

**INVITATION FOR BID**  
**March 20, 2026**

INVITATION FOR BID NUMBER	IFB 26-014
PROJECT #	IE-106 MAWSS
NAME OF BID	Myers Water Treatment Plant Electrical Query
BIDS WILL BE RECEIVED AT	MAWSS Bid Box East Visitor Entrance 4725 Moffett Road Mobile, AL 36618  If sending bids by UPS/Fed Ex, deliver to the Warehouse: 1610 Shelton Beach Rd. Ext., Mobile, AL 36618
MANDATORY PREBID MEETING	9:30 am on March 26, 2026, at HE Myers WTP located at 1475 Hubert Pierce Rd., Mobile, AL 36608
BID OPENING DATE	April 10, 2026
BID CLOSING TIME	10:30 am Central Time
AWARD WILL BE MADE BY	Total Cost & Lead Time
MATERIAL DELIVERED TO	HE Myers Water Treatment Plant 1475 Hubert Pierce Rd. Mobile, AL 36608
ADDITIONAL INFORMATION CONTACT	Richard Muniz (251 )344-2022 Ext. 702 or Email: <a href="mailto:Richard.muniz@isaiahengineering.com">Richard.muniz@isaiahengineering.com</a> Nate Everett (251) 344-2022 Ext. 708 or Email: <a href="mailto:Nate.everett@isaiahengineering.com">Nate.everett@isaiahengineering.com</a>
APPLICABLE SDP POLICY	17-01

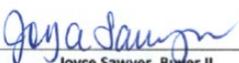
Sealed bids must be in the Purchasing Department no later than the time specified in order to be considered. Submissions received after the deadline will not be considered. Envelopes must bear the name of the supplier, company address and the words “IFB 26-014 Myers WTP Electrical Query” or “IFB 26-014 NO QUOTE.” Facsimile or email bids will not be accepted.

All bids must be submitted on the attached forms, or your bid will be disqualified. Bidder shall furnish all the information required by the solicitation. The bidder’s name must be typed or printed on the bid sheet and signed by the bidder or appropriate authorized executive officer of the bidder’s company. Bidders must initial any changes or erasures. Bidders should retain a copy of bids for their records.

Bidders shall acknowledge receipt of all addenda to this solicitation by signing and returning each addendum or by identifying the addendum number and the date on the bid form. Failure to acknowledge receipt of any addendum by a bidder will result in rejection of the bid if MAWSS determines that the addendum contains information that materially changes the requirements.

All bids shall be quoted FOB Destination, freight prepaid with no additional charges. Unless otherwise specified in the bid, all prices will be on a firm-fixed price basis and are not subject to adjustments based on costs incurred. MAWSS reserves the right to reject any or all bids submitted, to waive any informality in any bid or in the bid process, or to terminate the bid process at any time, if deemed by MAWSS to be in MAWSS’s best interest.

A Purchase Order and this “Invitation for Bid” with “Specifications,” “Conditions,” “Bid Form,” signed by the successful bidder’s authorized representative, and all attached drawings and other documents furnished by MAWSS to the bidders with the Invitation for Bid in order to illustrate the contract requirements, will constitute a contract for the goods and/or services to be purchased.

  
Joyce Sawyer, Buyer II  
Board of Water and Sewer Commissioners

## IFB 26-014 MYERS WTP ELECTRICAL QUERY CONDITIONS

The Board of Water and Sewer Commissioners of the City of Mobile will accept bids for the **Myers WTP Electrical Query** in our Purchasing Department Bid Box located at the East Visitor Entrance at 4725 Moffett Road, Mobile, AL. 36618 **no later than 10:30 a.m.** local time on **Friday, April 10, 2026**. Bids will be opened immediately after bid closing time in the Operations Center Board room located at the East Visitor Entrance. Award will be by **Total Cost & Lead Time**. The bidder offers and agrees, if this bid is accepted, to furnish the items as defined in the specifications for the unit price set opposite each item. Pricing shall be FOB Mobile, Alabama. All items shall be delivered to **HE Myers WTP at 1475 Hubert Pierce Rd., Mobile, AL 36608** or to the job site as needed. The bidder shall state the expected length of delivery time on the Bid Form.

**A mandatory Pre-Bid meeting** will be held between representatives of Contractor and representatives of MAWSS prior to the bid opening. The Pre-Bid meeting is scheduled for **9:30 am on Thursday, March 26, 2026**, at HE Myers WTP located at 1475 Hubert Pierce Rd., Mobile, AL 36608.

Plans and Specifications may be inspected at the office of **Isaiah Engineering, Inc.**, Consulting Engineers, located at 413 Azalea Rd., Ste C, Mobile, AL. Electronic Plans and Specifications may be obtained via e-mail for review only from **Isaiah Engineering, Inc.**, Telephone: (251)344-2022. Copies of the Plans, Specifications, and other Contract Documents may be obtained from Isaiah Engineering, Inc., located at 413 Azalea Rd., Ste C, Mobile, AL, upon a non-refundable payment of **\$100.00** per set. No Contract Documents will be issued later than twenty-four (24) hours prior to bid submission time.

No substitution for items to be provided pursuant to this contract shall be permitted during the contract period without the express written consent of MAWSS. All items provided shall be for commercial use and for the purposes reflected in the contract documents. No bid on closed out or discontinued item(s) will be accepted. Item(s) that have a determinable shelf life must be disclosed at the time of bid submittal. Bidder understands and agrees that quantities will be purchased by MAWSS on an "as needed" basis to replenish inventory. MAWSS shall not be committed to the purchase of a pre-established minimum quantity for any one item.

Bidder understands that his/her bid shall be good and may not be withdrawn for a period of sixty (60) calendar days after the scheduled closing time for receiving bids. A bidder may not modify its bid after bid opening. Errors in the extension of unit prices stated in a bid or in multiplication, division, addition or subtraction in a bid may be corrected by the MAWSS Purchasing Buyer prior to award. In such cases, unit prices shall not be changed.

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

It is the responsibility of the bidder to determine prior to the bid opening whether any amendment, additions, deletions or changes of any type have been made to this Invitation for Bid, Conditions, Specifications, Bid Form or any of the other bid documents. Bid documents and any amendments made to this bid will be posted on our website at [www.mawss.com](http://www.mawss.com).

A copy of the SDP (Supplier Diversity Program) policy that applies to this Invitation For Bid can be furnished upon request. It is the responsibility of the bidder to read and make efforts to meet the goals of this policy. Please contact the Supplier Diversity Department at [supplier.diversity@mawss.com](mailto:supplier.diversity@mawss.com) for any questions regarding this policy. **Bidders MUST acknowledge receipt of this policy by submitting the SDP Policy Acknowledgement and the Subcontracting Plan/Good Faith Effort form with the bid proposal, regardless if using a Diverse Contractor/Supplier or not.** Contractors are required to use Contractors/Suppliers only in the areas for which the Contractors/Suppliers are certified.

**Invoicing Requirements:** MAWSS requires additional information for all work performed and services provided. On the vendor's invoice for payment should be a detailed listing of work performed, services provided, dates completed, locations involved, and any other pertinent information needed to verify the work and/or services were completed in accordance to the bid specs. This additional information can be supplied in the form of detailed invoices, work orders, checklists or any other documents used to track the work performed or services provided but details must be included on the actual invoice. A copy of the invoice and these additional details must be sent to the "ADDITIONAL INFORMATION CONTACT" found on Page 1 of the bid documents and a copy emailed to Accounts Payable at [AcctsPayable@mawss.com](mailto:AcctsPayable@mawss.com).

**END OF CONDITIONS**

Board of Water and Sewer  
Commissioners of The City  
Of Mobile, Alabama



## **Myers Plant Electrical Query Project TECHNICAL SPECIFICATIONS**

ISAIAH ENGINEERING INC. PROJECT NO.

IE-106 MAWSS

IFB 26-014

**PREPARED FOR**

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



**PREPARED BY**

Isaiah Engineering Inc.  
413-C Azalea Road Mobile, Alabama 36609  
Tel.:251.344.2022 Fax: 251.494.3022  
Email:info@isaiahengineering.com



March 2026

Bid Set No.-----

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

**Proposal, Contract Documents and Specifications**

**Myers Water Treatment Plant Query Project**

**ISIAAH ENGINEERING INC. PROJECT NO. IE-106 MAWSS  
IFB 26-014**

Isaiah Engineering Inc.  
413-C Azalea Road Mobile, Alabama 36609  
Tel.:251.344.2022 Fax: 251.494.3022  
Email:info@isaiahengineering.com

**March 2026**

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([WWW.MAWSS.COM/doing-business-with-us/standard-specifications](http://WWW.MAWSS.COM/doing-business-with-us/standard-specifications))

## INFORMATION FOR BIDDERS

**No bid will be accepted or read from a bidder who is not on the list of entities who have picked up a set of Plans and Specifications for this project. Only entities which have picked up a set of Plans and Specifications from Isaiah Engineering Inc. and placed their names on the list of plan holders will be allowed to bid on this project. This does NOT include an electronic set of plans and specifications received via email for review. Bids must be submitted upon the standard forms, furnished by the Board of Water & Sewer Commissioners of the City of Mobile, Alabama, included in the Project Specifications.**

Guarantee will be required with each bid for at least 5% of the amount of the bid not to exceed \$10,000 filed in the form of a certified check, Bid Bond, or irrevocable Letter of Credit acceptable to the Owner payable to the Board of Water & Sewer Commissioners of the City of Mobile, Alabama. Bid Bonds shall include certification that the bonding company is listed in Circular 570 of the U. S. Treasury Department. The name, address, telephone number, and contact person for the bonding company shall also be included.

The Contractor shall furnish either a "Contract Bond" and a "Labor and Material Bond" or an irrevocable "Letter of Credit" acceptable to the Owner. All bonds and letters of credit shall be for 100% of the contract price.

Bids must be submitted upon the Standard forms furnished by the Board of Water & Sewer Commissioners of the City of Mobile, Alabama, included in the Project Specifications. Bidders shall be listed as plan holders.

The right is reserved, as the interest of the Owner may require, to reject any and all bids and to waive any informalities in bids received. **Failure to complete and sign the "Proposed Subcontracting Plan" in the Proposal will be cause for rejection of bid. In the event that no subcontractors will be used, the form shall read zero and shall be signed.**

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

**Failure to complete the "SSO and Unpermitted Discharge Prevention Notification" in the Proposal will be cause for rejection of bid.**

**MAWSS  
MYERS WATER TREATMENT PLANT ELECTRICAL QUERY**

**BASE BID**

<u>ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE DOLLARS/CENTS</u>	<u>TOTAL DOLLARS/CENTS</u>
BD-1	MOBILIZATION <b>(SHALL NOT EXCEED 3% OF THE TOTAL BID)</b>	LS	1		
MS-1	250 HP, 460V, 3Ø, VARIABLE FREQUENCY DRIVE (VFD)	EA.	1		
MS-2	#350 KCM (AWG)	LF	500		
MS-3	#3 (AWG)	LF	200		
MS-4	3" RIGID GALVANIZED STEEL CONDUIT	LF	20		
-	-	-	-		
SUBTOTAL GENERAL WORK \$					
ALL WORK SUBTOTAL \$					

**ALTERNATE BID**

<u>ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>	<u>UNIT PRICE DOLLARS/CENTS</u>	<u>TOTAL DOLLARS/CENTS</u>
MS-1	250 HP, 460V, 3Ø, VARIABLE FREQUENCY DRIVE (VFD)	EA.	2		
SUBTOTAL ALTERNATE BID \$					
ALTERNATE BID SUBTOTAL \$					

**Estimated Equipment Lead Time** \_\_\_\_\_

**Estimated Start Date for Installation** \_\_\_\_\_

**Estimated Time of Completion** \_\_\_\_\_

Company Name \_\_\_\_\_ Payment Terms \_\_\_\_\_

Address \_\_\_\_\_ City, State, Zip \_\_\_\_\_

Submitted By \_\_\_\_\_ Title \_\_\_\_\_

Please Print

Phone \_\_\_\_\_ Email Address \_\_\_\_\_

Please Print

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

Signature \_\_\_\_\_ Date \_\_\_\_\_

**PROPOSAL**

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

Submitted: \_\_\_\_\_  
(Date)

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

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

Myers Water Treatment Plant Electrical Query  
PROJECT NO. IE-106MAWSS / IFB 26-014

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

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

The quantities for bid items listed on the Proposal sheet are estimated quantities only for the purpose of comparing bids. Any differences between these estimated quantities and actual quantities required for this Contract shall not be taken as a basis for claims by the Contractor for extra compensation. Compensation will be based on the lump sum or unit prices and actual construction quantities.

The Bidder further proposes and agrees hereby to commence the Work with an adequate force, plant and equipment at the time stated in the notice to the Contractor from the Engineers to proceed, and fully complete performance within **ninety (90)** consecutive calendar days from and after the date stated in said notice.

The undersigned further agrees that, in case of failure on his part to execute the said Contract and the bond within 10 consecutive calendar days after written notice being given of the award of the Contract, the check or bid bond in the amount of 5 percent of this bid, not to exceed \$10,000, accompanying this bid, and the monies payable thereon, shall be paid into the funds of the Board of Water and Sewer Commissioners of the City of Mobile, Alabama as liquidated damages for such failure; otherwise the check or bid bond accompanying this Proposal shall be returned to the undersigned:

Attached hereto is a certified check on the \_\_\_\_\_

\_\_\_\_\_ Bank of \_\_\_\_\_

or a Bid Bond for the sum of \_\_\_\_\_

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

made payable to the Board of Water and Sewer Commissioners of the City of Mobile, Alabama.

By \_\_\_\_\_  
(Legal Signature)

\_\_\_\_\_  
(Printed Name and Title)

Witness: \_\_\_\_\_  
(Legal Signature)

Witness: \_\_\_\_\_  
(Legal Signature)

CONTRACTOR'S LICENSE NO:

\_\_\_\_\_

BIDDER acknowledges receipt of the following ADDENDA

\_\_\_\_\_

Failure to fully complete this page and include a handwritten signature may be cause for rejection of bid.

SSO AND UNPERMITTED DISCHARGE PREVENTION NOTIFICATION:

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

<u>Estimated Volume Spilled</u>	<u>Penalty Amount</u>
0 to 10,000 gallons	\$1,000
10,001 to 25,000 gallons	\$2,000
25,001 to 50,000 gallons	\$2,500
50,001 to 150,000 gallons	\$3,000
More than 150,000 gallons	\$6,000

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

---

Contractor Name

---

Street

---

City

---

Signature

# BID BOND

**KNOW ALL MEN BY THESE PRESENTS:**

That we, \_\_\_\_\_  
(Name of Bidder)

\_\_\_\_\_, as Principal,  
(Address)

and \_\_\_\_\_  
(Name of Surety)

of \_\_\_\_\_, as Surety,  
(Address)

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

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

**Myers Water Treatment Plant Electrical Query**

Project No. IE-106 MAWSS/IFB 25-014

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

- (a) executes and delivers a Construction Contract with the required Contract and Labor and Material (each in the form contained in the Bid Documents and properly completed in accordance with the bid) and delivers evidence of insurance as prescribed in the Bid Documents, or
- (b) fails to execute and deliver such Construction Contract with such Bonds and evidence of insurance, but pays the Owner the difference, not to exceed the Penal Sum of this Bond, between the amount of the Principal's Bid and the larger amount for which the Owner may award a Construction Contract for the same Work to another bidder,

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

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

**SIGNED AND SEALED** this \_\_\_\_\_ day of \_\_\_\_\_.

**ATTEST:**

\_\_\_\_\_

**PRINCIPAL:**

\_\_\_\_\_

By \_\_\_\_\_  
Name and Title

**ATTEST:**

\_\_\_\_\_

**SURETY:**

\_\_\_\_\_

By \_\_\_\_\_  
Name and Title

**SDP POLICY ACKNOWLEDGEMENT\***

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

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

**The following documentation must be included in the bid proposal.**

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

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

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

Company Name \_\_\_\_\_

Submitted By \_\_\_\_\_ Title \_\_\_\_\_  
Please Print

Signature \_\_\_\_\_ Date \_\_\_\_\_

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

## SUBCONTRACTING PLAN/GOOD FAITH EFFORT\*

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

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

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

Copies of MAWSS SDP Policy 16-01 (for public works projects), SDP/Supplier Diversity Policy 17-01 (for contracts for other goods and services), and links to organizations that have information on SDPs/Diverse Suppliers can be found by visiting our website at <https://www.mawss.com/bids/supplier-diversity-program/>.

STATE WHAT PERCENTAGE OF THE WORK FOR THIS CONTRACT YOU PLAN TO AWARD TO SDP/DIVERSE SUPPLIER SUBCONTRACTORS AND/OR VENDORS	TOTAL %
ESTIMATED TOTAL DOLLAR AMOUNT TO BE AWARDED TO SDP/DIVERSE SUPPLIER	TOTAL \$
AMOUNT BID FOR THIS CONTRACT	TOTAL \$

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

SUBCONTRACTOR/VENDOR NAME	SDP/DIVERSE SUPPLIER (Yes or No)	% OF CONTRACT	CERTIFICATION GROUP (ALDOT, ADECA, SRMSDC, BCIA)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

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

### GOOD FAITH EFFORT ACKNOWLEDGEMENT/AFFIDAVIT

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

\_\_\_\_\_  
BIDDER/COMPANY

\_\_\_\_\_  
BY (Signature)

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

**IFB 26-014 MYERS WTP ELECTRICAL QUERY  
INSURANCE REQUIREMENTS**

- A. **General:** The Supplier shall provide insurance in accordance with the required specifications. A current certificate of insurance must be provided with your bid. MAWSS does not need to be named as an additional insured on this certificate until bid is awarded.
- B. **Supplier Coverage:** The Supplier shall not commence work under this Contract until he has obtained all insurance required under the following paragraphs and until such insurance has been approved by the Owner, nor shall the Supplier allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been obtained and approved. If the subcontractor does not take out insurance in his own name, the Supplier shall provide such insurance protection for the subcontractor and such subcontractor's employees.
- C. **Casualty Insurance:** The following insurance coverages (with limits not less than specified herein) shall be maintained by the Supplier for the duration of the Contract, affording coverage for any claim arising out of Supplier's operations herein, whether by the Supplier or by any subcontractor or by any Employee or Agent of either:
1. Claims of employees under Worker's Compensation and other similar employee benefit acts, including claims because of bodily injury, occupational sickness or disease, or death.
  2. Claims arising out of bodily injury, sickness, disease, or death of any person other than employee.
  3. Claims for damages arising out of libel, slander, false arrest, detention or imprisonment, malicious prosecution, defamation or violation of right of privacy, wrongful entry or eviction or other right of private occupancy, including claims as a result of an offense related to the employment of a claimant by Contractor (so-called "Personal Injury").
  4. Claims arising out of damage to or destruction of tangible property, including loss of use.
  5. The Supplier shall furnish certification of insurance and policies verifying that the above coverages are in effect before commencing any work, and that each policy is endorsed to give the Owner 30-day notice in writing in the event of cancellation or material change therein.

Policies of Insurance shall state that the Owner and the Owner's employees be named as additional insureds on the Supplier's Automobile Liability and Commercial General Liability policies. In respect to Worker's Compensation, a Waiver of Subrogation shall be issued in favor of the Owner. If Supplier is exempt from Worker's Compensation, the Supplier shall provide written documentation as to why they are exempt. Where applicable, the U.S. Longshore and Harbor Workers' Compensation Act Endorsement shall be attached to the policy. Where applicable, the Maritime Coverage Endorsement (to include coverage under Jones Act) shall be attached to the policy. Both the U. S. Longshore and Harbor Workers and the Maritime Coverage shall have limits equal to or greater than the employer's liability coverage.

6. Rated by AM Best – A- or better. For non-admitted companies, a rating of A or better by AM Best.
  - a. At the discretion of the Board, worker's compensation insurance may be placed through a qualified worker's compensation self-insurance fund.

b. **Limits of Liability:**

<b>Worker's Compensation</b>	Statutory
<b>Employers' Liability</b>	\$500,000 Each Accident \$500,000 by Disease, Policy Limit \$500,000 by Disease, Each Employee
<b>Commercial Automobile</b>	\$1,000,000 Each Accident Bodily Injury and Property Damage Combined Business Auto Includes All Owned, Leased, Hired and Non-Owned Automobiles
<b>Commercial General Liability</b>	\$1,000,000 per Occurrence \$1,000,000 Personal & Advertising Injury \$2,000,000 General Aggregate per Project \$2,000,000 Products & Completed Operations Aggregate \$100,000 Fire Damage Liability

**Umbrella Liability:** In addition to the basic limits previously set out for Commercial General Liability, Products and Completed Operations, Automobile Liability and Worker's Compensation, coverage shall be issued with a "pay on behalf of" wording, including Personal Injury and other extensions, and provide coverage at least as broad as that afforded by the primary insurance policies.

**Extensions (only if applicable):**

Blanket Contractual Liability	Blanket Collapse and Underground Coverage
Personal Injury	Broad Form Property (including Completed Operations)
Host Liquor Liability	Employees as Additional Insureds
Non-owned Watercraft Liability	Incidental Medical Malpractice
Worldwide Products	Extended Bodily Injury (Assault and Battery)
Fire Legal Liability	
Newly Acquired Organizations	

When and if the use of explosives for blasting purposes appears necessary or desirable, such methods shall not be undertaken without written authorization of the Owner, and then only provided that acceptable extensions of liability coverage have been obtained specifically to include the explosion ("X") hazard and the collapse ("C") hazard. The policy of general liability shall include the special underground property damage coverage (providing the so-called "U" hazard) on a blanket basis.

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

**END OF INSURANCE**

**CONTRACT**

THIS CONTRACT is made and entered into the \_\_\_\_\_ day \_\_\_\_\_ of 20\_\_\_\_, by and between

\_\_\_\_\_,  
(Contractor)

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

**WITNESSETH:**

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

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

MAWSS Myers Water Treatment Plant Electrical Query Project

**Isaiah Engineering, Inc.**

PROJECT NO. IE-106 MAWSS / IFB 26-014

2. The Contractor shall commence performance of this Contract on a date to be specified in a written order of the Owner, and shall fully complete all Work hereunder within 90 consecutive calendar days from and after said date. "Work" shall include all construction, delivery of materials and items, and other obligations of the Contractor under this Contract.
3. The Owner hereby agrees to pay to the Contractor for the faithful performance of the Contract, subject to additions and deductions as provided in the Specifications or Proposal, in lawful money of the United States, as follows:

Approximately \_\_\_\_\_ Dollars  
(\$ \_\_\_\_\_), in accordance with lump sum and unit prices set forth  
in the Proposal.

