor speed, machine speed reference and machine speed.

D. The graphic display terminal shall consist of programmable function keys. The functions shall allow both operating commands and programming options to be preset by the

operator. A hardware selector switch shall allow the graphic display terminal to be locked out from unauthorized personnel.

E. The graphic display terminal shall offer a simply smart to advanced user menu consisting of parameter setting, I/O map, fault history, and drive configuration. A software lock shall limit access to the main menu.

F. The navigation wheel shall provide the ability to scroll through menus and screens, select or activate functions or increase the value of a selected parameter.

G. An escape key shall allow a parameter to return the existing value if adjustment is not required and the value is displayed. The escape function shall also return to a previous menu display.

H. A RUN key and a STOP key shall command a normal starting and stopping as programmed when the VFD is in keypad control mode. The STOP key shall be active in all control modes.

I. A user interface shall be available that is a WINDOWS® based personal computer, serial communication link or detachable graphic terminal display.

J. The keypad and all door mounted controls shall be Type 12 rated.

2.13 CONTROL

A. External pilot devices shall be able to be connected to a terminal strip for starting/stopping the VFD, speed control and displaying operating status. All control inputs and outputs shall be software assignable.

B. 2-wire or 3-wire control strategy shall be defined within the software. 2-wire control allows automatic restart of the VFD without operator intervention after a fault or loss of power. 3-wire control requires operator intervention to restart the VFD after a fault or loss of power.

C. The internal power supply shall incorporate an automatic current fold-back that protects the internal power supply if incorrectly connected or shorted. The transistor logic outputs shall be current limited and shall not be damaged if shorted or excess current is pulled. See below for external power supply requirements.

D. All logic connections shall be furnished on pull apart terminal strips.

E. There shall be (2) two software assignable analog inputs with interference filtering. The analog inputs shall be software selectable and consisting of user defined configurations: 4-20 mA or 0-10 V.

F. There shall be five software assignable logic inputs that shall be selected and assigned in the software. The selection of assignments shall consist of forward, reverse, jog, plus/minus speed (2 inputs required), setpoint memory, preset speeds (up to 8 inputs),

auto/manual control, controlled stop, terminal or keypad control, output contactor when applicable (2 inputs required), motor switching, and fault reset.

G. There shall be a minimum of two (2) software assignable analog outputs with interference filtering (see plans for additional requirements). The analog outputs can be selected and assigned in the software. The analog output assignments shall be proportional to the following motor characteristics: frequency, current, power torque, voltage and thermal state. The output signal shall be user defined configurations: 4-20 mA or 0-10 V.

H. A minimum of two voltage-free Form C relay output contacts shall be provided. One of the contacts shall indicate VFD fault status. The other contact shall be user assignable. Refer to plans for additional requirements.

I. There shall be a hardware input/output extension module available that also provides interlocking and sequencing capabilities. The module shall be fully isolated and housed in a finger-safe enclosure with pull apart terminal strips. The module shall add logic inputs, analog inputs, relay outputs, and analog outputs as required by wiring diagrams shown on plans. All of the I/O shall be user assignable in the software as previously defined.

J. The VFD shall have a control power source from the 120V CPT. When an input isolation contactor is provided, the 120V CPT shall be powered from upstream of the input isolation contactor such that control power to the VFD is maintained when the input isolation contactor is opened.

K. The peripheral VFD control circuitry shall be operated at 120 Vac 60 Hz from a control power transformer included within the enclosure.

L. Operator devices shall be door mounted, functions/types as shown on drawings.

M. All operator devices shall be remote-mounted using supplied 120 Vac control logic. Clearly labeled terminals shall be provided for field installation.

N. All wiring shall be clearly identified on each end to match the wiring diagram(s) provided with the VFD.

O. Refer to Specification Section 26 24 19 (Motor Control Centers) or Specification Section 26 29 00 (Manufactured Control Panels) as applicable for all operator device and control component requirements (for pushbuttons, indicator lights, selector switches, relays, control wiring, etc).

2.14 COMMUNICATIONS

A. The VFD shall be able to be connected to communication network type(s) as indicated on plans or required by the SCADA Integrator (exact network/protocol type(s) required shall be as directed by the facility SCADA Integrator). Where no specific network connections are specified on plans or required by the SCADA Integrator, the VFD shall be provided with at least one of the following network communication:
    a. Ethernet IP

B. The communication shall be able to provide access to the control, to the adjustment and to the supervision of the VFD.

C. No additional compensation will be granted to provide gateways, network components, etc. to properly communicate with the facility SCADA system. Equipment supplier is responsible for verifying all network connection requirements with the SCADA Integrator prior to bid.

2.15 INPUT SURGE PROTECTION

A. Each drive that does not have an upstream isolation contactor, and is not mounted within an MCC that has its own main bus surge protection shall be provided with a 3-phase, line-side surge protection device rated 80kA (per phase) or greater. The lead length between the surge protection device and the drive terminals shall be 12" or less. The surge protection device shall be designed / located / isolated such as to prevent / limit potential physical damage to other components within the enclosure if the surge protection device fails.

PART 3 - EXECUTION

3.1 TESTING

A. All incoming material shall be inspected and/or tested for conformance to quality assurance specifications.

B. All subassemblies shall be inspected and/or tested for conformance to quality assurance specifications.

C. Each completed unit shall be functionally tested prior to shipment to assure conformance to the specifications.

3.2 DELIVERY, STORAGE AND HANDLING

A. Handling and shipment of the equipment shall be in such a manner to prevent internal component damage, breakage, and denting and scoring of the enclosure finish.