4. The Owner shall make monthly partial payments to the Contractor on the basis of a duly certified and approved estimate of Work performed during the preceding calendar month by the Contractor. The Owner may retain five percent (5%) of the amount of such estimate until fifty percent (50%) of the Work has been completed. The Owner may hold this retainage until all Work has been performed strictly in accordance with this Contract and until all Work has been accepted by the Owner and all obligations of the Contractor under this Contract have been satisfied.
5. Upon submission by the Contractor of evidence satisfactory to the Owner that all payrolls, material bills, and other costs incurred by the Contractor in connection with the performance of this Contract have been paid in full, and upon satisfaction by the Contractor of all other obligations under this Contract, final payment on account of this Contract shall be made within thirty (30) days after the completion by the Contractor of all Work covered by this Contract and the acceptance thereof by the Owner.
6. The parties hereto acknowledge and agree that time is of the essence for performance of this Contract. The parties agree that in the event the Work is not completed within the time herein specified, the Owner may retain from the compensation otherwise to be paid to the Contractor the sum of \$ 600 per day for each day thereafter, Sundays and holidays included, that the Work remains uncompleted. The parties agree that this dollar amount represents their agreed upon stipulation as to the damages which the Owner will have sustained per day due to the failure of the Contractor to complete the Work within the time stipulated, and that this amount is not a penalty.
7. Sanitary Sewer Overflows (SSOs) and unpermitted discharges of wastewater to the environment are a violation of Federal and State laws, as well as a breach of this Contract. The Contractor and associated subcontractors, vendors, and other entities and persons chosen to complete this Work shall not, through act or omission, discharge untreated wastewater to the environment or cause wastewater to back up into a building. The Contractor hereby agrees to indemnify the Owner if the Owner is assessed penalties or fines, receives regulatory actions, or has actions, suits, or claims filed against it by any person or entity as a result of SSOs or unpermitted discharges caused by act or omission of the Contractor and/or any entity or person performing work in the Contractor's behalf under this Contract. The Contractor shall reimburse the Owner for all damages, losses, penalties, fines, judgments, interest, costs, and expenses of every nature incurred by the Owner, including but not limited to reasonable attorney's fees, arising from or associated with each SSO or unpermitted discharge. In addition, the Contractor shall pay the penalties identified in the Contract Documents to the Owner for SSOs and unpermitted discharges caused by the Contractor and/or any entity or person performing Work in the Contractor's behalf, regardless of whether such SSOs or discharges reach waters of the State.
8. The parties hereto further agree hereto that if at any time after the execution of this Contract and the Contract Bond hereto attached for its faithful performance, the Owner shall deem the surety or sureties upon such bond to be unsatisfactory, or if, for any reason, such bond ceases to be adequate to cover the performance of the Work, the Contractor shall at its expense, within five (5) days after the receipt of notice from the Owner to do so, furnish an

additional bond or bonds in such form and amount and with such surety or sureties as shall be satisfactory to the Owner. In such event, no further payment to the Contractor shall be due under this Contract until such new or additional security for the faithful performance of the Work shall be furnished in manner and form satisfactory to the Owner.

9. The parties acknowledge that the Contract Documents governing the Contract between them for this project include, but may not be limited to, this Contract form; all other materials furnished with the Invitation for Bids; the Contractor's Proposal and all documents and items submitted with Contractor's bid for this project; the Owner's Standard Specifications, General Conditions, and Special Conditions; all plans and drawings for the project; other documents which may be incorporated into any of the foregoing by reference; and Change Orders for the project, if any.
10. In addition to the Indemnity obligations set forth in the Contract Documents, in the event that legal action is brought by any person or entity against the Owner, its employees, or agents, asserting negligent act(s) or omission(s), violation of law or regulation, or other legally culpable conduct of the Contractor, the Contractor's employees, subcontractors, successors, or anyone for whose acts or omissions the Contractor may be legally liable, whether said action be for property damage, personal or bodily injury, wrongful death, environmental harm, or anything else, the Contractor shall reimburse the Owner for the Owner's reasonable attorneys' fees, costs, and expenses incurred in defending against same, through all trial and appeals relative to thereto, including but not limited to cost of bonds and interest in the event of an appeal, whether filed by the Owner or by another party.
11. Should the Owner employ legal counsel to prevent a breach of this Contract, or to otherwise assert or protect its rights under this Contract, the Contractor shall reimburse the Owner for the Owner's reasonable attorneys' fees, costs, and expenses incurred, including those incurred through any appeal, if the Owner is the prevailing party.
12. The Contractor acknowledges that the Contractor has had an opportunity to fully review with Contractor's legal counsel all requirements of this Contract, including this Contract form and all other Contract Documents. The Contractor acknowledges that the Contractor is fully familiar with the requirements for the project which is the subject hereof.
13. The Contractor shall comply with all laws, ordinances, and regulations applicable to the project.
14. The Contractor shall maintain in full force and effect all insurance required by the Contract Documents.
15. The parties hereto acknowledge that the Contract Documents reflect their complete understanding as to the provisions of this Contract and shall supersede all prior understandings, representations, and communications between them, whether oral or written, as to its subject matter.

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

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

ATTEST

By \_\_\_\_\_  
(Legal Signature)

By \_\_\_\_\_  
(Legal Signature)

\_\_\_\_\_  
(Printed Name and Title)

\_\_\_\_\_  
(Printed Name and Title)

**CONTRACTOR:** \_\_\_\_\_

By \_\_\_\_\_  
(Legal Signature)

By \_\_\_\_\_  
(Legal Signature)

\_\_\_\_\_  
(Printed Name and Title)

\_\_\_\_\_  
(Printed Name and Title)

(SEAL)

# **CONSTRUCTION SPECIFICATIONS**

## **SPECIAL PROVISIONS**

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

Update of Standard Specifications  
Section 10

Special Provisions

**Updated May 2021**

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## **PART 1 GENERAL**

### **10.1.01 ALABAMA ACT NO. 84-228**

- A. Contractors shall comply with the requirement of Act No. 84-228 of the Legislature of the State of Alabama. Particular attention is directed to Section 2 of Act. No. 84-228 which requires submission of certain documents with the bid documentation and failure to submit such documents may be cause for rejection of the Contractor's bid.
- B. As a convenience to bidders, the law is presented below; however, it shall be the Contractor's responsibility to satisfy himself as to the responsibilities under the law.
  - 1. ALABAMA LAW (Regular Session, 1984) - Act No. 84-228 - S. 135-Senators Foshee, and Teague - AN ACT
- C. Relating to contracts and contractors; to give preference to resident contractors who bid on public work projects except where federal funds are involved.
- D. Be it Enacted by the Legislature of Alabama:
  - 1. Section 1. In the letting of public contracts in which any state, county or municipal funds are utilized, except those contracts funded in whole or in part with funds received from a federal agency, preference shall be given to resident contractors and a nonresident bidder domiciled in a state having laws granting preference to local contractors shall be awarded Alabama public contracts only on the same basis as the nonresident bidder's state awards contracts to Alabama contractors bidding under similar circumstances; and resident contractors in Alabama as defined in Section 39-2-12, Code of Alabama 1975, be they corporate, individuals or partnerships, are to be granted preference over nonresidents in awarding of contracts in the same manner and to the same extent as provided by the laws of the state of domicile of the nonresident.
  - 2. Section 2 Nonresident bidders must accompany any written bid documents with a written opinion of an attorney at law licensed to practice law in such nonresident bidder's state of domicile, as to the preferences, if any or none, granted by the law of that state to its own business entities whose principal places of business are in that state in the letting of any or all public contracts.
  - 3. Section 3. A summary of this law shall be made a part of the advertised Specifications of all projects affected by this law.
  - 4. Section 4. The provisions of this Act are severable. If any part of this Act is declared invalid or unconstitutional, such declaration shall not affect the part which remains.
  - 5. Section 5. All laws or parts of laws which conflict with this Act are hereby repealed.
  - 6. Section 6. This Act shall become effective immediately upon its passage and approval by the Governor, or upon its otherwise becoming law.
    - a. Approved April 30, 1984 Time: 4:30 P.M.

10.1.02 REVISIONS

- A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Guide Specifications to insure the latest and most current revision is applied to the project.

10.1.03 REFERENCED SECTIONS

- A. Section 5 – Control of Work
- B. Section 8 – Prosecution and Progress
- C. Section 12 – Sanitary Sewer Standard Specifications
- D. Appendix F – Project Sign Detail
- E. Appendix I – Trench Widths and Paving Cut-Backs

10.1.04 REFERENCED CODES AND STANDARDS

- A. State of Alabama Highway Department - Standards for Accommodating Utilities on Highway Rights-of-Way
- B. Federal Specification QQ-B-71a – Steel for Concrete Reinforcement
- C. AWWA C105 – Polyethylene Encasement for Ductile Iron Pipe Systems

10.1.05 SMALL AND SMALL UNDERUTILIZED BUSINESSES

- A. The Board’s Small and Underutilized Business office will assist Bidders upon request in meeting the requirements of the Contract.

10.1.06 STATE HIGHWAY OR RAILROAD PERMITS

- A. Where a pipe is to be laid along or under a State Highway or railroad, the Contractor shall furnish the Highway Department or railroad company with bonds and insurance as required to secure a permit. The cost of bonds and insurance will be borne by the Contractor.

10.1.07 PERMITS, CERTIFICATES, LAWS AND ORDINANCES

- A. The Contractor shall, at his own expense, procure all permits, certificates and licenses required of him by law for the execution of his work. He shall comply with all federal, state, and local laws, ordinances and rules and regulations relating to the performance of the Work.
- B. The Contractor shall also comply with Ordinance 55-012 “An Ordinance Regulating All Excavation Work of Existing Streets and Improvements Within Public Rights-of-Ways,” adopted by the Board of Water and Sewer Commissioners of the City of Mobile, Alabama, April 3, 1970.

10.1.08 WAGE RATES

- A. The construction of said Project shall in all respects conform to all applicable requirements of federal, state and local laws and ordinances.

10.1.09 SEQUENCE OF OPERATIONS

- A. The Contractor shall start at the point or points designated by the Owner and shall proceed with the sequence of construction as the Owner directs. The Contractor shall provide sufficient crews to lay pipe and complete the job within the time specified. In general, each line shall be laid, tested and placed in service before another line is started.

10.1.10 PROJECT DOCUMENTATION

- A. General: Prior to start of construction, the project right-of-way or easement shall be documented by the use of photographs or videotapes. Pictures (photo or video), in color, shall be taken at 100 feet on centers and shall be taken along the centerline of the Project looking up station. At least one station marker shall be visible for identification purposes and station markers shall be set up by the Contractor. During the course of documentation, any features or items of interest or importance which may be encountered shall be photographed or videotaped. Prints or tapes shall be delivered to the Engineer within one week after they are made.
- B. Photographs: Clear, legible photographs shall be taken by a skilled technician using a wide angle lens. Each photograph shall be identified on the back with Project number, location, date and time of day that photograph was taken. One color print approximately 4" x 6" and the negative shall be delivered to the Engineer.
- C. Videotapes: The purpose of the videotape recordings shall be a supply of continuous visual and audio record of problem areas, items, and features found within any particular area. This videotape record may be supplemented with photographs to exactly identify and locate specific bad features or items.
  - 1. The videotape recordings shall be capable of recording and reproducing a picture having not less than 500 lines of resolution. The videotape recorder shall be one on which both sound and video information can be recorded utilizing a VHS video cassette system. The videotape recording shall be made on magnetic tape which shall produce a visual image equal to or better than the quality of the picture on a television monitor. The replay of the recorder video information, when reviewed on a monitor/receiver, shall be free of electrical interference and shall produce clear, stable images. To ascertain that the equipment to be used in this Work meets the stated minimum requirements, a videotape of a suitable test pattern will be required prior to initiation of Work.
  - 2. The audio portion of the composite signal shall be sufficiently free of electrical interference and background noise to provide an oral report that is clear and completely and easily discernible. The audio portion of the tape report shall be recorded by the operating technician on the audio-video tapes as they are being produced and shall include the location or identification of the section being viewed, the station-to-station direction of travel, the distance traveled on the specific run, and any problems encountered.

3. Videotape recordings shall be enclosed in a vinyl plastic container which shall clearly indicate the date the tape was taken, and the designated section(s) of the Project contained on the tape.
4. There shall be no separate payment for photographic and/or videotape work.

#### 10.1.11 REPORTS, RECORDS AND DATA

- A. The Contractor and each of his subcontractors shall submit to the Owner such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records, and other data as the Owner may request concerning work performed or to be performed under this Contract.

#### 10.1.12 SIGNS

- A. Before starting and during construction on any Project, the Contractor shall place at both ends of the section signs approximately 8 feet long by 4 feet high. The signs shall be worded approximately as shown in Appendix F.

#### 10.1.13 CONSTRUCTION WITHIN STATE HIGHWAY RIGHT-OF-WAY

- A. The requirements of the State of Alabama Highway Department “Standards for Accommodating Utilities on Highway Rights-of-Way” are hereby made a part of these Specifications for all utility construction within rights-of-way for roads or highways under the jurisdiction of the State of Alabama Highway Department.

#### 10.1.14 CUTTING OF TREES WITHIN PUBLIC RIGHTS-OF-WAY

- A. The Contractor shall obtain a permit from the Mobile Tree Commission prior to trimming or removing any trees located within public rights-of-way. When large tree limbs and roots are encountered, the Contractor shall take precautions to protect by tunneling, or pushing the pipe under the roots so as not to damage them. No additional payment shall be made for this Work, but it shall be included in the unit price bid for related items.

#### 10.1.15 DEWATERING

- A. The Contractor shall remove any water which may be found or may accumulate in the trenches and shall perform all work necessary to keep them clear of water while the foundations are being laid, the masonry being constructed, or pipe laying is in progress. Such removal shall be accomplished by means of a well point system or other approved means. Comprehensive plans for dewatering operations, if used, shall be submitted prior to installation. No extra payment will be made for dewatering.

#### 10.1.16 WEATHER CONDITIONS

- A. In the event of temporary suspension of work or during inclement weather, or whenever the Owner shall direct, the Contractor will, and will cause his subcontractor to protect carefully his and their Work and materials against damage or injury from weather. If any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors to protect his work, such materials shall be removed and replaced at the expense of the Contractor.

10.1.17 LOCKS AND KEYS

- A. All locks to be furnished under this Contract shall be keyed alike and 5 keys shall be delivered to the Engineer for distribution to the Owner. Padlocks shall be furnished by the Owner except where noted otherwise on the Plans and in these Specifications.

10.1.18 TIGHTNESS OF WATER CONTAINING WALLS

- A. All basins and tanks are hydraulic structures and shall be watertight. Each tank shall be filled with water to full depth and kept full 24 hours for observation. The Contractor shall exercise every precaution to secure watertightness by careful mixing and placing of the concrete so as to obtain a homogeneous mixture at maximum density, without air pockets or voids, using the minimum practical amount of water in the mix. Extreme care shall be used to secure continuity of water stops at expansion and construction joints, sealing off holes from wall ties, etc., and thoroughly placing concrete about wall sleeves, wall pipes and other obstructions. The Contractor shall fix all leaks. The Contractor shall furnish test water at his own expense.

10.1.19 EXTENSION OF CONTRACT TIME

- A. Unless specifically waived by the Owner, when an extension of contract time is granted by the Owner to the Contractor to complete the Work under this Contract, the Contractor shall pay any additional engineering Cost or other Cost accrued to the Owner as a result of the extension of time granted.
- B. The requirements of Specification Paragraph 5.14, Paragraph 5.15 and Paragraph 8.10 will be strictly adhered to upon completion of the Work.

10.1.20 CLEAN-UP

- A. The job shall be kept clean at all times. Loose dirt shall not be allowed to clog ditches or cover sidewalks. Soft clay or other undesirable material removed from the trenches shall be removed from the streets, sidewalks or ditches. The Owner reserves the right to demand that the Contractor's forces be diverted to this clean-up at any time that condition of streets, driveways, sidewalks, or private property warrants such diversion. Such diversion of Contractor's forces will not entitle the Contractor to any extension of time or additional compensation.

10.1.21 BRANDS OF EQUIPMENT AND MATERIALS

- A. When referenced the name of a certain brand, make or manufacturer is to denote the quality standard of the equipment or material, and is to convey the general style, type, character and quality. Whenever a material or article required is specified or shown on the Plans by using the proprietary product or of a particular manufacturer or vendor, any material or article which will meet the design criteria and is equal in function and durability as determined by the Engineer will be considered.

10.1.22 AFFIDAVIT OF COMPLIANCE

- A. Suppliers of pipe and fittings shall furnish in triplicate to the Owner, an affidavit stating that all pipe and fittings furnished under this Contract conform to the

requirements as set forth in these Specifications. Unless specified otherwise, all materials shall be new, unused and without defect.

#### 10.1.23 SUPERVISION OF INSTALLATION AND THE GUARANTEE

- A. The Contractor shall employ a factory trained engineer to supervise the installation and alignment of all items of mechanical and electrical equipment. He shall see that all items of equipment are installed, piped, and wired, meeting the requirements of the Plans and Specifications and in accordance with the manufacturer's recommendations. The Contractor shall place all equipment in satisfactory operation and demonstrate such. The Contractor shall guarantee the satisfactory operation of all apparatus and machinery against defects in workmanship, material, and installation for a period of one year from the date of final acceptance. The Owner will give notice of observed defects with reasonable promptness and the Contractor shall remedy any defects in the Work and pay for any damage to other work resulting therefrom. Neither the final certificate of payment nor any provision in the Contract Documents nor partial or entire use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with the Contract Documents, or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.
- B. The manufacturer's representatives shall submit to the Engineer in writing a document stating the Contractor has installed the equipment properly and in accordance with the manufacturer's recommendations.

#### 10.1.24 MANUFACTURER'S CERTIFICATION

- A. To assure that manufacturers and suppliers are aware of the use to which their equipment and products will be subjected, the Contractor shall require the manufacturer or manufacturer's representative to place the following certification on submittal data transmittals:
  - 1. "This is to certify that we have examined the Plans and Specifications for this Project and have ascertained that this equipment or material is suitable for the Purpose and use intended. \_\_\_\_\_ Authorized Signature"

#### 10.1.25 MAXIMUM TRENCH WIDTH:

- A. The maximum trench widths set the limit of payment for various items listed in Paragraph 10.1.26, "Basis of Payment and Method of Measure." The maximum trench widths and typical paving cut-backs which are applicable to these Specifications are shown in Appendix I.

#### 10.1.26 BASIS OF PAYMENT AND METHOD OF MEASURE:

- A. General: The unit price bid for the various items shall be compensation in full for furnishing all materials, labor, equipment, and incidentals for the item in place complete in every detail. There will be no direct payment for clearing, excavating, bracing, caulking, backfilling, clean-up, restoration of property, testing or other items of work necessary for the installation of the item, with the exception of the removal and replacement of pavement as paid for under a separate item.

B. Item Number Clarification: Bid items are numbered according to the following classifications: Sanitary Sewer Items (SS); Water Line Items (WL); Backfilling Items (BF); Pavement Items (PA); General Construction Items (GC); and Erosion Control Items (EC).

1. **SS-1. Stacks and Laterals:** The unit price bid for this item will be compensation in full for furnishing and installing 1 linear foot of the various types and sizes of pipe used for stacks and laterals complete in place with plug or cap for each stack or lateral. Any bends required for alignment of laterals will be paid for under this item on the linear foot basis. Where stacks or laterals are to serve property that is lower than the street, the stacks and laterals shall be placed at such depth as required to serve such property and no additional payment will be made for extra depth required for stacks and laterals.
2. **SS-2. Sewer Pipe:** The unit price bid for the various sizes, types and depths of sewer pipe shall be compensation in full for 1 linear foot of pipe complete in place, the measurement being made parallel to and along the centerline of the installed pipe. Where pipe starts and terminates in manholes, the measurements will be from center to center of manholes. Where pipe starts or terminates without manholes, the measurement will be made from end of pipe to center of next manhole. No deduction in length will be made for space in the line occupied by manholes or fittings. The depth of cut to be paid for will be the vertical distance from the ground surfaces on the centerline of pipe to the pipe invert. Elevated pipelines shall be paid for at the unit price for 1 linear foot of the various size and type of elevated pipe. Retained joints in elevated gravity sewers shall be included in price bid per linear foot of elevated sewer pipe. Pipe in encasement or culverts shall be paid for at 0'-6' depth.
3. **SS-3. Wyes and Tees for Sewers:** The unit price bid shall be compensation in full for furnishing and installing 1 wye or tee complete in place, including covers or plugs if required.
4. **SS-4. Manholes:** The unit price shall be compensation in full for 1 lined manhole of the various sizes, types, and depths complete in place. The depth of manhole shall be established as the vertical distance from the surface of ground on centerline to the lowest pipe invert. Where the manhole protrudes above the surface of the ground, the depth shall be established as the vertical distance from the top of manhole cover to the lowest pipe invert. The unit price shall include the joints of pipe and plugs used as stubouts, where shown on the Plans.
5. **SS-5. Drop Connections at Manholes:** Payment for this item will be made on the basis of the unit price per linear foot; the measurement will be made between the invert of the incoming sewer and the invert of the manhole. The unit price bid shall be for 1 linear foot of drop connection complete in place including sewer pipe and fittings of the proper size, extension of the concrete manhole base, the concrete or masonry encasement and all incidentals. This payment is to be in addition to the payment for the standard manhole.
6. **SS-6. Force Main:** The unit price bid for the various sizes, classes, and types of pipe will be compensation in full for furnishing all labor, material, equipment, and incidentals (including locked mechanical joint retainer glands when set forth in the Proposal) necessary to lay and complete 1 linear foot of the pipe regardless

of depth of cover in accordance with these Specifications. Measurement for payment will be made along the centerline of installed pipe, such measurement starting at the centerline of installed pipe and terminating at the centerline of junctions or to the various ends. There will be no deductions in measured length for specials, fittings, or valves installed in the line.

7. **SS-7. Sewage Pumping Station:** The lump sum bid shall be compensation in full for 1 sewage pumping station complete within the limits shown on the Plans including, but not limited to structures, piping, grading, topsoil, grassing, fencing, electrical work, pumps, motors and starters, and incidentals necessary for a complete installation.
8. **SS-8. Abandon Existing Manhole:** The unit price bid for this item shall be compensation in full for breaking and filling 1 abandoned sewer manhole complete in accordance with the Plans. The unit price shall include furnishing, placing, and compacting sand or sand-clay backfill to the original grade. There will be no additional payment made for sand or sand-clay backfill material used under this item. Existing manholes to be abandoned shall be broken off to a depth of 3 feet below the ground line. Removing and cleaning the manhole frame and cover, and transporting frame and cover to the Owner's warehouse will be paid for separately.
9. **SS-9. Concrete Plug for Sewer Pipe:** The unit price bid for this item shall be compensation in full for all labor, material, equipment, and incidentals necessary for 1 concrete or masonry plug of the various sizes used to plug an abandoned sewer pipe.
10. **SS-10. Concrete for Sewer Construction:** The unit price bid shall be compensation in full for 1 cubic yard of concrete for pipe cradles, foundations, thrust blocks, or encasement for pipe. Concrete used for manhole bottoms, concrete manholes, and for repaving will not be paid for under this item. (No payment will be made for this item where the Contractor elects to use it for his own convenience or to fill overcuts).
11. **SS-11. Ductile Iron or Cast Iron Fittings for Sewers/Force Mains:** The unit price bid for fittings for sewers or force main items will be compensation in full for furnishing and installing 1 pound of ductile iron or cast iron fittings complete in place (including locked mechanical joint retainer glands when set forth in the Proposal). Payment will be based on catalog weight of the manufacturer supplying fittings. Bolts and other miscellaneous items will not be included in the weights.
12. **SS-12. Running Board:** The unit price bid for this item shall be compensation in full for furnishing and laying 1 linear foot of the assembled running board including splices, battens, and wedges complete in place.
13. **SS-13. Saddle Piles:** The unit price bid for this item shall be compensation in full for furnishing and driving 1 linear foot of pile to grade, ready for receiving the running board.

14. **SS-14. Haunching for PVC Sewer Pipe:** The unit price bid for this item shall be compensation in full for 1 linear foot of haunching complete in place, measured along the centerline of the installed pipe.
15. **SS-15. Air and Vacuum Valve Assembly:** The unit price bid for this item shall be compensation in full for furnishing and installing 1 air and vacuum valve assembly complete in place, including the air and vacuum valve, valve back flush system, tapping saddle or tee, washed gravel, concrete pipe type valve pit, cast iron manhole type cover, fittings, connecting valving and piping, and all excavations, compaction, backfilling and clean-up, and incidentals necessary for a complete installation.
16. **SS-16. Internal Video Inspection:** The unit price bid for this item shall be compensation in full for furnishing all labor, equipment, materials, and incidentals necessary to complete 1 linear foot of television inspection of the new various size sewers for the purpose of documenting lateral locations.
17. **WL-1. Water Pipe:** The unit price bid for the various sizes and types of pipe will be compensation in full for furnishing all material, labor, equipment, and incidentals (including locked mechanical joint retainer glands when set forth in the Proposal) necessary to lay and complete 1 linear foot of pipe, in accordance with these Specifications. Measurement for payment will be made along the centerline of installed pipe, such measurement starting at the centerline of installed pipe and terminating at the centerline of junctions or to the various ends. There will be no deductions in measured length for specials, fittings, or valves installed in the line.
18. **SWL-2. Ductile Iron or Cast Iron Water Fittings:** The unit price bid for this item will be compensation in full for furnishing all material, labor, equipment, and incidentals (including locked mechanical joint retainer glands when set forth in the Proposal) necessary to install and complete 1 pound of ductile iron or cast iron fittings in accordance with these Specifications. All fittings including sleeves, reducers, etc., will be included under this item. Bolts and other miscellaneous items will not be included in the weights. Payment will be based on catalog weight of the manufacturer supplying fittings.
19. **WL-3. Gate Valves:** The unit price bid for the various size and type gate valves will be compensation in full for furnishing all material, labor, equipment, valve box, and incidentals necessary to install and complete 1 gate valve in accordance with the Plans and Specifications.
20. **WL-4. Butterfly Valves:** The unit price bid shall be compensation in full for furnishing and installing 1 butterfly valve of the various sizes complete in every respect including valve, operator, valve box, and incidentals necessary for a complete installation.
21. **WL-5. Tapping Valves and Sleeves:** The unit price bid for the various size tapping valves will be compensation in full for 1 tapping valve and sleeve with valve box complete in place in accordance with these Specifications.
22. **WL-6. Air Release Valve Assembly:** The unit price bid for this item shall be compensation in full for furnishing and installing 1 air release valve assembly

complete in place, including the air release valve, tapping saddle or tee, washed gavel, concrete pipe type valve pit, cast iron manhole type cover, fittings, connecting valving and piping, and all excavation, compaction, backfilling and clean-up, and incidentals necessary for a complete installation.

23. **WL-7. Valve Stem Extensions:** The unit price bid for the various size valve stem extensions will be compensation in full for furnishing all material, labor, equipment, and incidentals necessary to install and complete 1 linear foot of valve stem extension in accordance with Plans and Specifications.
24. **WL-8. Fire Hydrants:** The unit price bid for fire hydrants will be compensation in full for furnishing all material, labor, equipment, and incidentals necessary to install and complete 1 fire hydrant in accordance with these Specifications. Depth of bury shall be 3'6" except where shown otherwise on the Plans or in the Proposal.
25. **WL-9. Fire Hydrant Extension Section:** The unit price bid for this item will be compensation in full for furnishing all material, labor, equipment, and incidentals necessary to install one, 1-foot long fire hydrant extension section complete with bolts, gaskets, and stem extension.
26. **WL-10. Hydrant Valve Anchoring Tee:** The unit price bid for hydrant valve anchoring tees will be compensation in full for furnishing all material, labor, equipment, and incidentals necessary to install and complete 1 hydrant valve anchoring tee of the various sizes in place.
27. **W-11. Concrete for Water Lines:** The unit price bid shall be compensation in full for 1 cubic yard of concrete used for foundations, anchors thrust blocks, or encasement for pipe. Concrete used for repaving will not be paid for under this item.
28. **W-12. Salvage Existing D.I. or C.I. Water Pipe:** The unit price bid for this item will be compensation in full for furnishing all labor, equipment, and incidentals necessary to remove, clean properly for reuse, and to transport salvaged water piping to a place of storage in the City of Mobile, Alabama to be designated by the Board, 1 linear foot of the various size pipe. Pipe damaged through carelessness of the Contractor will not be paid for. Measurement will be made along the centerline of the pipe. No deduction in length will be made for valves or fittings and the removing of these items shall be included in the unit price bid for salvage of existing pipe. Contractor shall place an identifying mark on each piece of pipe with blue paint, "W" for water pipe.
29. **W-13. Lowering Existing Water Line:** The unit price bid for this item will be compensation in full for furnishing all labor, equipment, and incidentals necessary to lower 1 linear foot of existing water lines (all sizes) at locations shown on the Plans or as designated by the Engineer, and to a depth that will afford ample clearance below proposed street or road construction and proposed drainage structures. Pipe damaged through carelessness of the Contractor will be replaced with new water pipe by the Contractor, at his expense. Measurement will be made along the centerline of the pipe. No deduction in length will be made for valves or fittings and the lowering of these items shall be included in the unit price bid for lowering existing water line. No extra compensation will

be allowed for necessary adjustment of fire hydrants attached to existing water lines to be lowered.

30. **W-14. Remove and Salvage Existing Water Meters and Boxes:** The unit price bid for this item will be compensation in full for furnishing all labor, equipment, and incidentals necessary to remove, clean, haul, and store 1 water meter and meter box from existing water lines to be abandoned or where water service is to be discontinued. Meters and meter boxes damaged through carelessness of the Contractor will not be paid for. The price bid for this item shall include transporting the salvaged items to a place of storage in the City of Mobile, Alabama to be designated by the Owner.
31. **WL-15. Remove and Relocate Water Meter and Meter Box:** The unit price bid for this item will be compensation in full for removing, transporting, and re-installing 1 existing water meter and meter box complete and ready for use in the new location as designated on the Plans or as directed in the field.
32. **WL-16. Remove and Relocate Fire Hydrant:** The unit price for this item will be compensation in full for removing, cleaning, transporting, and reinstalling 1 existing fire hydrant complete and ready for operation in the new location as designated on the Plans or as instructed in the field. The price shall also include repainting of the hydrant in accordance with these Specifications.
33. **WL-17. Corporation Stops:** The unit price bid for the various size corporation stops will be compensation in full for furnishing corporation stops, tapping water lines, installing, and completing in accordance with these Specifications. Stops shall be installed where specified. Corporation stops used for bleeding air and testing purposes will not be paid for.
34. **WL-18. Curb Stops:** The unit price bid for various size curb stops will be compensation in full for furnishing curb stops, installed and completed in accordance with these Specifications. Stops shall be installed where specified or instructed in the field.
35. **WL-19. Copper Service Pipe:** The unit price bid for furnishing and laying the various sizes of service pipe will be compensation in full for furnishing all materials, labor, equipment and incidentals necessary to lay and complete 1 linear foot of pipe in accordance with these specifications. Measurement will be made along the center line of installed pipe, such measurement starting at the center line of installed pipe and terminating at the center line of junctions or to the various ends. There will be no deductions in measured lengths for specials, fittings, or valves installed in the line. Adapters necessary to properly join the copper service pipe to corporation stops and curb stops shall be considered incidental to the unit price bid for this work and no separate payment shall be made for such.
36. **BF-1. Sand or Sand-Clay Backfill:** The unit price bid for this item will be compensation in full for 1 cubic yard of sand or sand-clay used for backfill, which shall include furnishing sand or sand-clay, backfilling, compacting, and hauling away surplus material.

- a. This item will be measured in place. The length authorized by the Engineer to be backfilled with sand or sand-clay, multiplied by the trench width for specified pipe diameter in accordance with Appendix I of these Specifications, multiplied by the average depth of backfill to the top of pipe and then converted to cubic yards, will be the amount paid for, regardless of the width or length removed, and replaced with sand or sand-clay.
37. **BF-2. Flowable Backfill:** The unit price for this item shall be compensation in full for furnishing and spreading 1 cubic yard of flowable backfill complete in place.
38. **PA-1. Removing and Preparation of Base for Flexible Pavement:** The unit price bid for this item shall be compensation in full for removing 1 square yard of flexible wearing surface and base and the preparation and placement of new base complete in place. In measuring this item for payment, the length removed multiplied by the specified trench width plus 18 inches will be the amount paid for, regardless of the width removed and replaced. No additional allowances will be made for bell holes or manhole.
39. **PA-2. Bituminous Wearing Surface for Patch Surfacing:** The unit price for this item shall be compensation in full for 1 square yard of bituminous concrete wearing surface placed at the rate of 1-1/4 inch square yard (or 1-1/2 inches in state and Mobile County right-of-way), including leveling, tack coat, pavement markings, and incidentals necessary for completion of the wearing surface.
40. **PA-3. Bituminous Wearing Surface for Full Width Street Surfacing:** The unit price bid for this item shall be compensation in full for 1 square yard of bituminous concrete wearing surface placed at the rate of 1-1/4 inch per square yard, including leveling, tack coat, pavement markings, and incidentals necessary for completion of the wearing surface.
41. **PA-4. Removing and Replacing Concrete Pavement:** The unit price bid for this item shall be compensation in full for removing and replacing 1 square yard of concrete pavement with Portland Cement Concrete Pavement complete in place including base course, saw cuts, pavement markings, and incidentals necessary for a complete installation of the concrete patch. In measuring this item for payment, the length removed multiplied by the width of pavement between saw cuts actually removed will be the amount paid for.
42. **PA-5. Temporary Asphalt Patch:** The unit price bid shall be compensation in full for 1 square yard of temporary asphalt patch complete in place including maintenance and removal prior to final concrete patch.
43. **PA-6. Replacement of Concrete Sidewalks or Ditch Paving:** The unit price bid for this item will be compensation in full for furnishing all material, labor, equipment, and incidentals to remove and replace 1 square yard of sidewalk under which pipe is laid. In measuring this item for payment the length removed multiplied by the trench width for the specific pipe diameter in accordance with Appendix I of this Specification will be the amount paid for, where the line crosses sidewalks regardless of the width removed and replaced. If the pipeline

is laid under and parallel with the sidewalk, the actual width of the sidewalk, up to a maximum of 5 feet, will be measured for payment.

44. **GC-1. Reef Shell Foundation:** The unit price bid for this item shall be compensation in full for furnishing, spreading, and compacting reef shell over the full width of trench to an 8 inch thickness for 1 linear foot of trench. (No payments will be made for this item where the Contractor elects to use it for his own convenience or to fill overcuts). At the Contractor's option, crushed stone, or slag may be used for foundation material in lieu of reef shell at no change in Contract Price. Gravel, crushed stone, slag, and reef shell are specified in other sections of the Specifications.
45. **GC-2. Crushed Slag or Crushed Stone Foundation:** The unit price bid for this item shall be compensation in full for furnishing, spreading, and compacting crushed slag, or crushed stone over the full width of trench to an 8 inch thickness for 1 linear foot of trench. (No payments will be made for this item where the Contractor elects to use it for his own convenience or to fill overcuts).
46. **GC-3. Mats:** The unit price bid for this item shall be compensation in full for furnishing and installing mats in lieu of foundation material for piping. Compensation shall be for the full width of the trench and for 1 linear foot of trench.
47. **GC-4. Restrained Joint Fitting:** The unit price bid shall be compensation in full for 1 positive or friction restrained joint fitting of the various sizes complete in place including tee head bolts, set screws, and gasket.
48. **GC-5. Rust Proof Rods for Anchorage:** The unit price bid for this item will be compensation in full for furnishing all material, labor, equipment, and incidentals necessary to install and complete 1 linear foot of anchor rod. The price shall include threading, bolts, and coating of the rod.
49. **GC-6. Rust Proof Clamps for Anchorage:** The unit price bid for this item will be compensation in full for furnishing all material, labor, equipment, and incidentals necessary to install and complete 1 clamp. The price shall include all bolts, nuts, and coating of the clamps.
50. **GC-7. Anchoring Couplings:** The unit price bid shall be compensation in full for each anchoring coupling of the various sizes complete in place.
51. **GC-8. Encasement Pipe:** The unit price bid for furnishing and installing encasement pipe (corrugated metal, welded steel or tunnel liner plate) will be compensation in full for furnishing all material, labor, equipment, and incidentals necessary to install and complete 1 linear foot of the encasement pipe of various sizes and types in accordance with the Plans and Specifications including sand fill. Measurement will be made along the centerline of the installed encasement pipe. The carrier pipe inside encasement pipe will not be included in the unit price bid for encasement pipe.
52. **GC-9. Concrete for Piers and Headwalls:** The unit price bid for this item will be compensation in full for 1 cubic yard of formed concrete used for headwalls, elevated piers, or other types of formed concrete. The unit price bid shall include

reinforcing steel, pipe straps, and anchor bolts. Measurements will be made of the complete structures.

53. **GC-10. Remove and Replace Concrete Curb and Gutter:** The unit price bid for this item shall be compensation in full for furnishing all equipment, labor, materials, transportation, handling, delivery and all incidentals necessary for removing and replacing 1 linear foot on concrete curb and gutter, concrete valley gutter or concrete curb, under which pipe is laid. Curb, gutter, and curb and gutter replaced shall be of the same type and thickness as that removed, with concrete, 3,000 psi minimum strength. The Contractor at his option may elect to bore or push piping liner under the existing concrete curb in lieu of removing and replacing concrete curb. If the Contractor elects to use this method, payment shall be the unit price bid to remove and replace concrete curb and gutter at the allowable trench widths.
54. **GC-11. Restoration of Property:** The lump sum bid shall be compensation in full for restoration of property within the various limits complete including, but not limited to replacement of sod in lawns and other sodded areas, replacement of ornamental shrubbery, clean-up, replacement of lawn decoration items and all other items of work required for restoration of property, except for removal and replacement of pavement and removal and resetting of fencing which will be paid for separately.
55. **GC-12. Remove and Reset Fencing:** The unit price bid shall be compensation in full for removing and resetting 1 linear foot of fence of the various types encountered. Measurement will be made for the length authorized to be removed and reset. Posts, fencing or other materials lost, damaged, or destroyed by the Contractor's operations shall be replaced with new material of the same type that existed prior to removal at the Contractor's expense. Fences that are removed and authorized by the Owner not to be reset will not be paid for.
56. **GC-13. Treated Timber Bracing:** The unit price bid shall be compensation in full for 1 board foot complete in place including all timber, bolts, washers, nuts, and incidentals necessary for a complete installation.
57. **GC-14. Caps for Pile Bents:** The unit price bid shall be compensation in full for 1 cap for pile bents complete in place including concrete, reinforcing steel, anchor bolts, sleeve nuts, anchor straps or cables, and coating of pipe anchorage.
58. **GC-15. Reinforcing Steel:** The unit price bid shall be compensation in full for 1 pound of reinforcing steel complete in place. Measurement of reinforcement will be made of the length of bars actually placed in accordance with the Plans or bar schedules approved by the Engineer, or in accordance with the instructions of the Engineer. The measured length will be converted to weights for the size of bars listed by use of the unit weights per linear foot stated in Federal Specification QQ-B-71a. Steel in laps indicated on the Plans or required by the Engineer will be paid for at the Contract Unit Price. No payment will be made for the additional steel in laps which are authorized for the convenience of the Contractor or for reinforcing steel in pile caps.
59. **GC-16. Polyethylene Sheath:** Where indicated on the Plans or where directed, the exterior of ductile iron pipe shall be covered with a sealed polyethylene

sheath in accordance with AWWA Specification C105. The unit price for the various sizes of this item shall be compensation in full for furnishing and installing 1 linear foot of sheath complete in place.

60. **EC-1. Grassing for Erosion Control:** The unit price bid shall be compensation in full for 1 acre of grassing for erosion control complete in place including ground preparation, fertilizing, seeding, and maintenance. Measurement will be made to the nearest tenth of an acre of the area actually grassed except that grassing areas outside of the construction easements will be considered the responsibility of the Contractor and will not be measured for payment.
61. **EC-2. Mulching:** The unit price bid shall be compensation in full for 1 acre of mulching complete in place. Measurement will be made to the nearest tenth of an acre of the area actually mulched except that mulching of areas outside of the construction easements will be considered the responsibility of the Contractor and will not be measured for payment.
62. **EC-3. Solid Sod:** The unit price bid for this item shall be compensation in full for 1 square yard of solid sod where specified.
63. **EC-4. Riprap:** The unit price shall be compensation in full for 1 square yard, 1 foot in thickness, of riprap complete in place. Price shall include shell or gravel used for choking riprap. Where depths greater than 1 foot are shown on the Plans or directed the quantity to be paid for will be increased in the proportions that the thickness bears to 1 foot, i.e., if thickness is 1.5 feet then the surface area will be multiplied by 1.5 to determine the quantity to be paid for.
64. **EC-5. Gravel Blanket for Riprap:** The unit price bid shall be compensation in full for 1 square yard, 6 inches in thickness, of gravel blanket for riprap complete in place.
65. **EC-6. Shell Blanket for Riprap:** The unit price bid shall be compensation in full for 1 square yard, 6 inches in thickness, of shell blanket for riprap complete in place.
66. **EC-7. Timber Ditch Checks:** The unit price for this item shall be compensation in full for 1 timber ditch check as detailed, complete in place.
67. **EC-8. Erosion Control Netting:** The unit price bid for this item will be compensation in full for furnishing and installing 1 square yard of erosion control netting, including all materials, equipment, tools, labor, and incidentals required to complete the item. Payment will be limited to a 20 foot total width.
68. **EC-9. Silt Fence:** The unit price bid for this item shall be compensation in full for all labor, material, equipment, and incidentals necessary for 1 linear foot of silt fence installed for temporary erosion control.
69. **EC-10. Hay Bales:** The unit price bid for this item shall be compensation in full for all labor, material, equipment, and incidentals necessary for 1 hay bale installed for temporary erosion control.

70. **EC-11. Geotextile Filter Blanket for Riprap:** The unit price bid for this item shall be compensation in full for all labor, materials, equipment, and incidentals necessary for the installation of 1 square yard of geotextile filter blanket, complete in place.

10.1.27 SPECIAL HANDLING OF PURCHASE ORDERS<sup>1</sup>

- A. The Board of Water and Sewer Commissioners is exempt from City, County, State and Federal sales tax for any hardware, equipment, and materials purchased for the installation of Capital projects. Contractors shall take this into consideration when preparing bids for capital projects. To ensure there are no taxes charged, Contractors are directed to do the following:
- B. Contractor shall contact the Alabama Revenue Department and apply for a tax exempt certificate for the specific project. The phone number for the Mobile office is 334-344-4737. The web site that explains the rules and regulations for tax exemption is [www.ador.state.al.us](http://www.ador.state.al.us), rule number 810-6-5.02.
1. Contractor shall mail copies of the tax exempt certificate to all suppliers of all hardware, equipment, and material.
- C. Contractor shall state on each purchase order to the supplier that material, equipment, and hardware for installation owned and operated by the Board of Water and Sewer Commissioners of the City of Mobile are exempt from County and State sales tax as per the number on the certificate of exemption.

10.1.28 BYPASS PUMPING

- A. The Contractor shall submit three (3) copies of a Bypass Pumping Plan as required in Section 12.1.26 to the Engineer for review prior to proceeding with bypassing operations. Bypassing operations shall not commence until a Bypass Pumping Plan is reviewed by the Engineer.
- B. The Contractor shall be responsible for and shall indemnify and hold the Owner harmless for any sanitary sewer overflow occurring as the result of the work performed. The Contractor is responsible for any sewer discharge to the surface due to failure in bypass hose, piping or other equipment. Any discharge from air release valves shall be contained. The Contractor shall ensure that raw sewage will not spill on the ground or into any bodies of water, channel, or conduits of conveyance of storm water during the performance of this work. Prior to removal of the bypass pumping pipe, the Contractor shall empty all sewage into the sewer system. The Contractor is responsible for and shall indemnify and hold the Owner harmless for any sanitary sewer discharge to the environment due to a failure in the equipment and/or bypassing operation.
- C. In the event of a sanitary sewer overflow, the Contractor shall contact the Owner's representative immediately and complete the Contractor Unpermitted Discharge Reporting Form provided by the Owner. If there is a sanitary sewer discharge to the environment due to a failure in the equipment and/or bypassing operation, the Contractor shall reimburse the Owner all costs related in any way to compliance with laws, regulatory requirements, and/or court orders and decrees associated with the overflow or discharge event. The costs include, but not limited to, water quality

monitoring, signage, cleanup, fines, legal fees, claims, and reporting. In the event that the peak flows during the bypass pumping operation exceed the projected peak flow figures previously provided by the Owner and a sanitary sewer overflow event occurs when the Contractor's equipment is operating correctly, the Contractor will not be held liable for the sanitary sewer overflow or discharge.

- D. The Contractor shall be liable for and shall indemnify and hold the Owner harmless for any other claims made as a result of the sanitary sewer discharge or sanitary sewer overflow due to a failure in the equipment and/or bypassing operation and shall be responsible for all requirements imposed by the regulatory agencies. In addition, the Contractor shall provide notification consisting of one (1) quarter page advertisement published in the Mobile Register within 3 days of the sanitary sewer overflow. The advertisement shall be written in a manner reasonably designed to inform fully the customers of the Owner. The notice shall be conspicuous and shall not use unduly technical language, unduly small print or other methods which would frustrate the purpose of the notice. The notice shall disclose all material facts regarding the subject including the amount of the overflow, when the overflow occurred, any potential adverse health effects, the population at risk, reasonably known methods of mitigation known, and steps being taken to mitigate problems with the by-pass pumping operation. Each notice shall contain the name, business address, and telephone number of the Contractor.

**END OF SECTION**

# **SECTION 26**

**ELECTRICAL SPECIFICATIONS**

## SECTION 26 05 05

### GENERAL PROVISIONS FOR ELECTRICAL SYSTEMS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals shown, specified, and required to complete the electrical Work, which includes:
  - a. Providing conduits, inserts and other electrical items to be embedded in concrete, built into walls, partitions, ceilings, and panels provided by others.
2. Demolition: Responsibility for electrical demolition is indicated in Section 01 12 13, Summary of Work.

###### B. Coordination:

1. Review installation procedures and schedules under other Specification Sections and coordinate with other trades the installation of electrical items that will be installed with or within formwork, walls, partitions, ceilings, and panels.
2. Coordination and Intent of Electrical Drawings:
  - a. Dimensions on Drawings related to equipment are based on equipment of certain manufacturers. Verify the dimensions of equipment furnished to space available at the Site and allocated to the equipment.
  - b. Drawings show the principal elements of the electrical Work, and are not intended as detailed working drawings for the electrical Work. Drawings supplement and complement the Specifications and other Contract Documents relative to principal features of electrical systems.
  - c. Equipment and devices provided under this Contract shall be properly connected and interconnected with other equipment and devices for successful operation of complete systems, whether or not all connections and interconnections are specifically mentioned or shown in the Contract Documents.
  - d. Drawings are provided for CONTRACTOR's guidance in fulfilling the intent of the Contract Documents CONTRACTOR shall comply with Laws and Regulations, including safety and electrical codes, and provide materials, equipment, appurtenances, and specialty items necessary for complete and operable systems.
3. Field Coordination:
  - a. Provide materials, equipment, and services to interface with existing circuits. Field-verify system and equipment requirements prior to modifying existing systems.