B. Equipment shall be stored indoors in a clean, dry environment as directed by the equipment supplier. Energize anti-condensation space heaters if so required.
   1. Verify that the location is ready to receive work and the dimensions are as indicated.
   2. Do not install VFD equipment until the building environment can be maintained within the service conditions required by the manufacturer.

3.3 INSTALLATION

A. Installation shall comply with manufacturer's instructions, drawings and recommendations.

B. A job-specific, custom wiring diagram for each VFD unit shall be provided to the contractor prior to installation for making the appropriate electrical connections. The wiring diagram shall clearly show all control components connected to the VFD (whether the components are mounted internal or external to the VFD enclosure). All wires and terminal blocks shall be clearly labeled. A laminated copy of the final wiring diagram for each unit shall be installed inside the door of the associated unit.

C. Operations and Maintenance Manuals shall be provided to the owner for all VFD components, control wiring, etc.

D. Operations and Maintenance Manuals shall include hardcopy printouts of all device settings and programming.

E. For safety, reliability, and continuity of warranty, any modifications, alterations, etc. required to conform to the requirements of this specification shall be performed by the VFD manufacturer only. Distributor modifications, third party packaging, etc. of a manufacturer's standard product are specifically disallowed.

3.4 START-UP AND TRAINING

A. The services of a qualified manufacturer's service representative shall be provided to install, test, and start up all VFD's furnished under this specification. The schedule of the startup(s) shall be determined by the contractor.

B. Services shall include a minimum of eight (8) hours of field/classroom training for owner's personnel on routine operation and maintenance of the specified units.

3.5 SPARE PARTS

A. The following spare parts shall be provided at no extra cost to the Owner:
   1. One of each type and size of control fuse.
   2. Three of each type and size of power fuse.

END OF SECTION 26 29 23

SECTION 26 50 00 – LIGHTING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Lighting Fixtures

B. Drivers

1.2 SUBMITTALS

A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/deviations from detailed contract requirements will be understood to indicated that the contractor/supplier intends to meet all contract requirements. Refer to specification section 26 05 00 for additional requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of Contractor to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.

B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.

C. All lighting fixtures shall be so designed and shall have drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by engineer, at contractor’s expense.

D. All fixtures installed such as to create penetrations through fire rated ceiling or wall assemblies shall be labeled as suitable for that purpose or installed with covers, tenting or other means as required to maintain the fire rating of the assembly.

2.2 LED LUMINAIRES

A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the lighting fixture.

B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color temperature, distribution pattern, operational life, and CRI as shown on drawings.

C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.

D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.

E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail "open" such as to prevent fixture operation after a surge protection failure.

F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.

G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

2.3 STEMS/PENDANTS

A. Hangers shall be approved ball aligner type swivel, 30 degrees from vertical with swivel below canopy.

B. Stems/Pendants shall be rigid conduit unless specified otherwise on plans. Proposed stem/pendant types shall be submitted for review prior to shipment of light fixtures from factory.

C. Stems/Pendants shall be provided as required to prevent swaying of fixtures due to HVAC system airflow or other similar occurrences.

D. Shall be painted the same color as the fixture trim unless noted otherwise.

2.4 MANUFACTURER

A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.

B. Drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTING FIXTURES

A. Support:

1. Support of all lighting fixtures shall be responsibility of electrical contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.

B. Coordination:
   1. Contractor shall coordinate all dimensions & locations of light fixtures prior to rough-in to ensure proper fit and coordination with other trades.
   2. Contractor shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

END OF SECTION 26 50 00

SECTION 27 05 00 – AUXILIARY SYSTEM CABLES, 0-50V

PART 1 - GENERAL

1.1 DESCRIPTION

A. Cables rated for 0V-50V application

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless specified otherwise, all cables within the scope of this specification section shall:
   1. Be rated for exposed cable tray installation.
   2. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
   3. Be UL-rated for the proposed application.
   4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation. Conductors with green insulation shall not be used for conductors other than ground.
   5. Utilize copper conductors.
   6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
   7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
   8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

2.2 INSTRUMENTATION CABLING

A. In addition to above requirements, and unless specified otherwise, Instrumentation cabling shall:
   1. Be #16awg minimum.
   2. Be rated for 300V.
   3. Have aluminum foil shielding.
   4. Have stranded, twisted conductors.
   5. Have PVC insulation/jacket with ripcord.
   6. Be manufactured by Belden, AlphaWire or General Cable.

2.3 CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:
   1. Be rated for 600V.
   2. Be industrial grade.
   3. Have stranded conductors.
   4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.

5. Be manufactured by Belden, AlphaWire or General Cable.

2.4 CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:
   1. Be rated for 300V.
   2. Be shielded if so recommended by the system supplier/integrator.
   3. Have twisted conductors.
   4. Have plenum-rated insulation/jacket with ripcord.
   5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

2.5 NETWORK CABLING

A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Routing:
   1. All wires and cables shall be installed in conduit or within MCC wireways unless specifically noted otherwise.
   2. End bushings shall be provided on both ends of all raceway terminations.
   3. No splices shall be pulled into conduit.
   4. No cabling shall be pulled until conduit is cleaned of all foreign matter.

B. Excess Cabling:
   1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

C. Terminations:
   1. All conductors/cabling (including spare conductors) shall be properly terminated unless specifically directed otherwise. See below for general termination hardware requirements.
   2. Cabling shall be neatly formed, bundled and tied at all terminations.

3.2 SPLICES/CONNECTIONS/TERMINATIONS:

A. Network Cabling:
   1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

B. Control Cabling:
   1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal

Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.

C. Shielded cabling:
   1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.
   2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

3.3 LABELING

A. Refer to Specification Section 26 05 53 for all labeling requirements.

END OF SECTION 27 05 00