- b. Coordinate the interface of equipment with OWNER's personnel and field conditions.
  - c. Field-compare existing starter and panel control circuit terminations from record documents with existing circuits.
  - d. Field-trace existing circuits as required to interface the equipment provided.
  - e. Field-identify terminations for starters and panel controls for follow function for re-connection.
- C. Related Sections:
- 1. Section 02 41 00, Demolition.
  - 2. Section 09 91 00, Painting.
  - 3. Section 40 61 13, Process Control Systems General Provisions.
- D. Materials and Equipment Installed by CONTRACTOR but Furnished by Others:
- 1. Motor Control Center
  - 2. Pump Station Control Panel.
- E. Area Classifications:
- 1. Materials, equipment, and incidentals shall be suitable for the area classification(s) shown, specified, and required.
  - 2. Wet Locations: Comply with NEC and NEMA requirements for wet locations. Enclosures in wet locations shall comply with NEMA 4 unless specified otherwise.
  - 3. Corrosive Locations: Comply with NEC and NEMA requirements for corrosive locations. Enclosures in corrosive locations shall conform to NEMA 4X requirements unless specified otherwise.
  - 4. Hazardous Locations: Comply with NEC requirements for the Class and Division designated.
  - 5. Dusty Locations: Indoor areas not designated as hazardous, corrosive, or wet are dusty locations. Comply with NEC and NEMA 12 requirements unless specified otherwise.

## 1.2 QUALITY ASSURANCE

- A. Qualifications:
- 1. Electrical Subcontractor:
    - a. Electrical Subcontractor shall have not less than five years experience installing electrical systems of the types required for the Project.
    - b. Electrical Subcontractor shall possess a valid electricians' and contractors' license in the jurisdiction where the Site is located.
    - c. Submit the following information for not less than three successful, completed projects: project name and location; year completed; name and contact information for: prime contractor for whom electrical Subcontractor worked, project owner, and project engineer or architect, including addresses and telephone numbers.

- B. Component Supply and Compatibility:
  - 1. Materials and equipment similar to each other shall be from the same manufacturer for uniformity.
- C. Regulatory Requirements:
  - 1. Permits: Refer to the General Conditions, Supplementary Conditions, and other parts of the Contract Documents for responsibilities relative to obtaining and paying for permits, licenses, and inspection fees.
  - 2. Codes: Refer to Section 01 42 00, References, for indication of applicable codes.

### 1.3 SUBMITTALS

- A. General:
  - 1. To the extent practical, submit Shop Drawings and other CONTRACTOR submittals for each Specification Section into the smallest number of submittals possible. Do not furnish partial submittals.
  - 2. Review of equipment submittals does not relieve CONTRACTOR of responsibility for providing complete and successfully operating systems.
- B. Action Submittals: Submit the following:
  - 1. Shop Drawings:
    - a. Internal wiring diagram and drawings indicating all connections to components and numbered terminals for external connections.
    - b. Dimensioned plan, section, elevations, and panel layouts showing means for mounting, conduit connection, and grounding.
    - c. List of components including manufacturer's name and catalog number (or part number) for each.
    - d. Point-to point interconnection wiring diagrams.
  - 2. Product Data:
    - a. Manufacturer's name and product designation or catalog number.
    - b. Electrical ratings.
    - c. Manufacturer's technical data and specifications.
    - d. Manufacturer's indication of compliance with applicable reference standards.
    - e. Painting and coating systems proposed.
  - 3. Test Procedures: Proposed testing procedures and testing limitations for source quality control testing and field quality control testing.
- C. Informational Submittals: Submit the following:
  - 1. Manufacturer's Instructions:
    - a. Installation data and instructions.
    - b. Instructions for handling, starting-up, and troubleshooting.
  - 2. Source Quality Control Submittals: Results for required shop testing.
  - 3. Field Quality Control Submittals: Results for required field testing.
- D. Closeout Submittals: Submit the following:

1. Record Documentation:
  - a. System Record Drawings: Include the following:
    - 1) One-line wiring diagram of the electrical distribution system.
    - 2) Actual, in-place conduit and cable layouts with schedule of conduit sizes and number, and size of conductors.
    - 3) Layouts of the power and lighting arrangements and the grounding system.
    - 4) Control schematic diagrams, with terminal numbers and control devices identified, for all equipment.
  - b. Point-to-Point Interconnection Wiring Diagram Drawings: Include the following:
    - 1) External wiring for each piece of equipment, panel, instrument, and other devices and wiring to control stations, lighting panels, and motor controllers.
    - 2) Numbered terminal block identification for each wire termination.
    - 3) Identification of the assigned wire numbers for all interconnections.
    - 4) Identification of wiring by the conduit tag in which the wire is installed.
    - 5) Terminal, junction, and pull boxes through which wiring is routed.
    - 6) Identification of equipment and the submittal transmittal number for equipment from which wiring requirements and termination information was obtained.
  - c. Record documents shall indicate final equipment and field installation information.

## PART 2 – PRODUCTS

### A. Performance Criteria:

1. Electrical equipment shall be capable of operating successfully at full-rated load, without failure, with ambient outside air temperature of 32 degrees F to 120 degrees F and an elevation of 50 feet above mean sea level.
2. Unless specified otherwise, electrical equipment shall have ratings based on 75 degrees C terminations.

B. Testing Laboratory Labels: Electrical material and equipment shall bear the label of Underwriters' Laboratories, Inc. or other nationally recognized, independent testing laboratory, where standards have been established and label service applies.

## PART 3 – EXECUTION

### 3.1 INSPECTION

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

### 3.2 INSTALLATION

- A. General:
  - 1. Install materials and equipment in accordance with the Contract Documents, Laws and Regulations, approved (and accepted, as applicable) Shop Drawings and other CONTRACTOR submittals, and manufacturer's recommendations.
  - 2. Provide tools and equipment required to trace circuits necessary for proper execution of the Work.
  - 3. Define and identify all wiring, circuit terminations, and equipment to be modified to ensure proper interface of components. The Contract Price includes all costs associated with field services specified for a complete and functional system.
- B. Staging, Sequencing, and Coordination with Existing Facilities:
  - 1. Schedule, sequence, and install materials and equipment in accordance with Section 01 14 16, Coordination with Owner's Operations
  - 2. Perform the Work in a manner that will not interfere with the existing equipment and facilities or cause interruption of the functions of the Site, unless specified otherwise or otherwise allowed by OWNER.
  - 3. When operation of existing facilities and Site is disrupted due to CONTRACTOR's operations, comply with Section 01 14 16, Coordination with Owner's Operations, unless otherwise allowed by OWNER.
  - 4. Where the Work ties in with existing installations, take precautions and provide safeguards in connecting the Work to existing operating circuits to prevent interruption to existing circuits. Connection of Work to existing circuits shall be performed in the presence of OWNER and ENGINEER.
  - 5. Interruptions of existing circuits, not addressed in Section 01 14 16, Coordination with Owner's Operations, shall be coordinated with the OWNER who will determine the length of time a circuit may be de-energized to maintain the OWNER's processes in dependable and safe operation.

### 3.3 FIELD QUALITY CONTROL

- A. Field Quality Control – General:
  - 1. Perform field quality control for electrical Work in accordance with the Contract Documents.
- B. Site Tests:
  - 1. Prior to requesting certificate of Substantial Completion, demonstrate to ENGINEER that electrical systems and electrically-operated equipment installed or modified under the Contract operates in accordance with the Contract Documents and operates as required
  - 2. Perform the following operational tests on electrical systems:

- a. Operate power circuits to verify proper operation and connection to electrical systems materials and equipment, including mechanical key-interlocks for circuit breakers.
  - b. Remove and re-apply power supply to manual transfer equipment to verify operation.
  - c. Operate control circuits, including pushbuttons, indicating lights, and similar devices, to verify proper connection and function. Operate all devices, such as pressure switches, flow switches, and similar devices, to verify that shutdowns and control sequences operate as required.
  - d. Operate lighting systems and receptacle devices to verify proper operation and connections.
3. Prepare and submit report on the equipment demonstration and operating field quality control tests. Report shall include complete information on the tests performed and results.
- C. Manufacturer's Services:
1. Furnish at the Site qualified, factory-trained representative(s) of equipment manufacturers for the services indicated in the Contract Documents.

++ END OF SECTION ++

## SECTION 26 05 19

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install low-voltage conductors and cabling.
2. Types of cabling required include:
  - a. Insulated cable for installation in raceways.

##### 1.2 REFERENCES

###### A. Standards referenced in this Section are:

1. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.
2. ASTM B3, Specification for Soft or Annealed Copper Wire.
4. ASTM D3485, Specification for Smooth-Wall Coilable Polyethylene (PE) Conduit (Duct) for Preassembled Wire and Cable.
5. ASTM F2160, Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD).
6. NEMA TC 7, Smooth Wall Coilable Electrical Polyethylene Conduit.
7. UL 44, Thermoset-Insulated Wires and Cables.
8. UL 1277, Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

##### 1.3 QUALITY ASSURANCE

###### A. Regulatory Requirements: Comply with the following:

1. NEC Article 300, Wiring Methods.
2. NEC Article 310, Conductors for General Wiring.

##### 1.4 SUBMITTALS

###### A. Action Submittals: Submit the following:

1. Product Data:
  - a. Manufacturer's literature, specifications, and engineering data for low volt insulated cable proposed for use.

###### B. Informational Submittals: Submit the following:

1. Field Quality Control Submittals:
  - a. Written results of field insulation resistance tests.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Insulated Cable In Raceways:
1. Application: Use for circuits located indoors and outdoors.
  2. Manufacturers: Provide products of one of the following:
    - a. Southwire.
    - b. The Okonite Company.
    - c. American Insulated Wire
    - d. General Cable
    - e. Or equal.
  3. Material: Single conductor copper cable complying with ASTM B3 and ASTM B8 with flame-retardant, moisture- and heat-resistant insulation rated for 90 degrees C in dry or wet locations, listed by UL as Type XHHW-2 or RHW-2 complying with UL 44.
  4. Wire Sizes: Not smaller than No. 12 AWG for power and lighting and No. 14 AWG for 120-volt control circuits.
  5. Stranding: 600-volt cable shall be stranded, except that solid cable, No. 10 and smaller may be used for lighting circuits.
- B. Cable for Installation in Trays:
1. Manufacturers: Provide products of one of the following:
    - a. Southwire.
    - b. The Okonite Company.
    - c. Prysmian Cables & Systems.
    - d. General Cable.
    - e. Or equal.
  2. Material: Factory-assembled single- or multi-conductor control, signal, or power cable that bears UL label Type TC and are specifically approved for installation in cable trays. Overall jacket shall be sunlight-resistant PVC. Cable shall be rated for 90 degrees C wet or dry, complying with UL 44 and UL 1277.
- C. Cable Connectors, Solderless Type:
1. Products and Manufacturers: Provide products of one of the following:
    - a. T&B Sta-Kon.
    - b. Burndy Hylug.
    - c. Or equal.
  2. For wire sizes No. 4 AWG and above, use either compression type or bolted type with silver-plated contact faces.
  3. For wire sizes up to and including No. 6 AWG, use compression type. Alarm and control wire shall be terminated using forked type connectors at terminal boards.
  4. For wire sizes No. 250 KCMIL and larger, use connectors with at least two cable clamping elements or compression indents and provision for at least two bolts for joining to apparatus terminal.

5. Properly size connectors to fit fastening device and wire size. Connectors shall be rated for 90 degree C, 600 volts.

D. Cable Splices:

1. Products and Manufacturers:
  - a. Compression-Type Splices: Provide one of the following:
    - 1) Burndy Hylink.
    - 2) T&B Color-Keyed Compression Connectors.
    - 3) Or equal.
  - b. Spring Connectors: Provide one of the following:
    - 1) Buchanan B-Cap.
    - 2) T&B Wire Connector.
    - 3) Or equal.
2. For wire sizes No. 8 AWG and larger, splices shall be made up with compression type copper splice fittings. Splices shall be taped and covered with materials recommended by cable manufacturer to provide insulation equal to that on conductors.
3. For wire sizes No. 10 AWG and smaller, splices may be made up with pre-insulated spring connectors.
4. For wet locations, splices shall be waterproof. Compression type splices shall be waterproofed by sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring thermosetting resin into mold that surrounds the joined conductor. Spring connector splices shall be waterproofed with sealant filler.
5. Splices shall be suitably sized for cable, rated 90 degrees C, and 600 volts.

E. Wire and Cable Markers:

1. Provide wire and cable markers in accordance with Section 26 05 53, Identification for Electrical Systems.

## 2.2 SOURCE QUALITY CONTROL

A. Factory Tests:

1. Factory-test wire and cable in accordance with UL standards

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Install cables complete with proper terminations at both ends. Check and correct for proper phase sequence and proper motor rotation.

B. Pulling:

1. Use insulating types of pulling compounds containing no mineral oil.
2. Pulling tension shall be within limits recommended by wire and cable manufacturer.
3. Use dynamometer where mechanical means are used.
4. Cut off section subject to mechanical means.

- C. Bending Radius: Limit to minimum of six times cable overall diameter.
- D. Slack: Provide maximum slack at all terminal points.
- E. Splices:
1. Where possible, install cable continuous, without splice, from termination to termination.
  2. Where required, splice as shown and also where required for cable installation. Splices below grade, in manholes, handholes, and wet locations shall be waterproof.
  3. Splices are not allowed in conduits.
- F. Identification:
1. Identify conductors in accordance with Section 26 05 53, Identification for Electrical Systems.
  2. Identify power conductors by circuit number and phase at each terminal or splice location.
  3. Identify control and status wiring using numeral tagging system.
- G. Color-code power cables as follows:
1. No. 8 AWG and Smaller: Provide colored conductors.
  2. No. 6 AWG and Larger: Apply general purpose, flame retardant tape at each end, wrapped in overlapping turns to cover an area of at least two inches.
  3. Colors: Match color scheme in use at the Site. If the Site does not have an existing color scheme, use the following colors:

<b>System</b>	<b>Conductor</b>	<b>Color</b>
All Systems	Equipment Grounding	Green
240/120 Volts Single-Phase, Three-Wire	Grounded Neutral One Hot Leg Other Hot Leg	White Black Red
208Y/120 Volts Three-Phase, Four-Wire	Grounded Neutral Phase A Phase B Phase C	White Black Red Blue
240/120 Volts Three-Phase, Four-Wire Delta, Center Tap Ground on Single-Phase	Grounded Neutral Phase A High (wild) Leg Phase C	White Black Orange Blue
480Y/277 Volts Three-Phase, Four-Wire	rounded Neutral Phase A Phase B Phase C	Gray Brown Orange Yellow

### 3.2 FIELD QUALITY CONTROL

#### A. Site Tests:

1. Test each electrical circuit after permanent cables are in place, to demonstrate that circuit and equipment are connected properly and will perform satisfactorily, free from improper grounds and short circuits.
2. Individually test 600-volt cable mechanical connections after installation and before they are put in service, with calibrated torque wrench. Values shall be in accordance with manufacturer's recommendations.
3. Individually test 600-volt cables for insulation resistance between phases and from each phase to ground. Test after cables are installed and before they are put in service, with Megger for one minute at voltage rating recommended by cable manufacturer or in accordance with ANSI/NETA ATS recommendations.
4. Insulation resistance for each conductor shall not be less than value recommended by cable manufacturer. Cables not meeting recommended value or that fail when tested under full load conditions shall be replaced with a new cable for full length.

++ END OF SECTION ++

## SECTION 26 05 53

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Scope:
  - 1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install identification for electrical apparatus and electrical Work.
- B. Related Sections:
  - 1. Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.

##### 1.2 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
  - 1. NEC Article 110, Requirements for Electrical Installation.
  - 2. NEC Article 210, Branch Circuits.
  - 3. NEC Article 215, Feeders.
  - 4. NEC Article 504, Intrinsically Safe Systems.
  - 5. 40 CFR 1910.145 (OSHA) – Specification for Accident Prevention Signs and Tags.
  - 6. NFPA 70E, Electrical Safety in the Workplace.

##### 1.3 SUBMITTALS

- A. Action Submittals: Submit the following:
  - 1. Shop Drawings: Submit the following:
    - a. Complete description and listing of proposed electrical identification and electrical identification devices for associated equipment or systems.
    - b. Conduit and wire identification numbering system and equipment signage.
  - 2. Product Data:
    - a. Manufacturer's literature, cut sheets, specifications, dimensions and technical data for all products proposed under this Section.

## PART 2 – products

### 2.1 MANUFACTURED UNITS

- A. Engraved Identification Devices (Nameplates and Legend Plates):
  - 1. Nameplates:
    - a. Laminated thermoset plastic, 1/16-inch thick, engraved condensed block black lettering on white background, square corners, and beveled front edges, or match existing.
    - b. Size: As required.
    - c. Letter Size: Minimum 3/16-inch.
    - d. Nameplates one-inch or less in height shall have one mounting hole at each end. Nameplates greater than one-inch in height shall have mounting holes in the four corners.
  - 2. Legend Plates:
    - a. Legend plates for pushbuttons, pilot lights, selector switches, and other panel-mounted devices shall be large size with dimensions of approximately 2-7/16 inches wide by 2-13/32 inches tall (Allen Bradley large automotive size), plastic, custom engraved with black letters on white background.
      - 1) Provide standard-size legend plates where devices are mounted on motor control centers and spacing of devices precludes using automotive-size legend plates.
    - b. Lettering size and line weight shall be the same for all legend plates on the same panel or enclosure. Maximum size shall be 1/4-inch and minimum size shall be 1/8-inch.
- B. Safety Signs and Voltage Markers:
  - 1. Low-Voltage Safety Signs:
    - a. Products and Manufacturers: Provide one of the following:
      - 1) B-302-86060 by Brady.
      - 2) Or equal.
    - b. Low voltage safety signs shall be pressure-sensitive vinyl complying with 40 CFR 1910.145, five inches by 3.5 inches in size, and shall read, “DANGER – 480 VOLTS”.
  - 2. Low-Voltage Markers:
    - a. Products and Manufacturers: Provide one of the following:
      - 1) CV442xx by Brady.
      - 2) Or equal.
    - b. Low voltage markers shall be either pressure-sensitive vinyl or vinyl cloth with black lettering on orange background and shall read, “120 VOLTS”, “208 VOLTS”, “120/208 VOLTS”, or “240 VOLTS” as required.
- C. Arc-flash Safety Signs:
  - 1. Products and Manufacturers: Provide one of the following:
    - a. Brady.

- b. Or equal.
- 2. Warning signs shall be adhesive-backed polyester.
- 3. Warning signs shall read, “Warning – Arc Flash and Shock Hazard. Appropriate PPE Required. Arc flash warning signs shall indicate the flash protection boundary, incident energy in calories per square centimeter, hazard level, description of required protective clothing, shock hazard, limited approach boundary, restricted approach boundary, prohibited approach boundary, and equipment name.

D. Voltage System Identification Directories:

- 1. General:
  - a. Directories shall be laminated thermoset plastic, 1/16-inch thick, engraved block black letters on white background, square corners, and beveled front edges.
  - b. Directories shall identify all voltage systems within building or structure.
  - c. Directories shall list the colors that identify ungrounded and grounded conductors of each system.
  - d. Colors shall be in accordance with Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.
  - e. Example Directory Text:

<b>Voltage System Identification</b>		
<b>System</b>	<b>A, B, C</b>	<b>Neutral</b>
277/480	Brown, Orange, Yellow	Gray
120/208	Black, Blue, Red	White

- 2. Large directories for rooms shall have text height not less than 1/2-inch.
- 3. Small directories for equipment shall have text height of not less than 1/4-inch.

E. Conduit Labels:

- 1. Products and Manufacturers: Provide one of the following:
  - a. B-915-xxxxx by Brady.
  - b. Or equal.
- 2. Shall be pre-tensioned acrylic/vinyl construction coiled to completely encircle conduit for conduit up through five-inch diameter, or pre-molded to conform to circumference of conduit six-inch diameter and larger.
- 3. Attach strap-on style for six-inch diameter conduit with stainless steel springs.
- 4. Shall be blank for use with custom printed labels.
- 5. Custom Labels:
  - a. Shall have black lettering on yellow background.
  - b. Shall not contain abbreviations in legend.
  - c. Shall be custom printed on continuous tape with permanent adhesive using thermal printer specified below.

- F. Wire Identification:
  - 1. Heat Shrinkable Wire and Cable Labeling System:
    - a. Products and Manufacturers: Provide one of the following:
      - 1) B-341 PS-xxx-2W by Brady.
      - 2) Or equal.
    - b. White heat-shrinkable irradiated polyolefin shrink-on sleeves. Labels shall be thermal printed. Labels shall be not less than two inches wide.
  - 2. Wrap-Around Wire and Cable Labeling System:
    - a. Products and Manufacturers: Provide one of the following:
      - 1) THT-XX-427 by Brady.
      - 2) Or equal.
    - b. Self-laminating white/transparent self extinguishing vinyl strips. Length shall be sufficient to provide at least 2.5 wraps. Labels shall be thermally printed and not less than two inches wide.
  
- G. Detectable Underground Warning Tape:
  - 1. Products and Manufacturers: Provide one of the following:
    - a. Indentoline by Brady.
    - b. Or equal.
  - 2. Material: Polyethylene or polyester with detectable metal core and polyester underlamine.
  - 3. Width: Two inches.
  - 4. Color and Labeling: Yellow or red with permanently imprinted black letters: "CAUTION – Buried Electric Line", repeated continuously over full length of tape.
  
- H. Thermal Printing System:
  - 1. Utilize thermal transfer process to provide non-smearing labels and markers.
  - 2. Wire and Cable Markers:
    - a. Portable, Products and Manufacturers: Provide one of the following:
      - 1) TLS2200 by Brady.
      - 2) Or equal.
    - b. Desktop, Products and Manufacturers: Provide one of the following:
      - 1) 200M by Brady.
      - 2) Or equal.
  - 3. Cable Markers:
    - a. Portable, Products and Manufacturers: Provide one of the following:
      - 1) Handimark by Brady.
      - 2) Or equal.
    - b. Desktop, Products and Manufacturers: Provide one of the following:
      - 1) Labelizer PLUS by Brady.
      - 2) Or equal.

## 2.2 FABRICATION

- A. Engraved Identification Devices (Nameplates and Legend Plates):

1. Nameplate and legend plate text is preliminary and subject to change pending final review and approval of nomenclature by ENGINEER after start-up and testing.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Provide electrical identification in accordance with manufacturer recommendations and as required for proper identification of equipment and materials.
- B. Engraved Identification Devices (Nameplates and Legend Plates):
  1. Unless otherwise indicated in the Contract Documents, attach permanent nameplates with permanent adhesive and with 3/16-inch diameter, round head, stainless steel machine screws into drilled and tapped holes.
  2. Provide nameplate with 1.5-inch high letters to identify each console, cabinet, panel, or enclosure as shown or indicated.
  3. Provide nameplates for field-mounted motor starters, disconnect switches, manual starter switches, pushbutton stations, and similar equipment operating components, which shall describe motor or equipment function and circuit number.
  4. Provide nameplates with 1/2-inch high letters to identify each junction and terminal box shown or indicated.
  5. On switchgear, provide nameplates for each main and feeder circuit including control fuses, and for each indicating light and instrument.
    - a. Provide nameplate with 1.5-inch high letters giving switchgear designation, voltage rating, ampere rating, short circuit rating, manufacturer's name, general order number, and item number.
    - b. Identify individual door for each compartment with nameplate giving item designation and circuit number.
  6. Motor Control Centers:
    - a. Provide nameplate with 1.5-inch letters with motor control center designation.
    - b. Identify individual door for each unit compartment with nameplate identifying controlled equipment.
  7. Except conduit, all electrical appurtenances including lighting panels, convenience outlets, fixtures, and lighting switches, shall be provided with nameplates indicating appropriate circuit breaker number(s).
  8. Push Buttons:
    - a. Provide legend plates for identification of functions.
    - b. Provide nameplates for identification of controlled equipment.
    - c. Provide red buttons for stop function.
    - d. Provide black buttons for other functions.
  9. Pilot Lights:
    - a. Provide legend plates for identification of functions.
    - b. Provide nameplates for identification of controlled equipment.

- c. Shall have lens colors as shown or indicated. Where no color is indicated, provide the following lens colors:

<b>Color</b>	<b>Legend</b>
Green	Running, Open
Red	Stopped, Closed
Amber	Alarm
Blue	Power
White	Status

- 10. Selector Switches:
  - a. Provide legend plates for identification of functions.
  - b. Provide nameplates for identification of controlled equipment.
- 11. Panel Mounted Instruments:
  - a. Provide nameplates for identification of function.
- 12. Interiors of Cabinets, Consoles, Panels, Terminal Boxes, and Other Enclosures:
  - a. Provide nameplates for identification.
  - b. Provide each item inside cabinet, console, panel, terminal box, or enclosure with laminated plastic nameplate as shown on approved Shop Drawings and CONTRACTOR's other submittals. Install nameplates with adhesive.
  - c. Interior items requiring nameplates include:
    - 1) Terminal blocks and strips.
    - 2) Bus bars.
    - 3) Relays.
    - 4) Rear of face-mounted items.
    - 5) Rear of door-mounted items.
    - 6) Interior mounted items that require identification when mounted externally.
  - d. Circuit Breaker Directory:
    - 1) Provide engraved laminated plastic directory listing function and load controlled for each circuit breaker within panel used for power distribution.
- 13. Re-label existing equipment whose designation have changed.

- C. Safety Signs and Voltage Markers:
  - 1. Provide safety signs and voltage markers on and around electrical equipment as shown or indicated.
    - a. Install rigid safety signs using stainless steel fasteners.
    - b. Clean surfaces before applying pressure-sensitive signs and markers.
  - 2. Install high voltage safety signs on all equipment doors providing access to uninsulated conductors, including terminal devices, greater than 600 volts.
  - 3. Install low voltage safety signs on equipment doors that provide access to uninsulated 480-volt conductors, including terminal devices.

4. Install low voltage markers on each terminal box, safety disconnect switch, and panelboard installed, modified, or relocated as part of the Work and containing 120/208 volt conductors.
- D. Voltage System Identification Directories
1. Provide voltage system identification directories as required by NEC Article 210 and NEC Article 215.
  2. Provide in each electrical room voltage system identification directory mounted on wall or door at each entrance to room.
  3. For panelboards, switchboards, motor control centers, and other branch circuit or feeder distribution equipment that are not located in electrical rooms, provide voltage system identification directory mounted on equipment.
    - a. Directories shall be affixed using epoxy glue. Screws or bolts shall not penetrate equipment enclosures.
    - b. Directories shall be readily visible and not obscure labels and other markings on equipment.
- E. Arc-flash Safety Signs:
1. Provide arc-flash safety signs as required by NEC Article 110.
  2. Provide signs for switchboards, panelboards, motor control centers, and industrial control panels. Provide signs for control panels that contain 480 volt equipment. Provide arc flash warning signs on other equipment where the incident energy is greater than 1.2 calories per square centimeter.
  4. Conduit labels shall indicate the following information:
    - a. Contract Number: Alphanumeric, three or four digits, as applicable.
    - b. Conduit Number: Alphanumeric as shown on the Drawings, as assigned by CONTRACTOR for unlabelled conduits, and in accordance with approved submittals.
  5. Conduits that contain intrinsically safe wiring shall have an additional pipe marker provided that has blue letters on white background and reads, "INTRINSICALLY SAFE WIRING".
    - a. Install intrinsically safe pipe markers in accordance with NEC Article 504 along entire installation. Spacing between labels shall not exceed 25 feet.
  6. Provide conduit labels at the following locations:
    - a. Where each conduit enters and exits walls, ceilings, floors, or slabs.
    - b. Where conduit enters or exits boxes, cabinets, consoles, panels, or enclosures, except pull boxes and conduit bodies used for pull boxes.
    - c. At maximum intervals of 50 feet along length of conduit.
  7. Orient conduit labels to be readable.
- F. Wire and Cable Identification:
1. Color-coding of insulated conductors shall comply with Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.

2. Use heat-shrinkable wire labels where wire or cable is terminated. Use wrap-around labels where wire or cable is to be labeled but is not terminated.
3. Do not provide labels for the following:
  - a. Bare (uninsulated) conductors, unless otherwise shown or indicated as labeled.
4. Provide wire and cable labels for the following:
  - a. New, rerouted, or revised wire or cable.
  - b. Insulated conductors.
  - d. Wire and cable terminations:
    - 1) Wire labels shall be applied between 1/2-inch and one inch of completed termination
    - 2) Apply cable labels between 1/2-inch and one inch of cable breakout into individual conductors.
      - a) Label individual conductors in a cable after breakout as specified for wires.
  - e. Wire or cable exiting cabinets, consoles, panels, terminal boxes, and enclosures.
    - 1) Label wires or cables within two inches of entrance to conduit.
  - f. Wire or cable in junction boxes and pull boxes
    - 1) Label wires or cables within two inches of entrance to conduit.
  - g. Wire and cable installed in cable tray.
    - 1) Wire and cable shall have labels at maximum intervals of 20 feet.
  - h. Wire and cable installed without termination in electrical manholes.
    - 1) Wire and cable shall have wrap-around labels applied within one foot of exiting manhole.
5. Wire and Cable Identification System:
  - a. Wire and cable labels shall be imprinted with an identifying designator.
    - 1) Wire and cable extending between two devices or items and that does not undergo a change of function shall be identified by a single unique designator as specified below.
  - b. Field Wiring:
    - 1) Wire or cable designator shall consist of:
      - a) Three left-most characters shall consist of the Contract number under which wiring or cable was installed.
      - b) Fourth character from the left shall be an asterisk (\*), a plus sign (+) or a hyphen (-). Do not use other punctuation symbols in a wire designator.
      - c) Remaining characters shall be alphanumeric and make wire designator unique.
      - d) Numbering shall reflect actual designations used in the Work and shall be documented in record documents.
  - c. Cabinet, Console, Panel, and Enclosure Wiring, Internal:
    - 1) New Cabinets, Consoles, Panels, and Enclosures:

- a) Wire and cable inside cabinets, consoles, panels, and enclosures shall have designators as specified in Section 40 61 13, Process Control Systems General Provisions.
6. Modified Cabinets, Consoles, Panels, and Enclosures:
- a. New or rerouted wire or cable in existing cabinets, consoles, panels, and enclosures shall be labeled as shown on the Drawings or be assigned a ten-character designator equivalent to field wire designator.
- G. Terminal Strip Labeling:
- 1. Label panel side of terminal to match panel wire number.
  - 2. Label field side of terminal to match field wire number. Terminal number shall not include the Contract number.

+ + END OF SECTION + +

## SECTION 26 24 19

### MOTOR CONTROL CENTERS

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install motor control centers.
- B. Coordination:
1. To properly size circuit breakers, starters, and control power transformers, obtain motor nameplate data on equipment being furnished under this and other contracts as required.
  2. To properly size control power transformers, obtain data on motor space heater and other accessories.
  3. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before motor control center Work.

##### 1.2 REFERENCES

- A. Standards referenced in this Section are:
1. ANSI/IEEE C37.2, Electrical Power System Device Function Numbers and Contact Designations.
  2. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.
  3. NEMA ICS 18, Motor Control Centers.
  4. NEMA ICS 1, Industrial Controls and Systems: General Requirements.
  5. UL 845, Motor Control Centers.

##### 1.3 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer: Shall have not less than five years experience of producing equipment substantially similar to that required and shall be able to submit documentation of not less than five installations in satisfactory operation for at least five years each.
  2. Independent Field Testing Firm:
    - a. Retain an independent testing firm to perform field acceptance testing of motor control centers.
    - b. Testing firm and its assigned personnel shall be experienced in inspecting and testing motor control centers.

- c. Testing firm shall be a member company of NETA.
- B. Component Supply and Compatibility:
  - 1. Obtain materials and equipment included in this Section, regardless of component manufacturer, from one motor control center equipment manufacturer.
  - 2. Motor control center equipment manufacturer shall review and approve, or shall prepare, all Shop Drawings and other submittals for components furnished under this Section.
  - 3. Equipment shall be specifically constructed for specified service conditions. Equipment and components shall be integrated into overall motor control center equipment system by motor control center equipment manufacturer.
- C. Regulatory Requirements: Comply with the following:
  - 1. NEC Article 430, Motors, Motor Circuits, and Controllers.

#### 1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
  - 1. Shop Drawings:
    - a. Outline and summary sheets with schedules of equipment in each unit.
    - b. One-line diagrams indicating circuit breaker sizes, bus rating, motor controller ratings, and other pertinent information to demonstrate compliance with the Contract Documents.
    - c. Unit control schematic and elementary wiring diagrams showing numbered terminal points and interconnections to other units.
  - 2. Product Data:
    - a. Manufacturer specifications, cut sheets, dimensions, and technical data for all components, materials, and equipment proposed for use.
  - 3. Testing Plans, Procedures, and Testing Limitations:
    - a. Not less than 30 days prior to actual factory testing, submit proposed testing methods, procedures, and apparatus.
    - b. Not less than 30 days prior to actual field testing, submit proposed testing methods, procedures, and apparatus.
- B. Informational Submittals: Submit the following:
  - 1. Supplier Instructions:
    - a. Instructions for shipping, storing and protecting, and handling the materials and equipment.
    - b. Installation data for the equipment, including setting drawings, templates, and directions and tolerances for installing anchorage devices.
    - c. Instructions for start-up and troubleshooting.
  - 2. Source Quality Control Submittals:
    - a. Reports of completed factory testing, including procedures used and test results.

3. Site Quality Control Submittals:
    - a. Reports of completed field testing, including procedures used and test results.
  4. Supplier Reports:
    - a. Submit written report of results of each visit to Site by Supplier's service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
  5. Qualifications Statements:
    - a. Independent testing firm.
    - b. Manufacturer, when requested by ENGINEER.
- C. Closeout Submittals: Submit the following:
1. Operations and Maintenance Data:
    - a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation, and spare parts information.
    - b. Manuals shall include record drawings of control schematics, including point-to-point wiring diagrams.
    - c. Comply with Section 01 78 23, Operations and Maintenance Data.
- D. Maintenance Material Submittals: Furnish the following:
1. Spare Parts:
    - a. Furnish, tag, and box for shipment and long term storage the following spare parts and special tools for each motor control center lineup furnished:

Item	Quantity per Switchgear Lineup Furnished
1) Starters and feeder breakers	Quantities and sizes as shown
2) Fuses	Six of each type and size used
3) Auxiliary control relays	Two, with at least two normally open and two normally closed contacts
4) Control power transformers	Two of each size used
5) Indicating lamps	Twelve
6) Covers for indicating lamps	Six of each color used
7) Starters: Contact kits for Size 1 motor starter	Five sets
8) Starters: Contact kits for Size 2, Size 3, and Size 4 motor starters	One set of each size

- b. Furnish a list of additional recommended spare parts for an operating period of one year. Describe each part, the quantity recommended and current unit price.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling, and Unloading:
  - 1. Packing:
    - a. Inspect prior to packing to assure that assemblies and components are complete and undamaged.
    - b. Protect mating connections.
    - c. Indoor containers shall be bolted to skids. Breakers and accessories shall be packaged and shipped separately..
    - d. Cover all openings into enclosures with-vapor inhibiting, water-repellent material.
  - 2. Upon delivery, check materials and equipment for evidence of water that may have entered equipment during transit.
  - 3. Handling:
    - a. Lift, roll or jack motor control center equipment into locations shown.
    - b. Motor control centers shall be equipped to be handled by crane. Where cranes are not available equipment shall be suitable for placement on rollers using jacks to raise and lower the groups.
  
- B. Storage and Protection:
  - 1. Store motor control center equipment in a clean, dry location with controls for uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Provide equipment by one of the following:
  - 1. General Electric Company.
  - 2. Schneider Electric/Square D Company.
  - 3. Eaton/Cutler-Hammer.
  - 4. Allen-Bradley
  - 5. Or equal.

### 2.2 MATERIALS

- A. General: Motor control center lineups shall comply with NEMA ICS 18 and be provided as shown with the following ratings:
  - 1. Service: Voltage rating and number of wires shall be as shown or indicated on the Drawings. Motor control center shall operate from a three-phase, 60 Hertz system.
  - 2. Wiring: NEMA Class II, Type B.
  - 3. Enclosure: NEMA 1.
  - 4. Interrupting Capacity Rating: Motor control center shall have an interrupting capacity rating as shown or indicated on the Drawings. Devices shall be suitable for minimum rating indicated.

5. Motor control center lineups shall be UL-rated as suitable for service entrance where shown or indicated on the Drawings and as required.
- B. Construction: Provide equipment with the following:
1. Totally-enclosed structure, dead front, consisting of nominal 20-inch deep, 20-inch wide, 7.5-foot high vertical sections bolted together to form a unit assembly.
  2. Vertical sections shall have side sheets extending the full height and depth of section.
  3. Removable lifting angles for each shipping section.
  4. Two removable floor sills for mounting.
  5. Horizontal wireways top and bottom, isolated from horizontal bus and readily accessible.
    - a. Wireway openings between sections shall have rounded corners and rolled edges.
  6. Isolated vertical wireways with cable supports, accessible through hinged doors, for each vertical section.
    - a. Wireway shall be separate from each compartment and remain intact when compartment is removed.
  7. All-metal non-conducting parts electrically continuous.
  8. Comply with NEMA ICS 18.
- C. Bus System:
1. Rating: Bus bracing and bus current capacities as shown or indicated on the Drawings.
  2. Bus bars shall be tin-plated, copper-rated, and comply with UL heat rise standards.
  3. Bus bar connections shall be easily accessible with simple tools.
  4. Main Horizontal Bus:
    - a. Continuous, edge-mounted, and isolated from wireways and working areas.
    - b. Mount the bus in vertical center of motor control center to provide easy access and even heat distribution.
    - c. Bus shall be supported, braced, and isolated by high-strength, non-tracking, FRP material.
  5. Vertical Bus:
    - a. Continuous, and isolated by glass polyester barrier.
    - b. Rated for 300 amperes continuous minimum, and at least equal to full-load rating of all installed units in the associated stack.
  6. Grounding Bus: Full length mounted across the bottom, drilled with lugs of appropriate capacity as required.
  7. Neutral Bus: Insulated, continuous through control center for four-wire services, drilled with lugs of appropriate capacity as required.
- D. Unit Compartments:

1. Provide individual front door for each unit compartment. Fasten door to stationary structure, instead of the unit itself, so that door can be closed when unit is removed.
2. Starter and feeder unit doors interlocked mechanically with unit disconnect device to prevent unintentional opening of door while energized and unintentional application of power while door is open, with provisions for releasing interlock for intentional access and application of power.
3. Padlocking arrangement permitting locking disconnect device in the "OFF" position with at least three padlocks with door closed or open. Equip unit disconnect devices located in the top compartment, compartment sized 12 inches or higher, with extender handle complying with UL 845. Extender handle shall allow disconnect operating handle to be located above NEC's height limitation of six-feet, seven-inches above floor.
4. Equip compartments as shown or indicated on the Drawings:
  - a. Blank compartments, unused space, and compartments shown or indicated on the Drawings as "SPACE" shall have bus covers and be complete with necessary hardware for future installation of a plug-in unit.
  - b. Provide shutters for each compartment that automatically open when unit is inserted and automatically close when unit is removed.
5. Provide wiring and device identification:
  - a. Identify compartment doors, devices, and field wiring in accordance with Section 26 05 53, Identification for Electrical Systems.
  - b. Identify internal control conductors with permanent wire markers. Each wire shall be identified by a unique number attached to wire at each termination point.
  - c. Identify internal control devices with permanent markers. Each device shall be identified by a unique number attached to each device.
  - d. Numbering system for each wire and control device shall be identified on the wiring diagrams in the Shop Drawings and shall reflect the actual designations used in the Work.
6. NEMA 1 minimum motor starter size. Starter units completely draw out type in Sizes 1 and 2 and draw out type after disconnecting power leads only in Sizes 3 and 4.
7. Motor starters shall be NEMA-rated and include magnetic contactor, with encapsulated magnet coils. Wound coils are unacceptable. Control shall be 120 vacac unless indicated otherwise.
  - a. Starters shall be full-voltage non-reversing unless shown or indicated otherwise on the Drawings.
  - b. Reduced Voltage Solid-State Starter:
    - 1) General:
      - a) Provide solid-state, step-less, current limiting, soft-start, motor controllers (RVSS) as shown or indicated on the Drawings.
      - b) RVSS shall be three-phase type and shall include an overload relay and isolation contactor.
      - c) Provide subsystems that will protect RVSS from damage due to over-current and over-voltage.

- d) Current Rating: 115 percent of motor nameplate rated current, continuous, minimum.
- 2) Required Features:
    - a) Adjustable current limit of not more than 250 percent of motor nameplate full-load current throughout entire motor acceleration period including first three cycles of voltage waveform from instant start signal is engaged.
    - b) Adjustable voltage acceleration, from two to 30 seconds.
    - c) Adjustable voltage deceleration, from two to 30 seconds.
    - d) Phase loss detection.
    - e) LED diagnostic indicators.
    - f) Static over-current and over-voltage trip.
    - g) Phase reversal, line or fuse loss, and under-voltage protection.
    - h) Power unit over temperature protection.
    - i) Motor inverse time overload protection.
    - j) Input line transient over-voltage protection.
  - 3) Enclosure:
    - a) Cooling fans, if required, shall incorporate anti-friction bearings and internal impedance type motor protection.
    - b) If cooling fans are used, enclosure for that section shall be NEMA 12 FVF, or NEMA 12 EFVFF force ventilated with filters, in accordance with NEMA ICS 1-110, installed by motor control center manufacturer.
  - 4) On start-up, start driven equipment at zero current and allow driven equipment to accelerate to maximum speed without exceeding the set current limit.
  - 5) On normal shutdowns, ramp driven equipment down at set deceleration rate that is non-regenerative for motor prior to shutdown.
  - 6) On emergency shutdowns, remove power to motor.
  - 7) Diagnostic LEDs: Provide LEDs on unit front that indicate the following:
    - a) Control power on.
    - b) Motor power on.
    - c) Motor starting.
    - d) Motor fault.
    - e) RVSS fault.
  - 8) Control Outputs:
    - a) Control output shall be electrically isolated, dry, normally open SPDT contacts, rated 10 amps at 120 vac.
    - b) Provide the following control outputs:
      - i. Motor running.
      - ii. Motor fault.
      - iii. RVSS fault.
8. Overload Relays: Provide an overload relay for each motor starter. Overload relays shall be in accordance with the following:
    - a. Thermal Overload Relays: Relays shall be thermal, bimetallic type, direct or current sensing. Relays shall include ambient compensation and be

- equipped with separate heater elements sized for full-load amperes and service factor of actual motors furnished.
- b. Each overload relay shall be manual reset type and shall include provisions for resetting by an insulating button on front of starter unit door.
  - c. Each overload relay shall include a normally-open auxiliary contact for remote alarm purposes.
  - d. Size each overload relay for full-load amperes and service factor of actual motors installed.
9. Individual control power transformers for all starters, capacity as required for all control circuit devices, 100 VA minimum, Class A insulation, two primary fuses, 120-volt secondary, one secondary fuse, and the other secondary leg grounded.
  10. Separate Control: Where control power to starter is from a separate power source, provide control power fuse in unit and equip main disconnect with normally-open contact to isolate control circuit from source when controller disconnect is open.
  11. Motor horsepower shown are preliminary. Circuit breaker trips and starter overload heaters to be coordinated with the actual equipment installed.
  12. Auxiliary contacts, relays, timers as required for specified control functions and those shown on Drawings.
  13. Current Sensing Devices:
    - a. Current Switch:
      - 1) Produces a dry contact output when load current exceeds set point.
      - 2) Suitable for use measuring current on motor leads of 480-volt, 60 Hertz., up to 100-amp continuous.
      - 3) Variable trip point and time delay. Trip point settable via calibrated dial.
      - 4) Monitors currents from 10 mA to 100 AC Amps
      - 5) Output relay (Form C) rated up to 20 amps
      - 6) LED trip status indicator
      - 7) Dead band prevents relay chatter
      - 8) Contact Material: Silver-cadmium oxide
      - 9) Mechanical Life: 10 million operations, typical at rated load
      - 10) Electrical Life: 100,000 operations, typical at rated load
    - b. Current Transducer:
      - 1) Produces four to 20 mA DC output current proportional to the input average RMS AC motor load current.
      - 2) Loop powered
  14. Starter devices, including spare contacts, shall be wired to numbered terminal blocks.
  15. Terminal blocks for field connections to unit compartments shall be plug-in/pull-apart type. Terminals shall be fully accessible from the front. Terminals shall be mounted near the front of vertical wireway.
  16. Control devices shall be 600-volt heavy duty, NEMA A600. Relays shall have convertible contacts. Pilot devices shall be oiltight. Pilot lights shall be transformer type with six-volt secondary. .

17. Feeder Circuit Breakers: Thermal magnetic type.
  - a. Circuit breakers of 100 amp frame or less shall be mounted in a dual mount compartment (two breakers in one space factor) or shall mount in one-half space factor, unless otherwise shown or indicated on the Drawings.
18. Motor Starter Circuit Breakers: Magnetic trip only motor circuit protectors.
19. Provide the following diagrams and tables inside of door for each compartment:
  - a. Elementary wiring diagram.
  - b. Table of overload heater sizes with correct heater highlighted.
  - c. Table of motor circuit protector settings with correct setting highlighted.
20. Where shown or indicated on the Drawings incorporate solid state protective relaying package (SSPRP) into motor starter for motor protection. Unit shall incorporate the ANSI/IEEE C37.2 device function numbers and selectable indications and communication modules indicated below:
  - a. Product and Manufacturer:
    - 1) GE MultiLin SR469.
    - 2) Or equal.
  - b. Motor Protection Device Functions:
    - 1) Stator winding over-temperature (Device 49).
    - 2) Short circuit (Device 50).
    - 3) Motor overload (Device 49/50/51).
    - 4) Locked rotor - multiple start (Device 48).
    - 5) Phase reversal (Device 46).
    - 6) Ground fault (Device 50G/51G).
    - 7) Mechanical jam.
    - 8) Unbalance/negative sequence currents (Device 46).
    - 9) Undercurrent (Device 37).
    - 10) Motor bearing over-temperature (Device 38).
    - 11) Thrust bearing over-temperature (Device 38).
    - 12) Over-voltage (Device 59).
    - 13) Undervoltage (Device 27).
    - 14) Voltage sequence (Device 47).
    - 15) Main trip and lockout output relay (Device 86).
    - 16) Alarm output relay (Device 74).
  - c. Selectable Indications:
    - 1) Average motor current.
    - 2) Average motor temperature.
    - 3) Motor current for each of the three phases.
    - 4) Motor temperature readout for six winding RTDs.
    - 5) Motor thrust-bearing temperature readout for two bearing RTDs.
    - 6) Ground fault current.
    - 7) Percent of motor capacity used.
    - 8) Line-to-line and line-to neutral voltages, all three phases.
    - 9) Average 15-minute kVA.
    - 10) Average 15-minute kW.
    - 11) Average 15-minute kVAR.

- 12) Maximum percent full load current since initial startup.
  - 13) Hottest RTD and temperature since initial startup.
  - 14) Highest percent current unbalance since initial startup.
  - 15) Highest ground fault current since initial startup.
  - 16) Highest motor bearing temperature since initial startup.
  - 17) Highest load bearing temperature since initial startup.
  - 18) Maximum line voltage since start.
  - 19) Minimum line voltage since start.
  - 20) Number of motor starts attempted.
  - 21) Number of motor starts completed.
  - 22) Hours of operation.
  - 23) Number of trips from each of ten protective functions.
  - 24) All measured values at the time of a motor trip.
  - 25) Values that have been loaded for system inputs and trip points.
- d. Communication Module: RS232 capable of uploading all the above protective function attitudes and the above-listed selectable indications upon being queried by a host PLC connected via RS232 communication port.
21. Main Circuit Breaker: Thermal magnetic, molded case type, unless shown or indicated otherwise. Where shown or indicated, equip main and tie breakers with key interlocking. Interlocking shall allow only two of the three breakers to be closed at a time. Provide locks and keys as required. Main circuit breakers shall be 100 percent amperage rated. Circuit breakers with frame ratings 800 amps and greater shall be electronic type with adjustable parameters and ground fault protection.

### 2.3 SURGE PROTECTIVE DEVICES

- A. Provide a surge protective device in accordance with Section 26 43 00, Surge Protective Devices, for each motor control center bus shown on the Drawings. Surge protective devices shall be included and factory-mounted within the motor control center by motor control center manufacturer. Surge protective device monitoring and display shall be visible from the motor control center front.

### 2.4 SOURCE QUALITY CONTROL

- A. Prior to shipping, perform factory tests on motor control centers. Tests shall include manufacturer's standard tests and the following:
1. Physical inspection and checking of components.
  2. Mechanical operation and device functionality tests.
  3. Primary, control, and secondary wiring hi-pot tests.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. Examine conditions under which Work is to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

### 3.2 INSTALLATION

- A. Install materials and equipment at locations shown or indicated on the Drawings. Install equipment on concrete bases in accordance with the Contract Documents and manufacturer's recommendations and instructions.
- B. For installations against masonry walls, provide an insulation board, 1/4-inch minimum thickness, between motor control center and wall for corrosion protection. Trim board neatly within outline of motor control center.
- C. Openings in top or side of motor control centers for other than conduit entrance are not allowed.
- D. Bundle cable circuits together within enclosures and identify with durable tag secured to cabling twine.
- E. Set motor circuit protectors at lowest setting that allows motor starting without nuisance tripping.
- F. Verify that wiring diagrams on inside of door of each compartment reflect the circuitry actually provided and that correct overload heater size and motor circuit protector setting are noted.
- G. Install in conformance with manufacturer's recommendations, Laws and Regulations, and the Contract Documents.

### 3.3 FIELD QUALITY CONTROL

- A. Site Tests:
  - 1. Perform field testing and inspection of motor control centers. Inspect and test each motor control center after installation. Testing and inspection shall be in accordance with the manufacturer's recommendations and the Contract Documents, and be performed by manufacturer's factory-trained representative, Inform OWNER and ENGINEER when equipment is correctly installed, prior to testing. Do not energize equipment without permission of OWNER.
  - 2. Test Equipment, Calibration and Reporting: All test equipment, instrument calibration and test reports shall be in accordance with ANSI/NETA ATS.
  - 3. Perform the following minimum tests and checks before energizing equipment:
    - a. Verify all overload and device settings.
    - b. Inspect mechanical and electrical interlocks and controls for proper operation.

- c. Check tightness of bolted connections.
  - d. Measure insulation resistance of each bus section, phase-to-phase and phase-to-ground.
  - e. Measure insulation resistance of each starter, phase-to-phase and phase-to-ground.
  - f. Measure insulation resistance of each control circuit with respect to ground.
  - g. Perform other tests recommended by equipment manufacturer.
- B. Manufacturer's Services: Provide a qualified, factory trained serviceman to perform the following:
- 1. Supervise unloading and installation of equipment.
  - 2. Instruct CONTRACTOR in installing equipment.
  - 3. Inspect, test, and adjust equipment after installation and ensure proper operation.
  - 4. Instruct operations and maintenance personnel in operation and maintenance of the equipment.

### 3.4 ADJUSTING

- A. Calibrate, set, and program all protective devices. Coordinate protective devices furnished under this Section and provide proper settings of devices in accordance with the study performed under Section 26 05 73, Electrical Power Distribution System Studies.

++ END OF SECTION ++

## SECTION 26 29 23

### LOW-VOLTAGE VARIABLE FREQUENCY DRIVES

#### PART 1 – GENERAL

##### 1.1 DESCRIPTION

###### A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment, services, and incidentals as shown, specified, and required to furnish and install low-voltage variable frequency drives, complete and operational.
2. Variable frequency drives required under this Section are low-voltage, voltage source inverter, pulse width modulated. Variable frequency drives shall be customized.
3. Low-voltage variable frequency drives included in this Section are associated with the following equipment:
  - a. Pump Station No. 28.

###### C. Related Sections:

1. Section 26 05 29, Hangers and Supports for Electrical Systems.
2. Section 26 05 53, Identification for Electrical Systems.

##### 1.2 REFERENCES

###### A. Standards referenced in this Section are:

1. IEEE 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
2. ISO 9000, Quality Management Systems, Fundamentals and Vocabulary.
3. ISO 9001, Quality Management Systems, Requirements.
4. ISO 9002, Quality Systems, Model for Quality Assurance in Production, Installation and Servicing.
5. NEMA ICS 2, Controllers, Contactors and Overload Relays Rated 600 Volts.
6. NEMA ICS 7, Industrial Control and Systems Adjustable Speed Drives.
7. NEMA MG 1, Motor and Generators.
8. UL 489, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.
9. UL 508, Industrial Control Equipment.

##### 1.3 QUALITY ASSURANCE

###### A. Qualifications:

1. Manufacturer:

- a. Low-voltage variable frequency drive manufacturer shall have not less than five years of experience designing and regularly manufacturing and servicing substantially similar equipment to that required, and upon ENGINEER's request shall submit documentation of not less than five installations in satisfactory operation for not less than five years each.
- b. Manufacturer shall be certified under ISO 9000, ISO 9001, or ISO 9002 for materials and equipment specified.
- c. For all required factory tests, low-voltage variable frequency drive manufacturer shall use a factory test facility that has calibrated its testing apparatus in the previous twelve months, and is staffed by qualified, experienced technicians.

B. Component Supply and Compatibility:

1. Drives specified under this Section employ a low switching frequency or pattern to minimize instantaneous rate of voltage change over time (dv/dt), and the adverse effects of potential bearing currents. Where alternate manufacturers are proposed, obtain manufacturer recommendations regarding bearing currents and provide equipment required at no additional cost to OWNER.
2. Each low-voltage variable frequency drive shall be fully compatible with associated driven equipment and motors. Variable frequency drives shall be matched to specific load requirements for each system. Operation of variable frequency drive shall not overstress motor insulation.
3. To centralize responsibility and to ensure that all equipment is properly coordinated, variable drives specified under this Section shall be obtained from the Supplier of the associated driven equipment.
4. Similar components of drives associated with each system shall be products of a single manufacturer.

#### 1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
  - a. Dimensional information and construction details of enclosures. Enclosure details shall consist of exterior and interior front door with nameplate legends, interior door front and rear views, and terminal block layout.
  - b. Three-line power and control schematic diagrams.
  - c. Wiring diagrams showing the interconnection of conductors to all devices with terminal assignments for remote devices.
  - d. Functional description of system operation.
  - e. VFD heat dissipation at full load, including heat rejection/cooling system.
2. Product Data:
  - a. Manufacturer's technical specifications.
  - b. Manufacturer's catalog cuts and product literature.
3. Testing Plans:
  - a. Not less than thirty days prior to source quality control testing, submit descriptions of proposed shop testing methods, procedures, apparatus, and limitations.

- b. Not less than thirty days prior to field quality control testing, submit descriptions of proposed field testing methods, procedures, and apparatus.
- B. Informational Submittals: Submit the following:
  1. Certificates:
    - a. Certification letters from low-voltage variable frequency drive manufacturer and motor manufacturer that the approved driven equipment has been reviewed and that variable frequency drive units and motors are compatible, and shall be provided in accordance with the Contract Documents and requirements of the driven equipment.
  2. Source Quality Control Submittals:
    - a. Within five days of completing source quality control tests and inspections, submit test results with indication of whether all criteria of the Contract Documents for the specified equipment were met.
  3. Field Quality Control Submittals:
    - a. Within five days of completing field quality control tests and inspections, submit test results with indication of whether all criteria of the Contract Documents for the specified equipment were met.
  4. Manufacturer Reports:
    - a. Within five days of each visit to the Site by manufacturer's representative, submit written report of reason for visit, problems encountered, solutions implemented, and remaining work.
  5. Qualifications Statements:
    - a. Manufacturer, when requested by ENGINEER.
- C. Closeout Submittals: Submit the following:
  1. Operation and Maintenance Data:
    - a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation, list of recommended spare parts, and spare parts ordering information.
    - b. Manuals shall include record drawings of control schematics, including point-to-point wiring diagrams.
    - c. Include a listing of all programmable drive parameters and their settings at Substantial Completion. Submit parameters as both printed pages in the operations and maintenance manual and in electronic format on compact disc that can be directly uploaded to the drive in event of drive replacement or repair.
    - c. Comply with Section 01 78 23, Operations and Maintenance Data.
- D. Maintenance Materials Submittals: Submit the following:
  1. Spare Parts and Extra Stock Materials:
    - a. Furnish, tag, and box for shipment and long-term storage spare parts and special tools for low-voltage variable frequency drives. Each set of spare parts and tools shall include manufacturer's recommended spare parts inventory for one year and include, at minimum, the following:

Item	Quantity per Four VFDs per HP Rating
1) Transistor and diode modules with accessories	One set
2) Power supply module	One
3) Fans	One set
4) Power fuses	One set of each size and type used
5) Control power fuses	Two sets of each size and type used
6) Pilot lights	Two per ten of each type used

- b. Furnish a list of recommended spare parts for an operating period of one year. Describe each part, the quantity recommended, and current unit price.

## 1.5 DELIVERY, STORAGE, AND HANDLING

### A. Packing, Shipping, Handling, and Unloading:

1. Packing:
  - a. Inspect prior to packing to ensure that assemblies and components are complete and undamaged.
  - b. Protect mating connections.
  - d. Cover all openings into enclosures with-vapor inhibiting, water-repellent material.
  - e. Indoor containers shall be bolted to skids.
2. Upon delivery, check materials and equipment for evidence of water that may have entered equipment during transit.
3. Handling:
  - a. Lift, roll or jack low-voltage variable frequency drive equipment into locations shown.
  - b. Variable frequency drives shall be equipped for handling required for installation. Handle equipment in accordance with manufacturer's requirements.

### B. Storage and Protection:

1. Store low-voltage variable frequency drive equipment in a clean, dry location with controls for uniform temperature and humidity. Protect equipment with coverings and maintain environmental controls.

## PART 2 – PRODUCTS

### 2.1 EQUIPMENT PERFORMANCE

#### A. System Performance:

1. Driven equipment to be controlled by a low-voltage variable frequency drive shall be provided with a customized variable frequency drive. Each drive unit shall include an adjustable frequency controller with associated controls for continuous speed adjustment and protection of the driven equipment. Output speed control of

motor shall be continuous throughout speed range of two to 60 Hertz under variable torque load or constant torque as specified for the driven equipment.

2. Low-voltage variable frequency drives associated with each set of driven equipment shall be similar to each other.
3. Variable frequency drives shall be UL-listed or ETL-listed and designed, built, and tested in accordance with UL 489, NEMA ICS 2, NEMA ICS 7, and UL 508.

## 2.2 MANUFACTURERS

- A. Provide low-voltage variable frequency drives by one of the following:
  1. Allen Bradley, Inc.
  2. Siemens-Robicon Corporation
  3. Danfoss Inc.
  4. Or equal.

## 2.3 ENCLOSURE

- A. Provide each low-voltage variable frequency drive with freestanding, front-access, NEMA 1, filtered and gasketed enclosure. Enclosure shall house all components required for the associated variable frequency drive.
- B. Enclosure shall provide adequate cooling for components within and include positive ventilation.
- C. Enclosure shall include circuit breaker disconnect switch. Circuit breakers shall be in accordance with UL 489. Switch handle shall be suitable for padlocking and be through-the-door type with handle height not exceeding six feet. Operation of switch shall remove the service supply from all internal components. Power devices shall be suitable for interrupting capacity of (--1--) RMS symmetrical amperes. Include current limiting semi-conductor fuses where required for protection of solid state components.
- D. Enclosure door shall include an operator interface for access to controller's digital keypad and display.
- E. Equip enclosure front with nameplates for identification of equipment and operating functions. Nameplates shall be in accordance with Section 26 05 53, Identification for Electrical Systems.
- F. Equip enclosure with phenolic type terminal blocks suitably labeled for all internal and remote wiring requirements, plus twenty percent spare.

## 2.4 ADJUSTABLE FREQUENCY CONTROLLER

- A. General:
  1. Adjustable frequency controller shall be microprocessor-based, pulse width modulated design, suitable for operation on a 480-volt, three-phase supply.

Controller shall produce an adjustable AC voltage/frequency output to vary speed of driven equipment. Controller shall consist of the following sections:

- a. Six-pulse diode bridge converter input section.
  - b. Fixed DC bus section.
  - c. Six-pulse power transistor inverter output section.
2. Controller switching frequency shall be adjustable and allow operation at 5,000 Hertz or less. Controller technology shall include a switching scheme that reduces the dv/dt of output supply.
  3. Equip controller with a three-percent DC bus reactor or input line reactor.
  4. Controller's solid state converter input section switching devices shall have 1600 volt PIV rating.
  5. Overload rating of 110 percent variable torque, 150 percent constant torque for one minute.
  6. RMS harmonic content of output current shall be less than five percent of fundamental current.
  7. Able to withstand output terminal line-to-line short circuits without component failure.

B. Operating Criteria:

1. Operating criteria shall be in accordance with the following:
  - a. Ambient temperature range of zero to 40 degrees C.
  - b. Operational humidity of up to 90 percent non-condensing.
  - c. Altitude up to 3,300 feet above sea level.
  - d. Nominal voltage of 480-volts plus or minus ten percent, three-phase, three-wire. Include an under-voltage feature to allow trip-free operation down to 35 percent undervoltage.
  - e. Nominal frequency of 60 Hertz plus or minus three Hertz.
  - f. Input power factor of 95 percent displacement power factor at all operating speeds.
  - g. Efficiency of 96 percent at full speed and full load.

C. Features:

1. Controller shall have the following features:
  - a. Digital keypad and display module shall provide parameter setting, adjustments, and monitoring of control functions and faults. Display messages shall be in English.
  - b. Serial communication port shall allow connecting to programmable controller interface using manufacturer standard protocol.
  - c. Independent acceleration/deceleration rates shall provide two to 600 seconds minimum. When called to stop, motor shall decelerate to minimum speed before stopping.
  - d. Power loss feature shall allow five cycle ride through capability for input supply interruptions.
  - e. Time delay automatic restart shall allow restart after controller fault conditions with programmable attempts.
  - f. Coasting motor restart shall allow controller to restart into a coasting motor without damage or tripping. Coasting motor restart feature shall allow

switching from bypass mode to low-voltage variable frequency drive mode while operating, without shutdown.

g. Isolated control inputs and outputs.

D. Protection:

1. Controller shall have protective functions as follows:
  - a. Input line metal oxide varistor transient protection.
  - b. Electronic over-current trip instantaneous and inverse time overload protection with thermal memory retention.
  - c. Over-temperature trip temperature protection.
  - d. Current limit trip protection.
  - e. Input line over- and under-voltage trip protection.
  - f. Ground fault trip protection.

## 2.5 OUTPUT FILTER

A. General:

1. Provide output filter to prevent overstressing motor insulation system. Provide output filter with each low-voltage variable frequency drive, when cable length between motor and variable frequency drive exceeds the following based on noted switching frequencies.
  - a. One KHZ switching frequency, 200 feet cable length.
  - b. Three KHZ switching frequency, 175 feet cable length.
2. Provide output filters in all other cases, based on recommendations of low-voltage variable frequency drive and motor manufacturers, when actual voltage peaks at motor terminals exceed NEMA MG 1 limits.

B. Features and Criteria:

1. Filter shall be three-phase, 600-volt class motor-protecting type consisting of suitable values of inductance, capacitance and resistance to form a damped, low pass filter.
2. Filter shall be low-loss type specifically designed to reduce voltage wave form  $dv/dt$ . Filter shall allow cable lengths at minimum exceeding actual application distances with waveform resulting in voltage spikes at motor terminal that are within NEMA MG 1 Part 31 voltage stress levels.
3. Filter shall be suitable for mounting within low-voltage variable frequency drive enclosure.

## 2.6 CONTROLS

A. General:

1. Equip each low-voltage variable frequency drive control system with relays, switches, fuses, indicating lights, and components required for a complete, functional system.
2. Variable frequency drive control shall be powered from a suitably sized and protected control power transformer.

3. Variable frequency drive control shall include status indicators, controller, and system fault condition displays and operating controls. Provide status indicators and operating controls associated with drive control on front door of enclosure.
  4. Control arrangement shall be such that variable frequency drive internal electronic supply voltage is isolated from field wiring.
- B. Control and Pilot Devices:
1. Relays shall be standard, latching type, and pneumatic or solid state time delay type. Provide relays with contacts rated ten amps, quantity as required.
  2. Pilot devices shall be heavy duty type, rated 10 amps continuous. Indicating lights shall be push-to-test transformer type with 12-volt secondaries.
- C. Operation:
1. Controls for each low-voltage variable frequency drive shall consist of all devices necessary for the following:
    - a. Stop/Start and Speed Control: Stop/start and speed control shall respond to drive-mounted selector switch. With switch in "REMOTE" position, stop/start and speed control shall be based on a stop/start contact and four- to 20-mADC speed signal from remote process control panel. With switch in "LOCAL" position, stop/start control shall be based on remote stop/start pushbuttons located adjacent to driven equipment, and speed control shall be based on drive-mounted speed potentiometer.
    - b. Emergency Stop Control: Emergency stop control shall respond to remote stop pushbutton located adjacent to driven equipment. When activated driven equipment shall stop immediately in all operating modes.
    - c. Motor Over-temperature Shutdown: Motor over-temperature control shall respond to remote contact that activates on motor over-temperature. When over-temperature is detected, driven equipment shall stop. Include provisions to remotely supply 120-volt power to thermistor control module located at motor.
    - d. Discharge Pressure Shutdown: Pressure control shall respond to a remote discharge pressure switch. When high pressure is detected, driven equipment shall stop after an adjustable time delay.
    - e. Seal water control (required for pumps and other equipment that require seal water): Seal water control shall include provisions to supply 120-volt power to remote seal water solenoid. Seal water solenoid shall energize when equipment requiring seal water is enabled. Equipment requiring seal water start shall be delayed until remote-located pressure switch verifies seal water flow. Upon loss of seal water, after an adjustable period of time, an alarm shall be initiated but equipment requiring seal water shall not shut down. When equipment requiring seal water is stopped, seal water solenoid shall remain energized for an adjustable period of time.
    - f. Motor Space Heater Control: Motor space heater control shall energize remote motor's internal heater when driven equipment is stopped. Include provisions to supply 120-volt power to heater.

D. Auxiliary Features:

1. Provide each low-voltage variable frequency drive with the following:
  - a. Status Indicators: Status indicators shall include separate pilot lights for indication of motor run (red), and bypass mode (blue).
  - b. Shutdown Indicators: Shutdown indicators shall include separate pilot lights (amber) for each shutdown condition. Arrange shutdown indication circuitry so that, when activated, indicator requires manual reset.
  - c. Contact Outputs: Contact outputs shall include separate dry contacts for remote indication of motor run, seal water alarm for equipment with seal water systems, each shutdown condition, and controller faults.
  - d. Speed Output: Speed output shall include four- to 20-mADC signal for remote indication of motor speed.

E. Wiring and Device Identification:

1. Provide control wiring and device identification for each low-voltage variable frequency drive:
  - a. Identify all control conductors with permanent type wire markers. Each wire shall be identified by a unique number and shall be attached to wire at each termination point.
  - b. Identify each control device with permanent type marker. Each device shall be identified by a unique number and shall be attached to each device.
  - c. Numbering system for each wire and control device shall be identified on wiring diagrams and shall reflect actual designations used in the Work.

## 2.8 SOURCE QUALITY CONTROL

A. Tests:

1. Perform factory tests on each low-voltage variable frequency drive prior to shipping. Tests shall consist of simulating expected load to be driven by operating load through speed ranges specified for driven equipment, for minimum of two hours per drive unit.
2. Provide factory control and alarm tests on each drive unit by simulating each control signal and each alarm function to verify proper and correct drive unit action.
3. Perform specified tests in addition to standard factory tests typically performed.

## PART 3 – EXECUTION

### 3.1 INSPECTION

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

### 3.2 INSTALLATION

- A. Install equipment in accordance with manufacturer's recommendations and instructions and in conformance with Laws and Regulations, and the Contract Documents.
- B. Unless otherwise shown or indicated, install equipment on concrete bases (--1--).
- C. Install equipment with sufficient access and working space provided for ready and safe operation and maintenance.
- D. For installations against masonry walls, provide an insulation board, 1/4-inch minimum thickness, between equipment and wall for corrosion protection. Trim board neatly within outline of equipment.
- E. Install all terminations, lugs, and required appurtenances necessary to properly terminate power supplies.
- F. Install control wiring terminations and appurtenances necessary to complete installing control and monitoring devices.
- G. Immediately prior to Substantial Completion, replace all enclosure filters and frames provided under this Contract with new filters and frames, except expanded metal filter types. Immediately prior to Substantial Completion, clean expanded metal filters.

### 3.3 FIELD QUALITY CONTROL

- A. Site Tests:
  - 1. After installation, inspect, adjust, and test each low-voltage variable frequency drive at the Site. Testing and inspection shall be in accordance with manufacturer's recommendations and be performed by manufacturer's factory-trained representative. Through CONTRACTOR, manufacturer's factory-trained representative shall inform OWNER and ENGINEER when equipment is correctly installed and ready to be energized. Do not energize equipment without permission of OWNER.
  - 2. Perform the following equipment inspection and testing and provide reports documenting procedures and results.
    - a. Verify all device settings and drive adjustments.
    - b. Inspect all mechanical and electrical interlocks and controls for proper operation.
    - c. Test each drive through specified speed ranges and loads for a minimum of two hours per drive unit.
    - d. Test each drive by using actual control signal for remote and local operation.
    - e. Test each drive alarm function.
    - f. Perform other tests recommended by equipment manufacturer.
- B. Manufacturer Services:
  - 1. Unloading and Installation: Manufacturer's factory-trained representative shall be

present during unloading of equipment and installation at equipment's final location. Representative shall train installing personnel in advance in the proper handling and rigging of equipment. Services by manufacturer's representative under this paragraph shall be at least 1 eight-hour days at the Site.

2. Post-installation Check: Manufacturer's factory-trained representative shall check and approve the installed equipment before initial operation. Manufacturer shall calibrate, set and program low-voltage variable frequency drives provided. Services by manufacturer's representative under this paragraph shall be at least 1 eight-hour days at the Site.
3. Manufacturer's factory-trained representative shall adjust the system to final settings as specified in Article 3.5 of this Section.
4. Manufacturer's factory-trained representative shall test the system as specified in Paragraph 3.3.A of this Section. Representative shall operate and test the system in presence of ENGINEER and verify that equipment is in conformance with the Contract Documents. Services by manufacturer's representative under this paragraph shall be at least 1 eight-hour days at the Site.
5. Representative shall revisit the Site as often as necessary until all deficiencies are corrected, prior to readiness for final payment.
6. Provide services of manufacturer's factory-trained representatives to correct defective Work within 72 hours of notification by OWNER during the correction period specified in the General Conditions as may be amended by the Supplementary Conditions.
7. Replacement parts or equipment provided during the correction period shall be equal to or better than original.
8. Training: Provide services of qualified factory trained specialists from manufacturer to instruct OWNER's operations and maintenance personnel in recommended operation and maintenance of equipment. Training requirements, duration of instruction, and other qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.

### 3.4 ADJUSTING

- A. Immediately prior to Substantial Completion, when testing is acceptably completed and low-voltage variable frequency drives are operating, manufacturer's representative shall return to the Site and make final adjustments as required to each variable frequency drive furnished under this Section.

++ END OF SECTION ++

# **DRAWINGS**

# MOBILE AREA WATER AND SEWER SYSTEM MYERS WATER TREATMENT FACILITY ELECTRICAL QUERY PROJECT

MAWSS BOARD MEMBERS.

BARBARA DRUMMOND, CHAIR  
LINDA ST. JOHN, VICE-CHAIR  
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THOMAS ZOGHBY  
RAYMOND L. BELL, JR.  
MARIA GONZALEZ  
JOHN C. WILLIAMS

ISAIAH ENGINEERING INC. PROJECT NO. IEMAWSS-0106

DRAWING INDEX

SHEET NO.	DESCRIPTION
<u>ELECTRICAL</u>	
G-1.0	TITLE SHEET
E-1.0	ELECTRICAL - SYMBOLS, NOTES AND LEGENDS
E-1.1	ELECTRICAL - ONE-LINE AND PLANS
E-2.0	ELECTRICAL - CONTROL DIAGRAM AND CONTROL LOGIC
I-1.0	ELECTRICAL - PID



MYER WATER TREATMENT FACILITY VICINITY MAP

MOBILE AREA WATER AND SEWER SYSTEMS  
MYERS WATER TREATMENT FACILITY  
ELECTRICAL QUERY  
HUBERT PIERCE ROAD, MOBILE, ALABAMA 36608



DATA
SCALE: AS NOTED
PROJECT NO.: IE-106 MAWSS
DRAWN BY: B. BERTRAND
DESIGN BY: N. EVERETT
REVIEWED BY: R. MUNIZ
APPROVED BY: N. EVERETT

REVISIONS



STAMP VALID ONLY IF SIGNED & DATED  
FILE: MAWSS MYERS WTP ELECT.  
DATE: 3/20/26

G-1.0  
TITLE SHEET

**ABBREVIATIONS**

A	AMPS
A/C	AIR CONDITIONING
A.F.F.	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
A.I.C.	AMPS INTERRUPTING CAPACITY (SHORT CIRCUIT)
Al	ALUMINUM
AM	AMMETER
AUTO	AUTOMATIC
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
B	BARE
C	CONDUIT
C.B.	CIRCUIT BREAKER
CH	CHILLED
CKT	CIRCUIT
Cu	COPPER
CONN.	CONNECTED
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
C.O.	CONDUIT ONLY
C.T.T.	CURRENT TRANSFORMER
D	DEEP
DC	DIRECT CURRENT
DISC.	DISCONNECT
DN	DOWN
EA	EACH
E.O.	ELECTRIC OPERATOR
ELEC.	ELECTRIC
E-EM	EMERGENCY
EX. RE.	EXIST. RELOCATED
EQ.	EQUIPMENT (GROUND)
FA	FIRE ALARM
FU	FUSE(S)
FUT	FUTURE
G. GR.	GROUND
GRDG.	GROUNDING
GFI	GROUND FAULT INTERRUPTING
H	HIGH (MOUNTING HEIGHT TO CENTER LINE)
H.O.A.	HAND-OFF AUTOMATIC SWITCH
HT	HEAT
IG	ISOLATED GROUND
ISO	ISOLATED
IN	INPUT
INS.	INSULATED
INST.	INSTALL OR INSTRUMENT
J.B.	JUNCTION BOX
K.O.	KNOCK OUT
KW	KILOWATTS
LTG.	LIGHTING
LTS	LIGHTS
LG	LONG
MAG	MAGNETIC (METER or STARTER)
MAN	MANUAL
M.B.	MAIN BREAKER
MCM	THOUSAND CIRCULAR MILS
MCS	MOLDED CASE SWITCH
MECH.	MECHANICALLY (HELD)
MT.	MOUNT
MTD.	MOUNTED
N. NEUT	NEUTRAL
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
OHE	OVER HEAD ELECTRICAL LINE
O.L.'s	OVERLOADS (THERMAL)
OUT	OUTPUT
P	POLE(S)
PNL	PANEL OR PANELBOARD
P.T.	POTENTIAL TRANSFORMER
#(SUFFIX)	POUNDS WEIGHT
#(PREFIX)	WIRE GAUGE (AWG)
Ø	PHASE
REC.	RECEPTACLE
RECEPT	RECEPTACLE
S.C.	SHORT CIRCUIT (DUTY)
SN	SOLID NEUTRAL
SOL	SOLID (CONDUCTOR)
SQ.	SQUARE
ST	SHUNT TRIP
STR.	STARTER
SW.	SWITCH
TEL	TELEPHONE
TEMP.	TEMPERATURE (CONTROL)
T.O.E.	TIMED ON ENERGIZATION
TYP.	TYPICAL
UPS	UNINTERRUPTIBLE POWER SYSTEM
UG	UNDERGROUND
UGP	UNDERGROUND PRIMARY
UGS	UNDERGROUND SECONDARY
V	VOLTS
VAC	VOLTS ALTERNATING CURRENT
VM	VOLTMETER
W	WATTS OR WIRE (USE CONTEXT)
	WATTS (WATTS) 3W (WIRE)
W.H.	WATER HEATER
WP	WEATHERPROOF
WW	WIREWAY (or GUTTER)

**ELECTRICAL LEGEND  
POWER, LIGHTING & FIRE**

	WALL MOUNTED EXTERIOR LIGHT, SEE FIXTURE SCHEDULE
	WALL MOUNTED, SELF-CONTAINED EMERGENCY LIGHT, SEE FIXTURE SCHEDULE
	SURGE SUPPRESSOR
	CEILING/WALL MOUNTED EXIT LIGHT, SEE FIXTURE SCHEDULE
	DUPLEX RECEPTACLE, 20A, 125V, 2P, 3W., GRDG, NEMA 5-20R, MOUNTED 18" H. ADDITIONAL MARKS FOR RECEPTS: G = GROUND FAULT INTERRUPTING TYPE WP = GROUND FAULT & WEATHERPROOF BOX & COVER PLATE FOR WET LOCATIONS XX"H. INDICATES HEIGHT ABOVE FINISHED FLOOR IF NOT STANDARD
	SINGLE POLE LIGHTING SWITCH, 20A, 120/277VAC, SILENT TOGGLE
	THREE-WAY LIGHTING SWITCH, 20A, 120/277VAC, SILENT TOGGLE
	FOUR-WAY LIGHTING SWITCH, 20A, 120/277VAC, SILENT TOGGLE
	"a" INDICATES OUTLET(S) OR LIGHTING CIRCUITS SWITCHED
	MANUAL MOTOR STARTING SWITCH, WHEN USED FOR THERMAL PROTECTION, INSTALL HEATERS
	SAFETY DISCONNECT SWITCH, NON-FUSED, SIZE/NO. OF POLES & ENCLOSURE NOTED
	ENCLOSED CIRCUIT BREAKER, SIZE/NO. OF POLES & ENCLOSURE NOTED
	JUNCTION BOX, 4" SQ. UNLESS NOTED, FURNISH BLANK COVER PLATE INCREASE SIZE AS PER CODE REQUIRED VOLUME
	JUNCTION BOX, WALL MOUNTED, 4" SQ. OR LARGER AS REQUIRED
	MAIN OR DISTRIBUTION PANEL OR SWITCHBOARD, 277/480V, 3PH., SURFACE TRIM
	LIGHTING OR MISCELLANEOUS POWER PANEL, SURFACE TRIM, SEE SCHEDULES
	WIRING IN CONDUIT, CONCEALED IN WALLS OR CEILING, HATCH MARKS INDICATE NO. OF CURRENT CARRYING WIRES IF MORE THAN 2. WHEN NOT MARKED 1/2" C. w/2-#12 & 1-#12 GR. (GROUND WIRES NOT MARKED, BUT REQUIRED; MINIMUM SIZE #12, GREEN INSULATED COPPER)
	WIRING IN EXPOSED CONDUIT, RUN PARALLEL AND PERPENDICULAR TO BUILDING LINES & STRUCTURAL ELEMENTS, WIRES SAME AS NOTES ABOVE
	WIRING, IN UNDERGROUND PVC CONDUIT, 18" MIN. COVER (GREATER WHEN NOTED) SEE NOTES FOR CONCEALED WIRING ABOVE
	HOME RUN TO PANEL, SEE NOTES FOR EXPOSED & CONCEALED WIRING, PANEL-CIRCUIT(S) NOTED
	CONDUIT TURNING UP
	CONDUIT TURNING DOWN
	MOTOR, AC INDUCTION; HORSEPOWER MARKED, VOLTAGE & PHASE NOTED
	DRY TYPE TRANSFORMER
	THERMOSTAT
	OPEN/CLOSE/AUTOMATIC (OCA.) STARTER, RELAY OR CONTACTOR; SEE PLANS FOR NOTES (FA = FIRE ALARM, LC = LIGHTING CONTACTOR)
	GROUND
	GROUND TEST STATION

**ELECTRICAL NOTES:**

- ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE, THE OCCUPATIONAL SAFETY AND HEALTH ACT, AND ALL ELECTRICAL CODES LOCALLY BEING ENFORCED BY LOCAL AUTHORITY HAVING JURISDICTION (AHJ) IN THE PROJECT AREA.
- CONTRACTOR TO OBTAIN AND PAY FOR ALL PERMITS, INSPECTION AND CONNECTION FEES.
- CONTRACTOR TO PROVIDE ALL LABOR, MATERIAL, EQUIPMENT AND SUPERVISION FOR AND INCIDENTAL TO THE COMPLETION OF A FULLY FUNCTIONAL, SAFE AND COMPLETE ELECTRICAL SYSTEM.
- CONTRACTOR TO TEST SYSTEM THOROUGHLY IN THE PRESENCE OF OWNER AND RENDER IT FREE FROM DEFECTS. CONTRACTOR TO PROVIDE OWNER WITH A ONE YEAR WARRANTY AFTER ACCEPTANCE.
- THE CONTRACTOR SHALL PROPERLY SEAL ALL PENETRATIONS.
- ELECTRICAL WORK SHALL BE COORDINATED WITH ALL OTHER TRADES TO AVOID ANY CONFLICTS AND/OR CREATING A SAFETY HAZARD.
- ELECTRICAL CONTRACTOR TO COORDINATE WITH THE OWNER FOR ANY ELECTRICAL REQUIREMENTS FOR SPECIAL EQUIPMENT.
- CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF ALL CIRCUITS ASSOCIATED WITH THE PROJECT WORK AREA.
- ALL EQUIPMENT AND MATERIALS SHALL MEET OR EXCEED THE SCHEDULED AND/OR REQUIRED ITEMS. SUBMIT FOR PRIOR APPROVAL FOR ANY DEVIATIONS.
- NO CHANGES SHALL BE MADE IN MATERIALS OR INSTALLATION WITHOUT ENGINEER AND OWNER'S APPROVAL.
- CONTRACTOR SHALL VERIFY CLEARANCE SPACE AVAILABLE, OFFSETS REQUIRED, STRUCTURAL OPENINGS, AND WORK BY OTHER TRADES.
- CONDUCTORS SHALL BE COPPER. MINIMUM SIZE FOR POWER CONDUCTORS SHALL BE #12 AWG. CONTROL CABLES SHALL BE TYPE THHW STRANDED COPPER, MINIMUM SIZE #14 AWG. SIGNAL CABLES SHALL BE TWISTED AND SHIELD, #16 AWG MINIMUM. CABLES SHALL BE U.L. LISTED AND SHALL BE MANUFACTURED BY G.E., GENERAL CABLE, ROME, COLLYER, OR AN ENGINEER APPROVED EQUIVALENT.
- SCHEDULE 80 PVC CONDUITS SHALL BE PROVIDED FOR UNDERGROUND INSTALLATION. ALL EXPOSED CONDUITS SHALL BE RIGID GALVANIZED STEEL.
- SPlicing OF CABLES INSIDE CONDUIT AND AREAS THAT ARE DAMP IS NOT PERMITTED.
- THE SCADA SYSTEM SHALL BE PROGRAMMED TO ACCEPT THE NEW INPUTS AND OUTPUTS SIGNALS AS INDICATED BY THE PLANS.
- ALL ELECTRICAL EQUIPMENT SHALL BE PURCHASED FROM LOCAL DISTRIBUTION WITHIN 100 MILES OF PROJECT UNLESS OTHERWISE SPECIFIED.
- ALL EXTERIOR RECEPTACLES WITH WEATHERPROOF (WP) COVERS SHALL BE THE "WHILE IN USE" POLYCARBONATE TYPE.
- THE ELECTRICAL SYSTEM SHALL MEET OR EXCEED THE IEEE 519 REQUIREMENTS FOR HARMONICS.
- THESE DRAWING IS BASED ON THE EXISTING CONTROL DRAWINGS PROVIDED BY THE CLIENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFYING THE EXISTING CONTROL SYSTEM.
- PLANS ARE BASED ON PLANS PROVIDED BY THE CLIENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR BUT SHALL NOT BE LIMITED TO FIELD VERIFYING ALL DIMENSIONS, EXISTING AND NEW EQUIPMENT LAYOUT, ALL ELECTRICAL PANELS AND CIRCUITS AS REQUIRED TO PROVIDE FULLY FUNCTIONAL AND WORKING SYSTEM.

**INSTRUMENT IDENTIFICATION LETTERS**

FIRST-LETTER		SUCCEEDING-LETTERS		
MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM	
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			USER'S CHOICE
D	DISSOLVED OXYGEN	DIFFERENTIAL	DENSITY	
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)	
F	FLOW RATE	RATIO (FRACTION)		
G	USER'S CHOICE		GLASS, VIEWING DEVICE	
H	HAND (MANUAL)			
I	CURRENT (ELECT.) OR INTERLOCK		INDICATE	HIGH
J	POWER	SCAN		
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION
L	LEVEL		LIGHT	
M	MOTION OR MOISTURE	MOMENTARY		LOW
N	USER'S CHOICE		USER'S CHOICE	MIDDLE, INTERMEDIATE
O	USER'S CHOICE		ORIFICE, RESTRICTION	USER'S CHOICE
P	PRESSURE OR VACUUM		POINT (TEST) CONNECTION	
Q	QUANTITY OR EVENT	INTEGRATE, TOTALIZE		
R	RATIO		RECORD	
S	SPEED, FREQUENCY OR SOLENOID	SAFETY		SWITCH
T	TEMPERATURE			TRANSMIT
U	MULTIVARIABLE		MULTIFUNCTION	
V	VIBRATION, MECHANICAL ANALYSIS		VALVE, DAMPER, LOUVER	MULTIFUNCTION
W	WEIGHT, FORCE		WELL	
X	TORQUE OR USER'S CHOICE	X AXIS	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED, FINAL CONTROL ELEMENT

(\*) pH, CL, RES., DO, OR AS NOTED ABOVE BUBBLE

**INSTRUMENT PLAN SYMBOLS**

(SHOWN ON ELECTRICAL PLANS)

	HAND SWITCH LIGHT
	TRANSMITTER
	TRANSDUCER, I/P, ETC..
	LEVEL SWITCH, PRESSURE SWITCH, ETC..
	TEMPERATURE WELL AND TRANSMITTER
	ANALYZER OR FIELD PANEL
	MAGMETER FLOW TUBE
	PNEUMATIC CONTROL VALVE
	BUTTERFLY VALVE w/PNEUMATIC OPERATOR
	MOTOR OPERATED PINCH VALVE
	MOTOR OPERATED PLUG VALVE
	MOTOR OPERATED KNIFE GATE VALVE
	SOLENOID VALVE, 120VAC COIL
	TEMPERATURE SWITCH IN MOTOR
	LIMIT SWITCH
	LEVEL SWITCH
	1/8A DIN RAIL MOUNTED FUSE
	GENERAL CONTROL PATH
	ELECTRONIC, FREQUENCY, ETC.
	PNEUMATIC LINE
	DATA OR LOGIC PERFORMED BY COMPUTER
	FUNCTION EXPLANATION OR UNITS
	INSTRUMENT CONTROL FUNCTION TAG
	LOOP NUMBER
	DENOTES MOUNTED INSIDE PANEL (OR REAR)
	W/O LINE DENOTES PRIMARY ELEMENT OR LOCALLY MOUNTED
	PANEL MOUNTED INSTRUMENT
	COMPUTER FUNCTION INPUT OR OUTPUT D = DIGITAL I = INPUT A = ANALOG O = OUTPUT
	PLC FUNCTION
	FUNCTION TAG LOOP NUMBER
	INDICATOR LIGHT (LETTER=COLOR)
	MOTOR OR MOTORIZED ACTUATOR
	SURGE ARRESTOR
	INTERLOCK
	STATUS OR EVENT POWER ON
	MOISTURE SWITCH
	TEMPERATURE SWITCH
	TEMPERATURE SWITCH ACTIVATED
	LEVEL SWITCH ACTIVATED
	LEVEL SWITCH ACTIVATED DIGITAL CLOSURE EQUIVALENT
	QI
	J I
	MS
	TS
	TI
	LS
	LI
	QS

**MOBILE AREA WATER AND SEWER SYSTEMS**  
**MYERS WATER TREATMENT FACILITY**  
**ELECTRICAL QUERY**

**HUBERT PIERCE ROAD, MOBILE, ALABAMA 36608**

414 C. North Road, Mobile, Alabama 36608  
 Office: 251.344.3022 | Fax: 251.948.3022  
 www.isaiahengineering.com

ISAIAH ENGINEERING

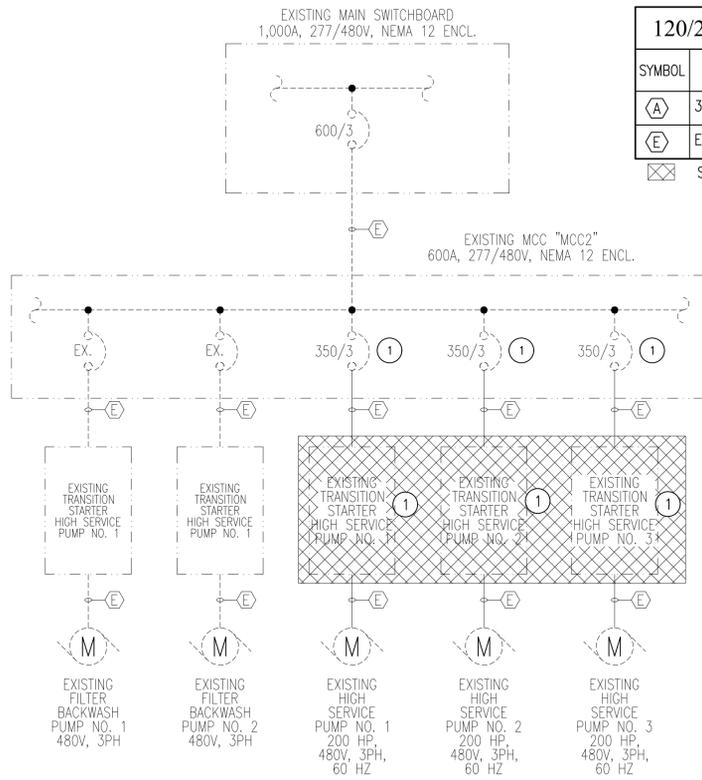
Building The Future

DATA
SCALE: AS NOTED
PROJECT NO.: IE-106 MAWSS
DRAWN BY: B.BERTRAND
DESIGN BY: N.EVERETT
REVIEWED BY: R.MUNIZ
APPROVED BY: N.EVERETT

REVISIONS

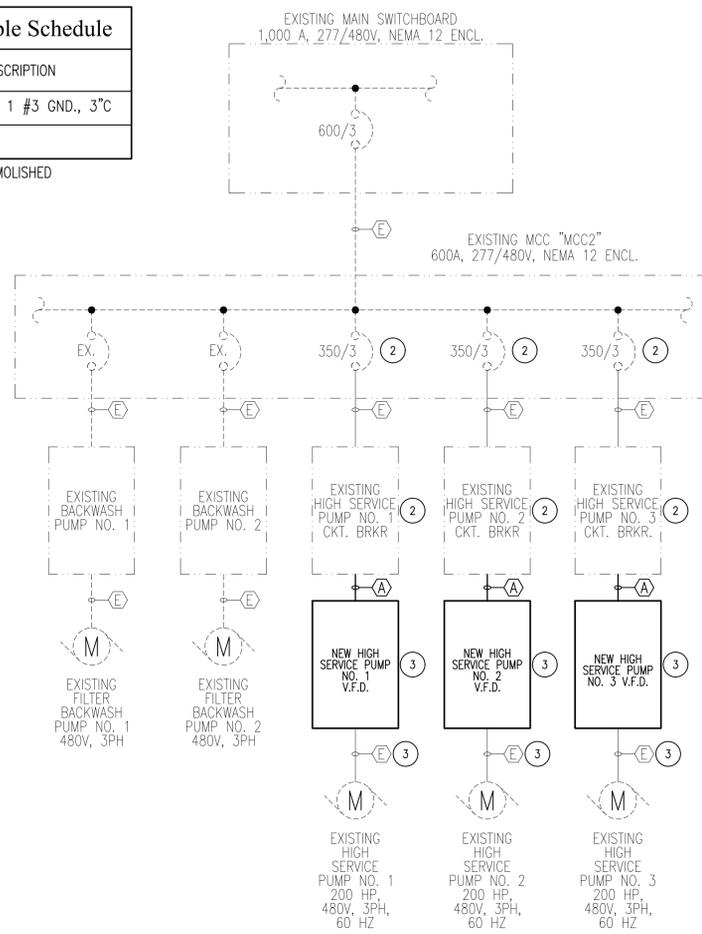


STAMP VALID ONLY IF SIGNED & DATED  
 FILE: MAWSS MYERS WTP ELECT.  
 DATE: 3/20/26

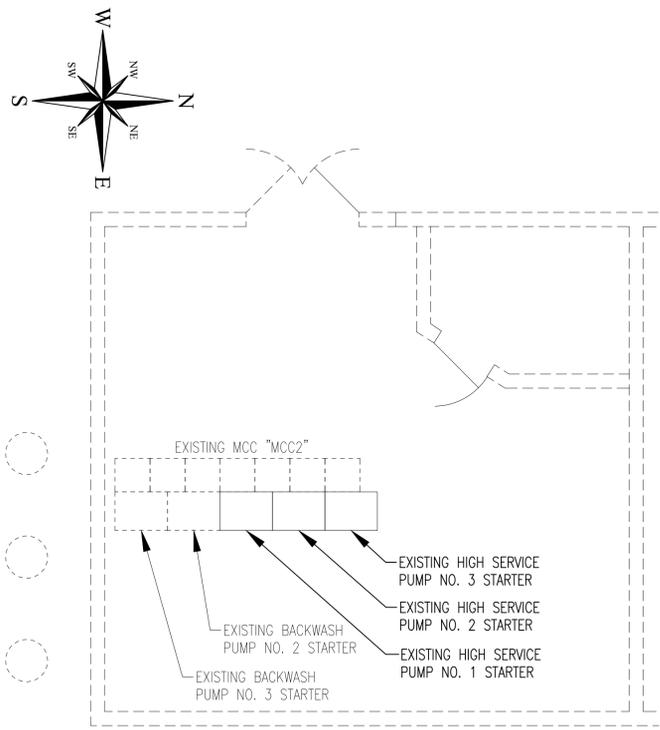


**EXISTING 277/480 V ELECTRICAL ONE-LINE DIAGRAM**  
NOT TO SCALE

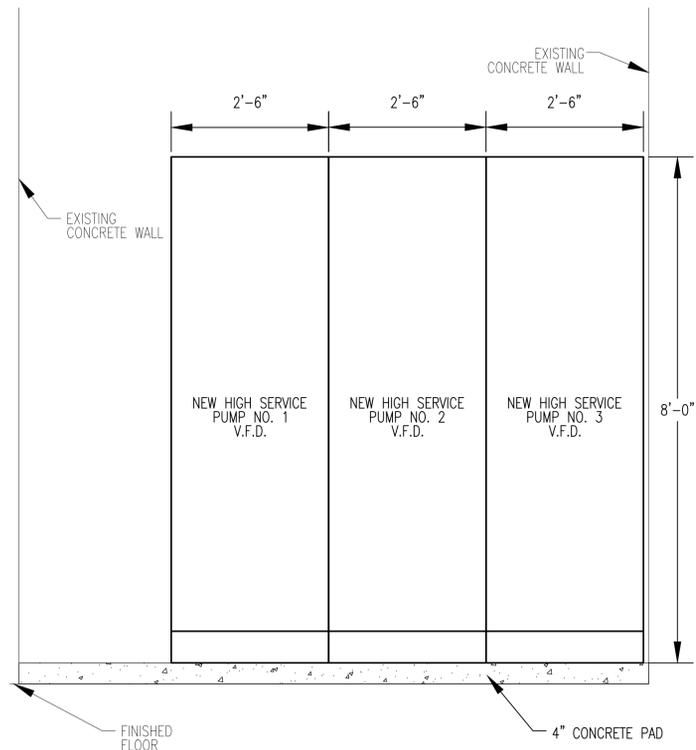
120/240V Cable Schedule	
SYMBOL	DESCRIPTION
(A)	3 #350 KCM, 1 #3 GND., 3°C
(E)	EXISTING
(X)	SHALL BE DEMOLISHED



**NEW WORK: 277/480 V ELECTRICAL ONE-LINE DIAGRAM**  
NOT TO SCALE



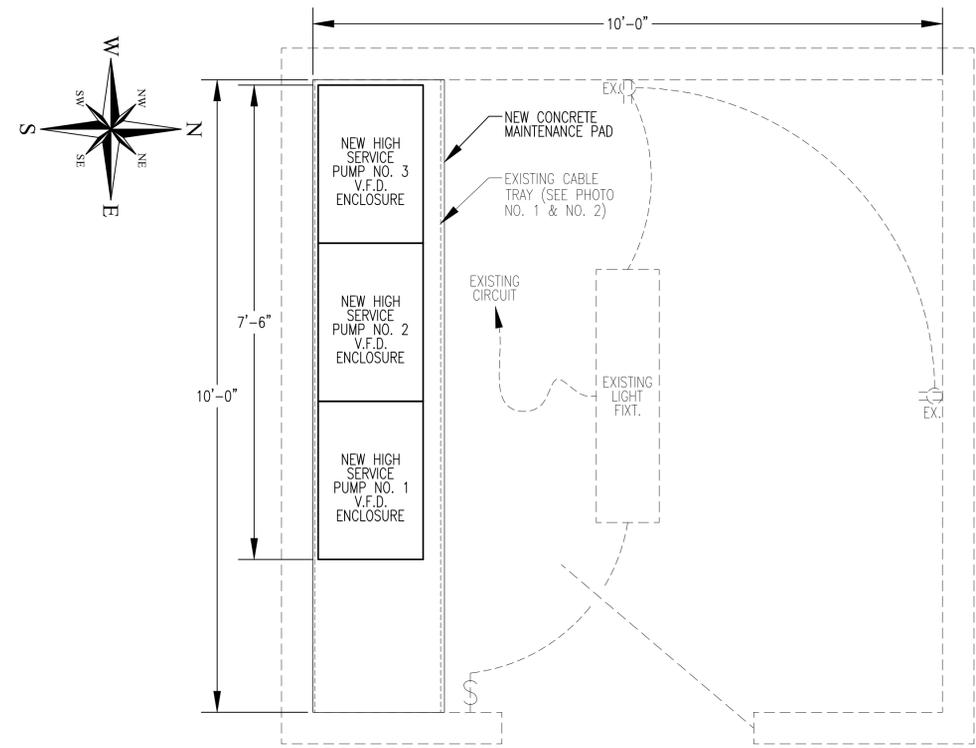
**EXISTING MCC "MCC2" PLAN**  
NOT TO SCALE



**NEW VFD ENCLOSURE ELEVATION**

**KEY NOTES:**

- 1 THE CONTRACTOR SHALL PROVIDE THE LABOR AND MATERIALS TO REMOVE THE EXISTING HIGH SERVICE PUMP TRANSITIONAL STARTERS AND CLEAN THE EXISTING MCC SECTION. THE EXISTING CIRCUIT BREAKER SHALL REMAIN IN SERVICE.
- 2 THE CONTRACTOR SHALL PROVIDE THE LABOR AND MATERIALS TO CLEAN AND REUSED EXISTING MCC SECTIONS AND CIRCUIT BREAKERS TO PROVIDE POWER THE NEW VFDs IN THE ROOM LOCATED BELOW.
- 3 THE CONTRACTOR SHALL PROVIDE THE LABOR AND MATERIALS TO REUSED THE EXISTING CONDUCTORS, CABLE TRAYS AND CONDUITS TO CONNECT THE EXISTING HIGH SERVICE MOTORS TO THE NEW VARIABLE FREQUENCY DRIVES AND THE EXISTING MOTORS.
- 4 THE CONTRACTOR SHALL PROVIDE THE LABOR AND MATERIALS TO RELOCATE THE EXISTING CONDUIT/CONDUCTORS TO A LOCATION THAT WILL NOT BE OBSTRUCTED BY THE NEW MCC.



**NEW VFD ROOM PLAN (LOCATED BELOW EXISTING MCC ROOM)**  
SCALE: 3/4" = 1' - 0"



**VFD ROOM PHOTO NO. 1 (EAST)**



**VFD ROOM PHOTO NO. 3 (WEST)**

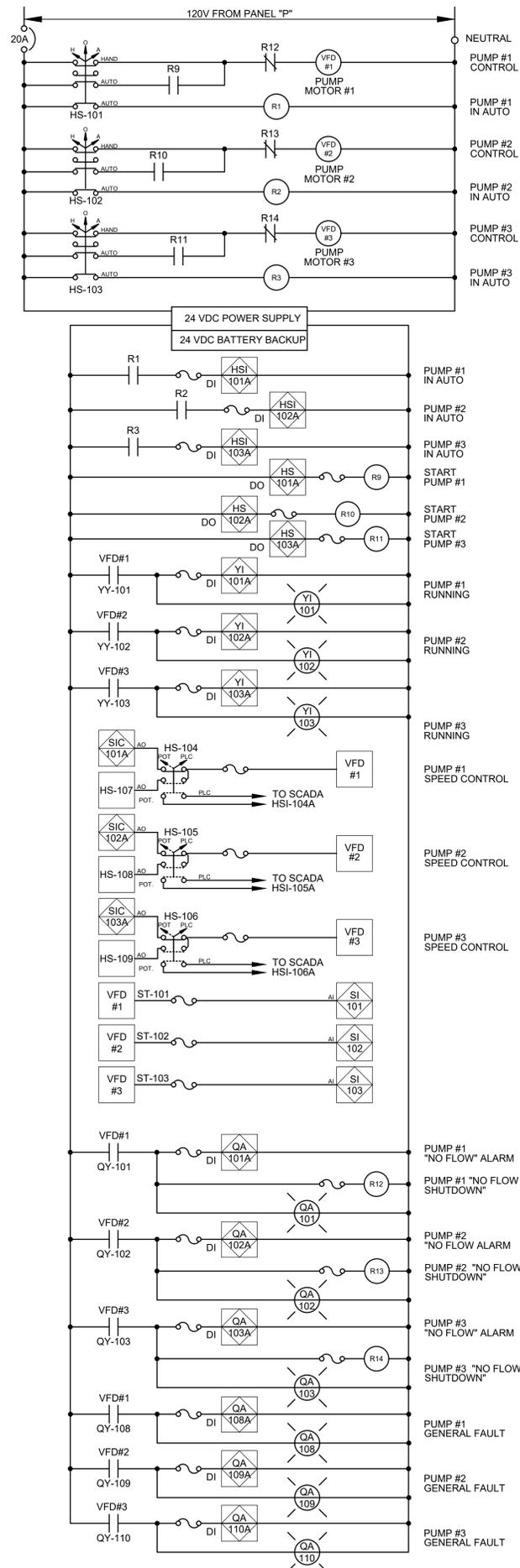


DATA
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PROJECT NO.: IE-106 MAWS
DRAWN BY: B. BERTRAND
DESIGN BY: N. EVERETT
REVIEWED BY: R. MUNIZ
APPROVED BY: N. EVERETT

REVISIONS



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**CONTROL PANEL DIAGRAM**

SITUATION	FIELD ACTION	PLC/SCADA ACTION	ALRM	SITUATION	FIELD ACTION	PLC/SCADA ACTION	ALRM
1. PUMP MOTOR NO. 1 HOA SWITCH PLACED IN AUTO POSITION	HS-101 CLOSES CONTACT HSI-101 AND RELAY R1 IS ACTIVATED TO CLOSE CONTACT R1	A. NOTIFY PLC LOGIC THAT PUMP MOTOR NO. 1 IS AVAILABLE	NO	16. GENERAL VFD NO. 1 ALARM	VFD NO. 1 GENERAL FAULT ALARM CONTACT (QY-108) CLOSSES	A. PROVIDE TO PLC AND SCADA THE ALARM MESSAGE "VFD NO. 1 GENERAL FAULT ALARM ACTIVATED". B. STOP OR PREVENT PUMP MOTOR NO. 1 START COMMAND AND START NEXT PUMP MOTOR WITH HOA IN AUTO POSITION.	YES NO
2. PUMP MOTOR NO. 1 H-O-A SWITCH IS PLACED IN HAND POSITION	HS-101 OPENS CONTACT HSI-101 AND VFD RUN STATUS IS ACTIVATED. VFD SHALL RUN AT DEFAULT SPEED SETTING UNLESS STATION IS IN MANUAL CONTROL MODE.	A. NOTIFY SCADA THAT PUMP MOTOR NO. 1 IS "RUNNING IN MANUALLY".	NO	17. GENERAL VFD NO. 2 ALARM	VFD NO. 2 GENERAL FAULT ALARM CONTACT CLOSSES (QY-109)	A. PROVIDE TO PLC AND SCADA THE ALARM MESSAGE "VFD NO. 2 GENERAL FAULT ALARM ACTIVATED". B. STOP OR PREVENT PUMP MOTOR NO. 2 START COMMAND AND START NEXT PUMP MOTOR WITH HOA IN AUTO POSITION.	YES NO
3. H-O-A SWITCH FOR PUMP MOTOR NO. 1 IS PLACED IN OFF POSITION	HS-101 OPENS CONTACT HSI-101	A. NOTIFY SCADA THAT PUMP MOTOR NO. 1 IS "OFF OR OUT OF SERVICE". B. CONTROL LOGIC SHALL REMOVE PUMP FROM CONTROL SEQUENCE AND CONTROL ALL AVAILABLE PUMP MOTORS WITH SELECTOR SWITCH IN THE AUTO POSITION	NO NO	18. GENERAL VFD NO. 3 ALARM	VFD NO. 3 GENERAL FAULT ALARM CONTACT CLOSSES (QY-110)	A. PROVIDE TO PLC AND SCADA THE ALARM MESSAGE "VFD NO. 3 GENERAL FAULT ALARM ACTIVATED". B. STOP OR PREVENT PUMP MOTOR NO. 3 START COMMAND AND START NEXT PUMP MOTOR WITH HOA IN AUTO POSITION.	YES NO
4. MOTOR NO. 2 HOA SWITCH PLACED IN AUTO POSITION	HS-102 CLOSES CONTACT HSI-102 AND RELAY R2 IS ACTIVATED TO CLOSE CONTACT R2	A. NOTIFY PLC LOGIC THAT PUMP MOTOR NO. 2 IS AVAILABLE	NO				
5. H-O-A SWITCH FOR PUMP MOTOR NO. 2 IS PLACED IN HAND POSITION	HS-102 OPENS CONTACT HSI-102 AND VFD RUN STATUS IS ACTIVATED. VFD SHALL RUN AT DEFAULT SPEED SETTING UNLESS STATION IS IN MANUAL CONTROL MODE.	A. NOTIFY SCADA THAT PUMP MOTOR NO. 2 IS "RUNNING IN MANUALLY".	NO				
6. H-O-A SWITCH FOR PUMP MOTOR NO. 2 IS PLACED IN OFF POSITION	HS-102 IS DE-ACTIVATED AND OPENS CONTACT HSI-102	A. NOTIFY SCADA THAT PUMP MOTOR NO. 2 IS "OFF OR OUT OF SERVICE". B. CONTROL LOGIC SHALL REMOVE PUMP FROM CONTROL SEQUENCE AND CONTROL ALL AVAILABLE PUMP MOTORS WITH SELECTOR SWITCH IN THE AUTO POSITION	NO NO				
7. MOTOR NO. 3 HOA SWITCH PLACED IN AUTO POSITION	HS-103 CLOSES CONTACT HSI-103 AND RELAY R3 IS ACTIVATED TO CLOSE CONTACT R3	A. NOTIFY PLC LOGIC THAT PUMP MOTOR NO. 3 IS AVAILABLE	NO				
8. H-O-A SWITCH FOR PUMP MOTOR NO. 3 IS PLACED IN HAND POSITION	HS-103 OPENS CONTACT HSI-103 AND VFD RUN STATUS IS ACTIVATED. VFD SHALL RUN AT DEFAULT SPEED SETTING UNLESS STATION IS IN MANUAL CONTROL MODE.	A. NOTIFY SCADA THAT PUMP MOTOR NO. 3 IS "RUNNING IN MANUALLY".	NO				
9. H-O-A SWITCH FOR PUMP MOTOR NO. 3 IS PLACED IN OFF POSITION	HS-103 OPENS CONTACT HSI-103	A. NOTIFY SCADA THAT PUMP MOTOR NO. 3 IS "OFF OR OUT OF SERVICE". B. CONTROL LOGIC SHALL REMOVE PUMP FROM CONTROL SEQUENCE AND CONTROL ALL AVAILABLE PUMP MOTORS WITH SELECTOR SWITCH IN THE AUTO POSITION	NO NO				
10. PUMP MOTOR NO. 1 IS STARTED	VFD NO. 1 RUN CONTACT IS ACTIVATED AND ENERGIZES RELAY R7.	A. NOTIFY SCADA THAT MOTOR NO. 1 IS RUNNING B. START MOTOR TOTALIZE RUN TIMER "T101"	NO NO				
11. PUMP MOTOR NO. 2 IS STARTED	VFD NO. 2 RUN CONTACT IS ACTIVATED AND ENERGIZES RELAY R8	A. NOTIFY SCADA THAT MOTOR NO. 2 IS RUNNING B. START MOTOR TOTALIZE RUN TIMER "T102"	NO NO				
12. PUMP MOTOR NO. 3 IS STARTED	VFD NO. 3 RUN CONTACT IS ACTIVATED AND ENERGIZES RELAY R11	A. NOTIFY SCADA THAT MOTOR NO. 3 IS RUNNING B. START MOTOR TOTALIZE RUN TIMER "T103"	NO NO				
13. PUMP MTR NO. 1 IS STARTED AND MOTOR CURRENT IS LESS THAN MINIMUM PUMPING CURRENT	VFD RUN STATUS ACTIVATES RELAY TIMER TDR101 IS STARTED, TDR101 HAS TIMED OUT AND CLOSSES CONTACT TDR101.	A. PROVIDE ALARM MESSAGE TO SCADA AND PLC "NO FLOW ON WELL PUMP MOTOR NO. 1". B. STOP OR PREVENT PUMP MOTOR NO. 1 START COMMAND AND START NEXT PUMP MOTOR WITH HOA IN AUTO POSITION.	YES NO				
14. PUMP MTR NO. 2 IS STARTED AND MOTOR CURRENT IS LESS THAN MINIMUM PUMPING CURRENT	VFD RUN STATUS ACTIVATES RELAY TIMER TDR102 IS STARTED, TDR102 HAS TIMED OUT AND CLOSSES CONTACT TDR102.	A. PROVIDE ALARM MESSAGE TO SCADA AND PLC "NO FLOW ON WELL PUMP MOTOR NO. 2". B. STOP OR PREVENT PUMP MOTOR NO. 2 START COMMAND AND START NEXT PUMP MOTOR WITH HOA IN AUTO POSITION.	YES NO				
15. PUMP MTR NO. 3 IS STARTED AND MOTOR CURRENT IS LESS THAN MINIMUM PUMPING CURRENT	VFD RUN STATUS ACTIVATES RELAY TIMER TDR103 IS STARTED, TDR103 HAS TIMED OUT AND CLOSSES CONTACT TDR103.	A. PROVIDE ALARM MESSAGE TO SCADA AND PLC "NO FLOW ON PUMP MOTOR NO. 3". B. STOP OR PREVENT PUMP MOTOR NO. 3 START COMMAND AND START NEXT PUMP MOTOR WITH HOA IN AUTO POSITION.	YES NO				

**NOTES:**

1. ALL INSTRUMENT TAG NUMBERS ARE ARBITRARILY ASSIGN FOR CLARITY ONLY, IT SHALL BE THE CONTRACTOR RESPONSIBILITY FOR ASCERTAINING THE ACTUAL EXISTING INSTRUMENT TAG NUMBERS AND THE AVAILABLE NUMBERS REQUIRED TO REPROGRAM THE EXISTING SCADA SYSTEM TO PROVIDE A COMPLETE AND FULLY FUNCTIONAL HIGH SERVICE PUMP SYSTEM.



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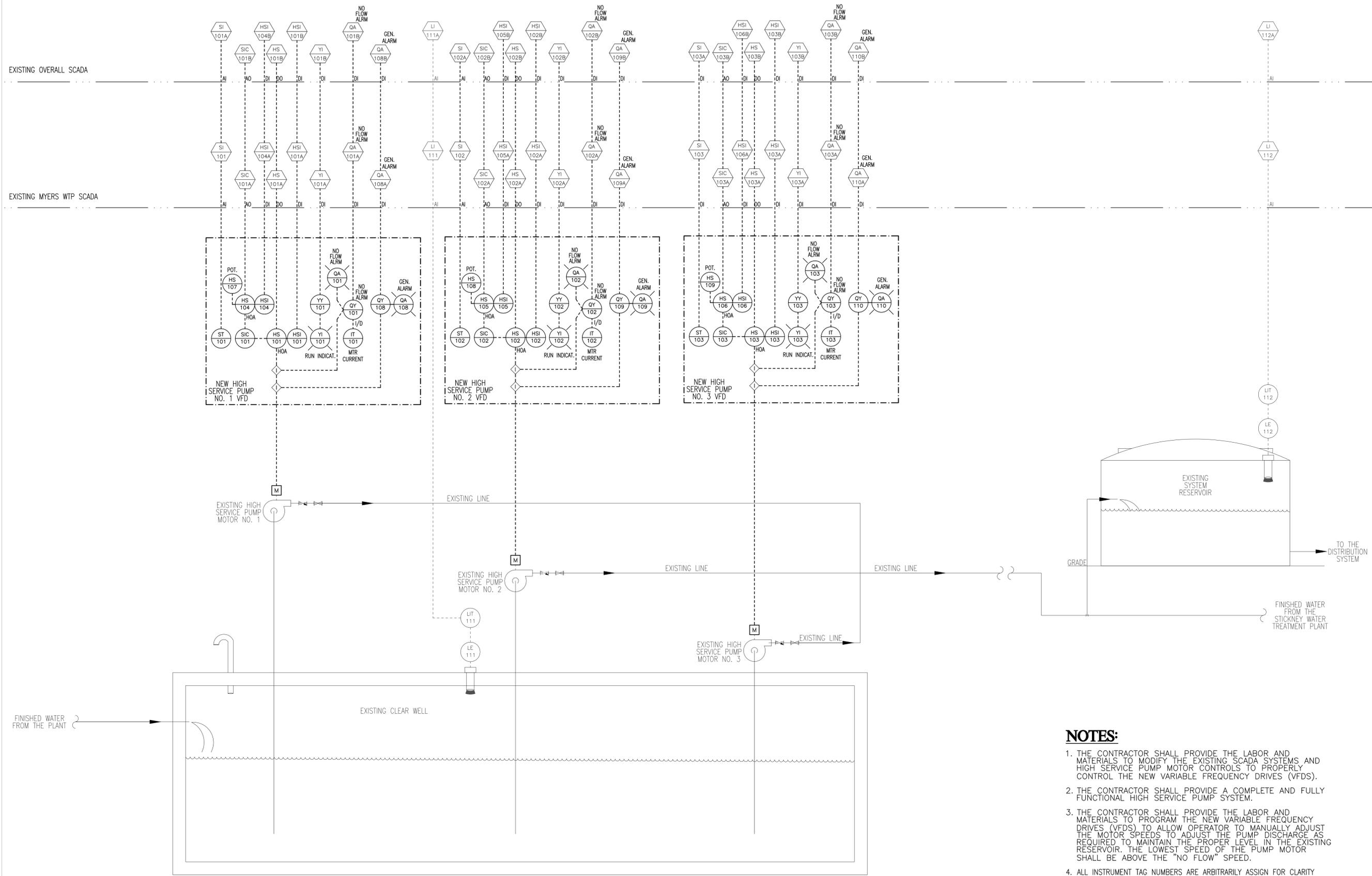


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- NOTES:**
1. THE CONTRACTOR SHALL PROVIDE THE LABOR AND MATERIALS TO MODIFY THE EXISTING SCADA SYSTEMS AND HIGH SERVICE PUMP MOTOR CONTROLS TO PROPERLY CONTROL THE NEW VARIABLE FREQUENCY DRIVES (VFDs).
  2. THE CONTRACTOR SHALL PROVIDE A COMPLETE AND FULLY FUNCTIONAL HIGH SERVICE PUMP SYSTEM.
  3. THE CONTRACTOR SHALL PROVIDE THE LABOR AND MATERIALS TO PROGRAM THE NEW VARIABLE FREQUENCY DRIVES (VFDs) TO ALLOW OPERATOR TO MANUALLY ADJUST THE MOTOR SPEEDS TO ADJUST THE PUMP DISCHARGE AS REQUIRED TO MAINTAIN THE PROPER LEVEL IN THE EXISTING RESERVOIR. THE LOWEST SPEED OF THE PUMP MOTOR SHALL BE ABOVE THE "NO FLOW" SPEED.
  4. ALL INSTRUMENT TAG NUMBERS ARE ARBITRARILY ASSIGN FOR CLARITY ONLY, IT SHALL BE THE CONTRACTOR RESPONSIBILITY FOR ASCERTAINING THE ACTUAL EXISTING INSTRUMENT TAG NUMBERS AND THE AVAILABLE NUMBERS REQUIRED TO REPROGRAM THE EXISTING SCADA SYSTEM TO PROVIDE A COMPLETE AND FULLY FUNCTIONAL HIGH SERVICE PUMP SYSTEM.